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UNIVERSITY OF ALBERTA

RE-DESIGN AND EVALUATION OF AN ON-LINE SPECIFIC OXYGEN UPTAKE RATE MONITORING APPARATUS AT THE GOLD BAR WWTP.

BY

W.K. (DAVE) WONG

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR

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To Whom It May Concern:

Permission is given by the undersigned to W.K.Wong to use the diagram " Schematic of OUR Apparatus " published in " Design and Evaluation of An Automated Oxygen Uptake Rate Measuring System " in the Canadian Journal of Civic Engineering, 15. pp 1015-1021, (1988) for his M.Sc. thesis titled " Re-design and Evaluation of an On-line Specific Oxygen Uptake Rate Monitoring Apparatus at Gold Bar WWTP ".

Dr. D. W. Smith

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21st, February, 1991.

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled **Re-Design and Evaluation of an On-line Specific Oxygen Uptake Rate Monitoring Apparatus at the Gold Bar WWTP**, submitted by **W.M. (Dave) Wong** in partial fulfillment of the requirements for the degree of **Master of Science in Environmental Science.**

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Abstract

Due to the increasing demand for the environmental pollution abatement in wastewater treatment sector, a sensitive on-line monitoring device that can provide rapid and cost-effective information on the quality of the raw influent would be the most needed equipment.

According to many researchers and wastewater treatment plant reports, specific oxygen uptake rate (SpOUR) apparatus seems to be one of the ideal monitoring devices. SpOUR is defined as the rate of oxygen consumption per unit mass of microorganisms during the aerobic metabolism process. In monitoring the SpOUR of a sample seeded with returned activated sludge, important informations such as the toxicity and treatable organics of the sample can be obtained.

The SpOUR apparatus was re-designed and upgraded from an earlier developed prototype in order to meet today's stringent requirements. By using a more efficient programming language and an advanced micro-controller unit integrated with electronic and mechanical devices, the re-designed apparatus can automatically take a sample, mix it with the "seed", measure the SpOUR and plot data on a real-time basis.

The newly developed apparatus was test-run and debugged during the continuous round-the-clock trial periods of 60 days and was proven to be a reliable and useful device for

providing the SpOUR information of the raw influent.

Practical applications from the SpOUR values obtained were also examined. These include monitoring of toxicity, prediction of BOD_5, tolerability of the activated sludge to liquid wastes and food to microorganisms ratio calculation. Finally a protocol for the management of unusual SpOUR results was also suggested.

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List of Abbreviations

ADP = adenosine diphosphate
ATP = adenosine triphosphate
BASIC = beginner's all-purpose symbolic instruction code
BOD_5 = biochemical oxygen demand (5 day incubation)
COD = chemical oxygen demand
DCP = dichlorophenol
DO = dissolved oxygen
EC_{50} = effective toxicant concentration in mg/L that will decrease the SpoUR of the control by 50% under the specfic testing conditions using the SpOUR apparatus
EEPROM = electrically erasable programmable read-only memory
F : M = food to microorganisms ratio
HCMOS = high density complimentary metal oxide semi-conductor
MCRT = mean cell retention time
MCU = micro-controller unit
MLVSS = mixed liquor volatile suspended solid
OECD = Organization for Economic Cooperation and Development
OUR = oxygen uptake rate
PE = primary effluent
RAM = random access memory
RAS = returned activated sludge
RAW = raw influent
RPM = round per minute
RTD = resistant temperature detector
SAT = secondary aeration tank
SOP = standard operation procedure
SpOUR = specific oxygen uptake rate
WWTP = wastewater treatment plant

1. Introduction

Various methods have been developed in recent years for determining toxicity and organic loadings into wastewater treatment plants. However, most of these methods require a skillful operator, take a long time for useful data production, are expensive, and relatively labour intensive. There is also a very difficult decision of which parameters to be chosen as the suitable surrogate for monitoring purposes.

For the wastewater treatment plant, the development of the microbial Oxygen Uptake Rate (OUR) monitoring is one of the most promising methods for helping the wastewater treatment plant personnel to deal with the increasing demand for environmental pollution abatement. OUR test provides an immediate indication on the materials in the wastewater that are or are not inhibitory to the microorganisms present. As such the test result reflects the tolerance of the microbial population to the wastewater that is to be treated. This "tolerability" test is often related to or used as a surrogate for the commonly called "treatability" test.

Two basic automatic models that utilize the monitoring of the respiratory activities of the microbial population are available. The commercially available automated respirometer developed by Arthur (1990) is a modified Warburg respirometer especially designed for wastewater treatment monitoring. A lot of research and development work has been done by Arthur Technology, the company which markets the respirometer, to improve the unit.

Aidun and Smith (1988) have also designed and patented another automatic OUR apparatus in 1986 using a dissolved oxygen (DO) probe and a combination of electrical, mechanical and computer interfacing systems. This apparatus seems to be very promising but is still in its infancy stage, more development work is required to improve the apparatus. Moreover, advances in technologies, especially in the computer area, have made the unit somehow inadequate and less flexible in dealing with today's wastewater treatment plant's increasing demand for better treatment efficiency and pollution abatement.

The initial purpose of this project was to review the literature on the OUR methodology and to improve the hardware as well as the computer software of the OUR apparatus.

Once this was done, practical applications of the up-dated automatic OUR apparatus were to be established for the City of Edmonton's Gold Bar Wastewater Treatment Plant.

1.1 Objectives

The objectives of this study were:

1.1.1 Based on a literature review of OUR methodology, revamp the hardware and software of the Automatic OUR apparatus developed by Aidun and Smith (1988) so that it could be used as an useful on-line monitoring apparatus.

1.1.2 To do a trial run of the newly developed on-line apparatus.

1.1.3 To establish practical applications of the apparatus for the facility at the City of Edmonton's Gold Bar Wastewater Treatment Plant (WWTP).

2. The need for monitoring toxicity and pollutants

In the recent years, private corporations and public regulatory agencies have been increasingly aware of the environmental concerns of the effects of the large number of toxicants and pollutants in the environment. Consequently many environmental protection policies and regulations have been implemented in an attempt to stop the improper dumping of toxic wastes. With the growing pressure from the environmentally conscious public sector and the need to protect the environment, the demand to develop an efficient, cost-effective, sensitive and rapid test for toxicity and pollutants is inevitable.

In particular, wastewater has been an area of concern because it has a direct and often immediate effect on open water sources and on the living organisms (including humans) that rely on them. In view of this concern, series of environmental regulations were imposed in the recent years.

2.1 United States Environmental Regulations.

In 1976, the Resource Conservation and Recovery Act (RCRA) was enacted to ensure the accountability of toxic substances and pollutants. In 1977, the U.S. Environmental Protection Agency (USEPA) issued permits to industries through Section 402 of the Clear Water Act (CWA), governing the discharge of toxic effluents into navigable water. Furthermore, National Pollutant Discharge Elimination System (NPDES) permits are issued by the individual states to control and regulate pollutant discharge.

The revision of the Clean Water Act in 1987 as Water Quality Act (WQA) laid the foundation of biological monitoring as a way of toxicity control.

2.2 Canadian Federal Environmental Legislation.

In 1988, Enviroment Canada had consolidated the various environmental legislations into a single Canadian Environmental Protection Act (CEPA). The CEPA takes a preventive approach to environmental protection. The main emphasis of this Act is on the management of toxic substances from their manufacture, transportation, distribution, storage, use, and eventually to their final disposal. The Act's "cradle to grave" approach attempts to deal with the increasingly important issue of toxic waste problem.

2.3 The Provincial Environmental Acts:

The Province of Alberta's Clean Water Act deals with the legislative aspects of treatment and disposal of liquid wastes. Section 17 of the Act specifies that licensed wastewater facilities such as the Gold Bar WWTP could be held liable as generator for any non-licensed materials that they may receive and eventually discharge to a water body even though they are not the generator of these toxic wastes. In view of the CEPA, the Alberta government is undergoing a revision of the Environmental Law Enforcement so that tougher penalties will be imposed for any violation of the relevant pollution acts.

2.4 City of Edmonton Sewage Bylaws.

Like many sewage treatment facilities in North America, the City of Edmonton allows certain categories of industrial / commercial wastes to be discharged to the sewer system. The obvious advantage of combining these industrial / commercial wastes with the domestic waste is cost effectiveness. Furthermore, the high dilution factor offered by the domestic sewage, also makes such options attractive. However, with the tightening of pollutant disposal requirements, industries may be tempted (and most often due to ignorance) to dispose of hazardous wastes to municipal sewer systems even though Sewer Bylaw #7118 (1983) of the City of Edmonton have set forth various pollutant limits for liquid wastes that can be discharged into the sanitary sewage system. Such unwarranted toxic loadings could easily upset the normal treatment capability of wastewater treatment plant and cause effluent deterioration. Consequently, the WWTP is constantly under the threats of licence violation and treatment failure.

Unfortunately, the Gold Bar WWTP at the City of Edmonton has not been designed to treat toxic wastes. The biological secondary treatment is therefore very vulnerable to toxic shock loads either on an acute or chronic basis. The daily routine monitoring tests done by the wastewater treatment personnel are also unable to give advance warning of any unusual or toxic loadings. In order to deal with this problem, the City of Edmonton has set up a Sewer Bylaws Revision Committee to put forth a new Sewer Bylaw with more stringent limits.

Even without the inflow of toxic wastes, the wastewater treatment plant at Gold Bar is constantly experiencing the diurnal fluctuation of sewage coming into the plant (both in hydraulic and organic loadings). Such fluctuations have caused a requirement for higher level of skill for process control in order to obtain the maximum treatment efficiency and to stay within the provincial and federal governments pollution control regulations.

Consequently, a monitoring device that can provide real-time information on the quality of the influent as well as the treatment process requirements would be the most needed device for the management as well as the operational staff at the wastewater treatment plant.

3. Methods of Monitoring

In order to monitor such toxic and/or high organic loadings to prevent possible wastewater treatment facilities upset and to provide subsequent effective pollutant removal, the following methods of monitoring have been suggested:

3.1 Enzymatic Response:

This approach uses the response of certain types of enzymes or metabolites to toxic materials. Kennicult (1980) reported that chemicals such as chloroform, mercuric chloride, and acrolein, when individually added to a standard solution of adenosine triphosphate (ATP), decreases significantly the luciferin - luciferase enzyme reaction.

By monitoring the changes in the amount of light emitted, an on-line enzymatic response system can be used for testing toxic materials. However, the author cautioned that this method was only in its development stage. This monitoring does not detect any unusual organic loading that can affect the normal operation of the wastewater plant.

3.2 Organic Pollutants Monitoring:

Automated on-line monitoring of Total Organic Carbon

(TOC), Total Carbon (TC), Total Oxygen Demand (TOD), Chemical Oxygen Demand (COD) chosen as indicators of organic pollutants for environment pollution control were described by Queeney & Hoek (1989).

Roesler (1986) had also suggested using of the organic halide as surrogate for toxicity. An on-line total organic halide (TOX) analyzer was used to oxidize TOX to halogen acids (HX) which were then measured by electrochemical or conductivity methods. However, due to the complexity of the raw influent sample matrix, manual sample preparation has to be done. Again, the detector cannot give any information on unusual organic load.

3.3 Gas Chromatography (GC):

Computer-based gas chromatography has been successfully used to detect low molecular weight volatile organics (Dowty *et al.*, 1976) that are toxic. The volatile organics are thermally desorbed from the liquid sample and displaced into the headspace by ultrapure helium purging. The displaced organics are then adsorbed on a special column which fits into the injection port of a gas chromatograph. On-line data collection is done by a microprocessor. However, this on-line gas chromatography is limited to certain specific compounds. It is also expensive to purchase, difficult to maintain and requires a high skill to operate.

3.4 Microscopic Examination

Richard (1988) had reported using of microscopic examination of microorganisms for toxicity assessment in activated sludge. Basing on the report of Himebaugh (1981), the staff of the Gold Bar WWTP (Brown and Nowak, 1983) have developed a microscopic method of evaluating status and activities of the secondary sludge microorganisms via microscopic examination.

Davey (1988) had also documented a "simple but effective" qualitative laboratory bench-top viability test by microscopic examination of the physical and biological changes to ciliates. However, in order to get good interpretation of the result, excellent staff training and the development of an unbiased protocol for reporting observations are required for the success of such a programme.

3.5 Bioassay:

Blaise *et al.* (1988) summarised the various types of current bioassays being tested by Environment Canada as shown in Table 1.

In this approach, micro- or macro-organisms are used to monitor their various physiological changes under different testing conditions. Among the tests listed, the photobacterial test marketed as the Beckman Microtox (Figure 1) which monitors the changes in light emission from the

TABLE 1.

Types of current biological tests conducted in Environment Canada's Environmental Protection Aquatic Toxicology Laboratories (adapted from Blaise *et al.*, 1988)

Test Type	End Point
Lethality	
Trout--*Salmo*	Mortality
Stickleback--*Gasterosteus*	Mortality
Waterflea--*Daphnia*	Mortality
Brine Shrimp--*Artemia*	Mortality
Sublethality	
Trout--*Salmo*	ATP Energy Stress
Waterflea--*Daphnia/Ceriodaphnia*	Reproduction
Algae--*Selenastrum*	Growth Inhibition
Bacteria--*Photobacterium*	Light Inhibition
Genotoxicity	
Dark Mutant Test	Mutagenicity
SOS Chromotest	Genotoxic Potential
AMES test	Mutagenicity
Bioavailability	
Clam--*Macoma*	Bioaccumulation
Freshwater and Marine Fish	Bioconcentration
Biodegradability	
Mixed Aerobic Bacterial Culture	Oxygen Uptake Rate
OECD (1984)	Inhibition

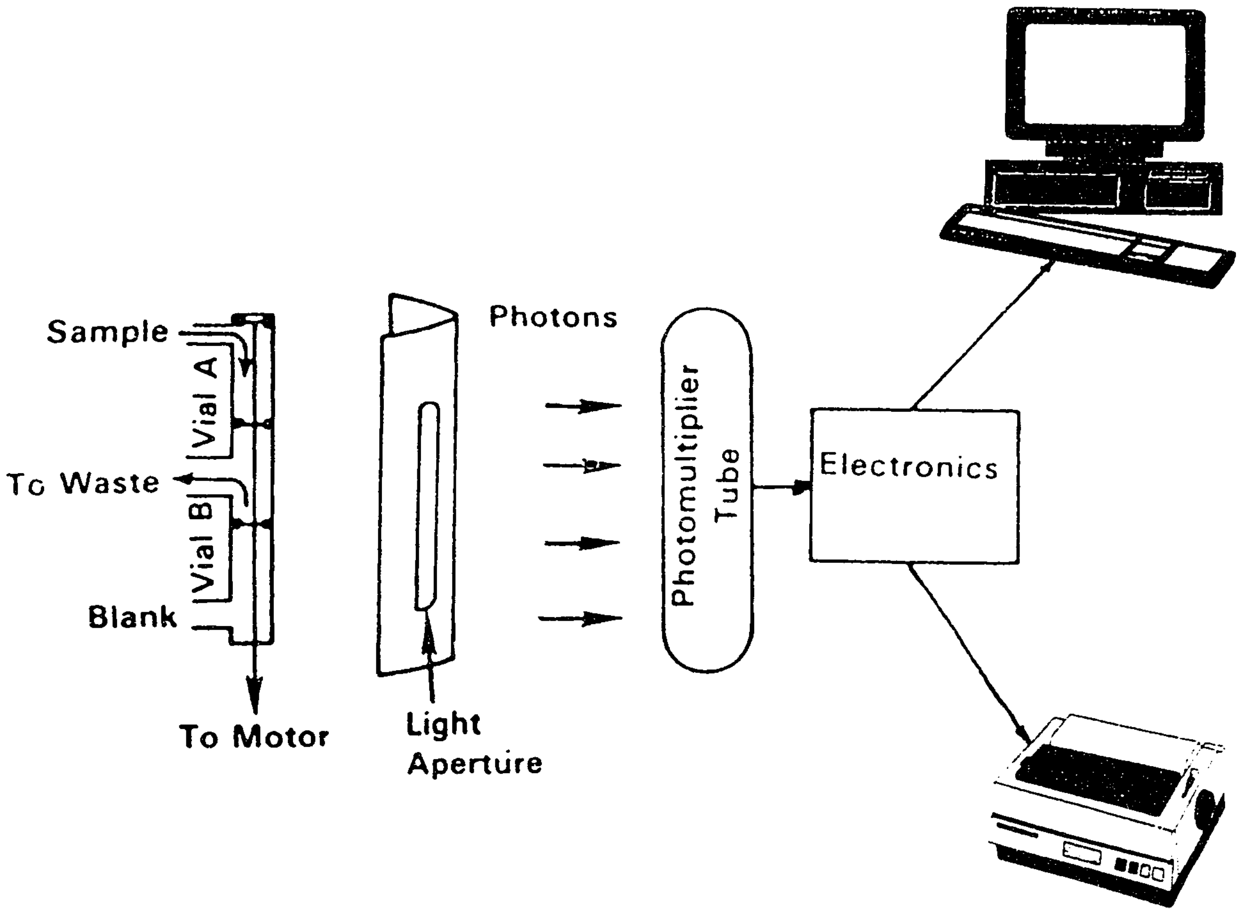


Figure 1. An on-line automated Microtox suggested by Roesler (1986).

luminescent bacteria and the mixed aerobic bacterial culture test (OECD 1984) that measures the bacterial respiration activity changes due to toxicity are the two tests that have gained increasing attention. This type of shifting from the use of fish and other macro-organisms to microbiotest which could be described as the "Second generation bioassay" is due to the ever increasing pressure for the need of effectiveness and economy in environmental protection assessments.

3.6 Others:

Other suggestions such as a combination of dissolved organic carbon (DOC), pH, turbidity, colour, oxidation-reduction potential (ORP) and flow measurement be used at the headworks to monitor the incoming wastewater for early warning of toxicity or high organic loadings or both, as recommended by Flynn (1979) or uses of an on-line respirometer in conjunction with other complicated instrumentation as reported by Summers *et al.* (1982) are either too labour intensive or too complicated to implement.

4. Principle of Specific Oxygen Uptake Rate (SpOUR)

OUR is defined as the rate of oxygen consumed by the microorganisms. It is expressed in formula as:

$$\text{OUR} = \frac{\text{Oxygen Uptake by microorganisms (mg } O_2\text{/L)}}{\text{Time (h)}} \quad (1)$$

The SpOUR of the activated sludge is expressed as the oxygen consumption of aerobic sludge or wastewater microorganisms per unit time per unit microbial mass. It is expressed as:

$$SpOUR = \frac{\text{Oxygen Uptake by microorganisms (mg } O_2/L)}{\text{Time (h) * MLVSS (g/L)}} \qquad (2)$$

MLVSS = Mixed Liquor Volatile Suspended Solid, g/L

SpOUR is one of the most commonly used microbial bioassays. Generally speaking, the test measures the response of the physical property of the OUR of a fixed mass of microorganisms with respect to certain conditions such as presence of toxic material, excess or lack of metabolic substrates, changes in temperature etc.

The respiration activities of an aerobic sludge can be classified as:

1. Endogenous Respiration (R_E) - oxygen is used by microorganisms for degradation of the internally stored reserve substrate due to a low or substrate-free activated sludge. R_E is relatively stable but there is a gradual decline in R_E value over time due to progressive reduction of all reserves.
2. Substrate Respiration (R_S) - oxygen demand in the presence of readily available substrate. For long-term measurement, there is a general transition to

R_E as the substrate diminishes.

3. Maximum Respiration Rate (R_M) - oxygen demand under conditions of excess substrate. The respiration rate R_M is quite steady until excess substrate is depleted and R_M gradually decreases to R_S and eventually to R_E.

These different respiration rates give a quantifiable insight into the enzymatically controlled metabolism rate of the whole micro and macro faunae. They also provide valuable information on the substrate utilization rate, the presence of any toxic chemicals in a very short testing time.

A simple representation of the respiration process can be represented by (after Hanel, 1988):

$$\text{Substrate} + O_2 \xrightarrow[\text{Biomass}]{\text{Activated Sludge}} \underset{\text{More sludge}}{C_{106}H_{180}O_{45}N_{16}P} + H_2O + CO_2 + NH_4^+ + NO_2^- + NO_3^- + PO_4^{3-} + SO_4^{2-} + \text{energy.}$$

Figure 2 shows a simplified aerobic metabolic pathway for the three most common substrates in wastewater. Acetyl groups derived from proteins, carbohydrates and fats enter the Krebs (citric acid) cycle to form CO_2 and hydrogen atoms. The latter are then fed into the respiration chain where the energy contained in the hydrogen is transferred to adenosine diphosphate (ADP) by the coupled oxidative

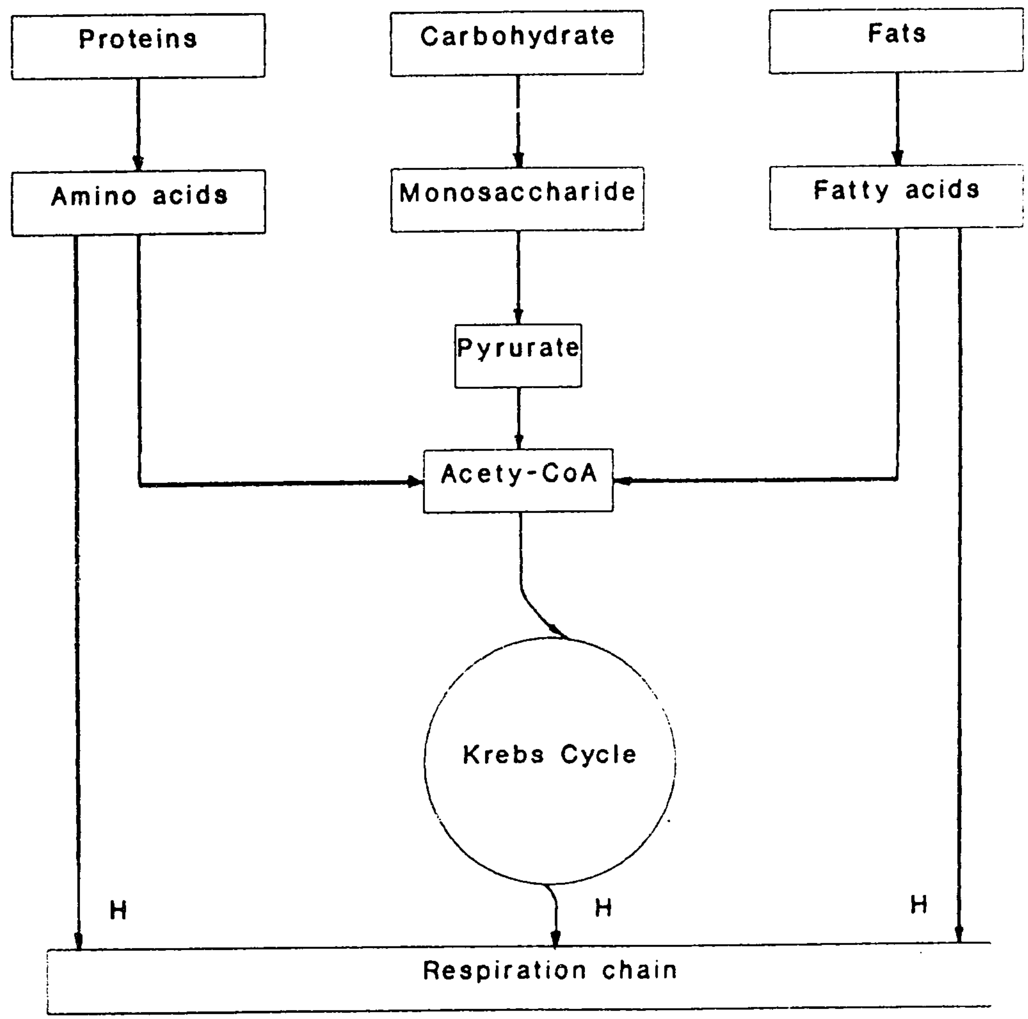


Figure 2. Aerobic degradation pathways for important sewage components in respiration chain.

phosphorylation process to form the high energy adenosine triphosphate (ATP). Oxygen is the normal acceptor for the unenergized hydrogen to form water. That is why OUR can be used as an indicator of microbial activities.

Huang and Cheng (1984) had related mathematically the SpOUR with the substrate concentration by the Monod equation as:

$$SpOUR = \frac{U_M{}^0 S}{K^0 + S} \qquad (3)$$

Where $U_M{}^0$ = maximum SpOUR, mg O_2/(gMLVSS.h).

S = substrate concentration, mg COD/L

K^0 = maximum SpOUR saturation constant, mg COD/L

By applying the Lineweaver - Burk (taking the reciprocal of both sides of the equation) relationship to equation (3) gives:

$$\frac{1}{SpOUR} = \frac{1}{U_M{}^0} + \frac{K^0}{U_M{}^0 S} \qquad (4)$$

Because only active microorganisms would use oxygen during the metabolism of substrate and other microbial activities, the use of SpOUR would be more appropriate for indicating active biomass than other indicators such as ATP, cell count. Moreover, the biokinetic constants $U_M{}^0$ and K^0, reflect the specific characteristics of a particular activated sludge under a given condition. Such information obtained from SpOUR is very useful for other operational control decisions.

Table 2 (adapted from Vargas-Lopez 1989, and Huang and Cheng 1984) shows the values of biokinetic constants obtained from various types of activated sludge at different mean cell retention times (MCRT).

5. Oxygen Uptake Rate (OUR)/Specific Oxygen Uptake Rate (SpOUR): Various Applications and Advantages

While some methods of monitoring are too specific (i.e monitoring only one specific parameter such as pH, TOC, cyanide), others require expensive equipment (e.g. gas chromatography) or trained technicians (e.g. microscopic examination).

Advantages of using Oxygen Uptake Rate (OUR) and more explicitly Specific Oxygen Uptake Rate (SpOUR) as biomonitoring or process control tool have been cited as early as 1956. Wuhrman (1956) had already observed that OUR has a close relationship with loading rates and past history of the sludge under aeration. Eckenfelder (1961) illustrated that SpOUR could be used for monitoring sludge stability. Benefield *et al.* (1975), and Mona *et al.* (1979) reported that any increases in the influent substrate concentration resulted in a corresponding increases in OUR. Based on the

TABLE 2.

Biokinetic Constants Under Various Types of Wastewater and Different MCRT

Source and Type of Activated Sludge	U_m^0 mg O_2/(g.h)(mean)	K^0 mg O_2/L(mean)
Synthetic (Dextrose-Nutrient Broth)[a] MCRT = 8 days.	55 to 115(90)	34 to 154(95)
Synthetic (Nutrient Broth)[a] MCRT = 25 days.	52 to 60(56)	175 to 350(235)
Synthetic (Dextrose)[a] MCRT = 25 days.	36 to 40(39)	100 to 150(117)
Municipal Wastewater[a] MCRT = 5 days.	35 to 42(39)	100 to 125(110)
Laboratory Scale Activated Sludge[b] MCRT = 48 days.	43	81

[a] adapted from Huang and Cheng, 1984.

[b] adapted from Vargas-Lopez, 1989.

continuous measurement of ambient dissolved oxygen (DO) level as a function of oxygen uptake by microorganisms, Clarke *et al.* (1977) and Solyom *et al.* (1976) had both developed a " Biomonitor " to provide early warning to shock loading. Arthur and Hursta (1968), and Therien and Ilhan (1983) had correlated biochemical oxygen demand (BOD) with OUR and suggested using a respirometer as an automatic monitoring device of the biodegradable organics entering the wastewater treatment plant.

Haas (1979) developed a relationship among the influent, effluent strengths and OUR which may be considered as analogous to direct control of Food to Microorganisms (F : M) ratio.

In his many publications about activated sludge process control, Arthur (1982a, 1982b, 1983, 1984, 1986, 1988, 1990) has suggested many uses of OUR in plant process control. These included "toxicity testing of influent, anticipatory control of microorganisms viability, control of return sludge, short term BOD determination such as prediction of BOD_5 in final effluent ......etc." Successful results were claimed by Nelsen (1987) and Miller (1985) in their wastewater treatment plants in Richland, Wash. and Syracuse, N.Y. respectively. Both plants reported using OUR as a monitoring device and recommended that it was an invaluable tool in predicting process performance changes or failures.

Huang and Cheng (1984) observed that OUR reflected the extent of microbial activity and specific oxygen uptake rate (SpOUR) could be related to the final effluent soluble chemical oxygen demand (SCOD) concentration. Mueller *et al.* (1985) further indicated the potential and usefulness of the OUR of an activated sludge in determining the microbial activity and viability. Suschka and Ferrira (1986) demonstrated that the respirometer measurement technique for OUR could be of great help in evaluation of the activated sludge characteristics, the sewage concentration fluctuation and the biodegradability. Roesler (1986) recommended that respirometer was one of the most promising on-line analyzers for early warning of a variety of toxic materials. Aidun and Smith (1988) were able to collect OUR data automatically on a continuous basis with the aid of a micro-computer. They felt such information was important for detection of toxic compounds entering the wastewater treatment plant and for general process control monitoring.

Colvin and Rozich (1989) have shown that OUR testing results could be used to calculate important process control information such as the biokinetic constants. Dutka and Kwan (1984) compared four different microbial toxicity testing procedures and found that the OUR testing is one of the best for testing contaminated samples because factors such as pH, turbidity, and colour do not seem to affect the outcome of the toxicity tests as compared to the other methods.

Vargas-Lopez *et al.* (1989), in their discussion of using SpOUR as an activated sludge process control parameter, had strongly recommended SpOUR be used in aeration and return sludge rate control and for early warning of shock loads and toxicity. However, they also specified that standardization and improvement in procedure should be investigated to improve the accuracy and precision of the measurement.

In their comparison of the three rapid toxicity test procedures, Elnabarawy *et al.* (1988) also concluded that the method of measuring respiratory activity can detect adverse effects on heterotrophic microorganisms but cautioned the lack of reproducibility if measurements are not done carefully.

Uses of OUR is not limited to the research laboratory only, it is also presently used and favoured by many wastewater treatment plants as one of the most valuable tools for plant process control. Fitzgibbons (1989) indicated that OUR is an useful tool for predicting changes in activated sludge operating conditions at an early stage at the City of Cranston, Rhode Island Wastewater Treatment Facility, but commented that manual testing is cumbersome.

Nelsen (1987) of the City of Richland Wastewater Treatment Plant, Washington, reported the routine uses of OUR for evaluation of the relative activity level of the biomass and prediction of the plant's BOD removal effectiveness. The City of Union, Ohio, (Miklos, 1990) also uses the OUR as a tool for rapid determination of treatability or toxicity. By using a YSI DO probe, a comparison of the wastewater treatment plant's activated sludge OUR before and after contact with the wastewater is utilized as a measurement of treatability/toxicity.

Miller (1985) of Onondoga County in Syracuse, N.Y., used the OUR as a "real time" control parameter for settleability, F:M ratio, mean cell retention time (MCRT) and the quantity of oxygen needed to maintain a healthy activated sludge.

The Patapsco Wastewater Treatment Plant on the Chesapeake Bay in Baltimore, Md., utilized OUR instrument to investigate the high CO_2 inhibition on activated sludge (Martin 1988). In the same facility, Whitney (1989) further used the OUR to continuously monitor presence of toxicity not only from the Patapsco Plant but also from any other suspected sites of possible toxic pollution in Baltimore. The City of Calgary's Bonnybrook Wastewater Treatment Plant also applies the OUR moitoring technique via a respirometer to test treatability and toxicity of wastewater. In Georgia, the Ellijay Water Pollution Control Plant uses OUR daily to monitor any inhibition in the secondary aeration tanks due to toxic chemicals (Bundy 1989).

Another advantage of using OUR or SpOUR as a monitoring method is that no chemical reagents are used for the test. Other monitoring procedures such as COD require some hazardous reagents and consequently will require additional waste disposal management.

The real advantage of using SpOUR is no surrogate is used, so there is no guessing or interpretation of the outcomes of the monitoring. Samples being examined are tested using the microorganisms taken from the treatment plant itself. The results give the direct indication of the impact of the sample to the treatment system.

Furthermore, from the point of view of process control, the SpOUR testing is superior to other methods of monitoring. The activated sludge used for SpOUR tests is site specific, while many other tests may give false positive or negative results. One example is the use of Microtox for testing toxicity of a sample. A positive toxicity sample identified by Microtox may not be toxic to a particular treatment plant due to activated sludge acclimatization and vice versa.

In spite of all these recommendations, negative feedbacks are also reported. Benefield *et al.* (1975) commented that OUR would increase lab workload, required a much higher degree of operator's attention and more complicated mathematical manipulation. Duggan and Cleasby (1976) illustrated that no relationship existed between OUR and effluent quality but concluded that OUR reflected influent concentration fluctuation. Sherrard (1980) reported that the OUR had limited use for process control purpose. He concluded that the more reliable information could be obtained by directly measurement of the aeration tank DO concentration and effluent quality. Khararjian (1980) believed that the use of OUR would tend to confuse plant operators and engineers. Edwards and Sherrard (1982), Godrej and Sherrard (1988), Chandra *et al*. (1987) further indicated that OUR or SpOUR would vary widely with very little change in effluent quality and was of little use as a plant process control parameter for both steady state and shock-loading conditions.

Miklos (1990) also pointed out the limitation of the OUR/SpOUR result as it can not differentiate between low organic loading and toxicity. The OUR or SpOUR result will only tell toxicity for that particular population of microorganisms. Consequently, no comparison or standard reading can be referenced as it can be done in the Microtox method.

Furthermore, the OUR/SpOUR tests results do not tell the effects of toxicity on the anaerobic digester and the effluent to the aquatic life.

With the above alleged advantages and limitations recognised, the microbial bioassay method of OUR/SpOUR is one of the most compelling and applicable methods for monitoring wastewater process control. It is far more desirable to have a small scale activated sludge upset such as registered in the SpOUR apparatus than to have an actual major upset in the plant's secondary that could result in a plant shut down or a licence violation.

6. SpOUR Measurement

The SpOUR measurement can be done by two principal methods of evaluation, both of which are acknowledged by the Standard Methods (APHA, *et al.*, 1989) as acceptable.

6.1 Respirometer

The first method uses the principle of the Warburg Respirometer that was developed in the early 1900's. Through years of improvement, automated respirometers mainly designed for wastewater monitoring purposes have been developed. The Arthur Automatic Respirometer (Figure 3) utilizes a combination of sample chamber carbon dioxide scrubber, a sensitive gas volume transducer, air pump and automatic vent - all immersed in a temperature controlled water bath. When a sample (1 to 4 litres) is introduced into the sample chamber, its respiratory activity uses oxygen and generates carbon dioxide which is immediately removed by the scrubber. The net loss of gas volume is detected by the transducer and recorded on a strip chart as oxygen uptake as shown in Figure 4. The rate of oxygen uptake is then calculated from the strip chart.

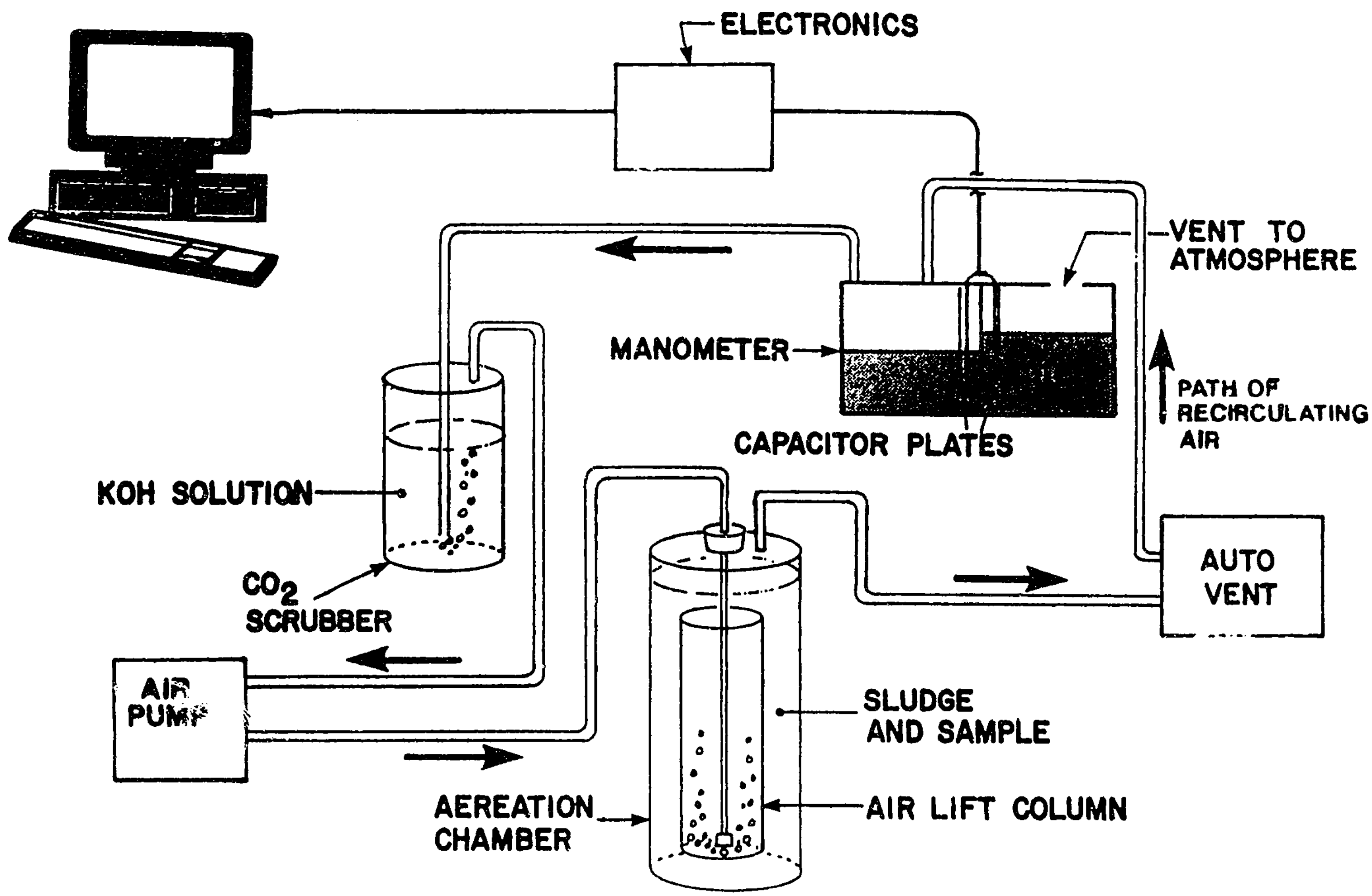


Figure 3. Arthur automated respirometer (adapted from Martin 1988).

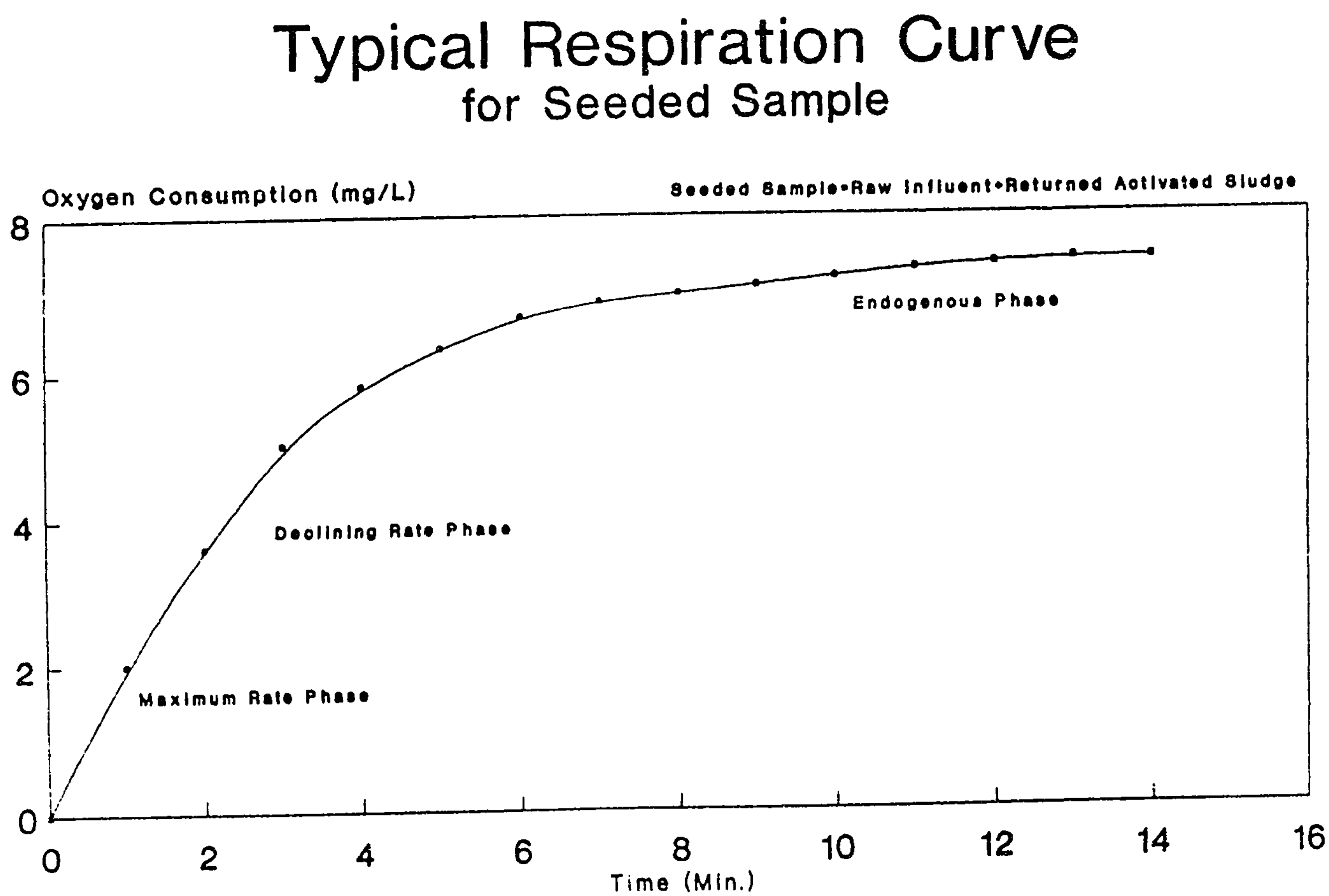


Figure 4. Typical respiration curve for seeded sample.

6.2 Dissolved Oxygen Probe

The second method uses an oxygen sensitive electrode to monitor the rate of decrease of oxygen (Standard Methods, APHA, *et al.*, 1989. Method #2710.B). This method is also adapted by the Organization for Economic Cooperation and Development (OECD 1984) for testing respiration inhibition on activated sludge. Basically, an oxygen sensing probe is used to measure the changes in oxygen concentration of a sample in a suitable container like a BOD bottle over a fixed period of time. Figure 5 shows the schematic of the testing arrangement.

In this project, the method of using the oxygen sensitive electrode for SpOUR measurement was chosen because of the following reasons:

(i) The oxygen sensitive electrode (dissolved oxygen probe) was readily available from the Gold Bar Wastewater Treatment Facility.

(ii) Dissolved Oxygen (DO) probe measures oxygen directly rather than indirectly as in the case of respirometer.

(iii) No complicated equipment such as the transducer or scrubber are required.

(iv) Successful development of an automated on-line OUR measurement system by Aidun and Smith (1988).

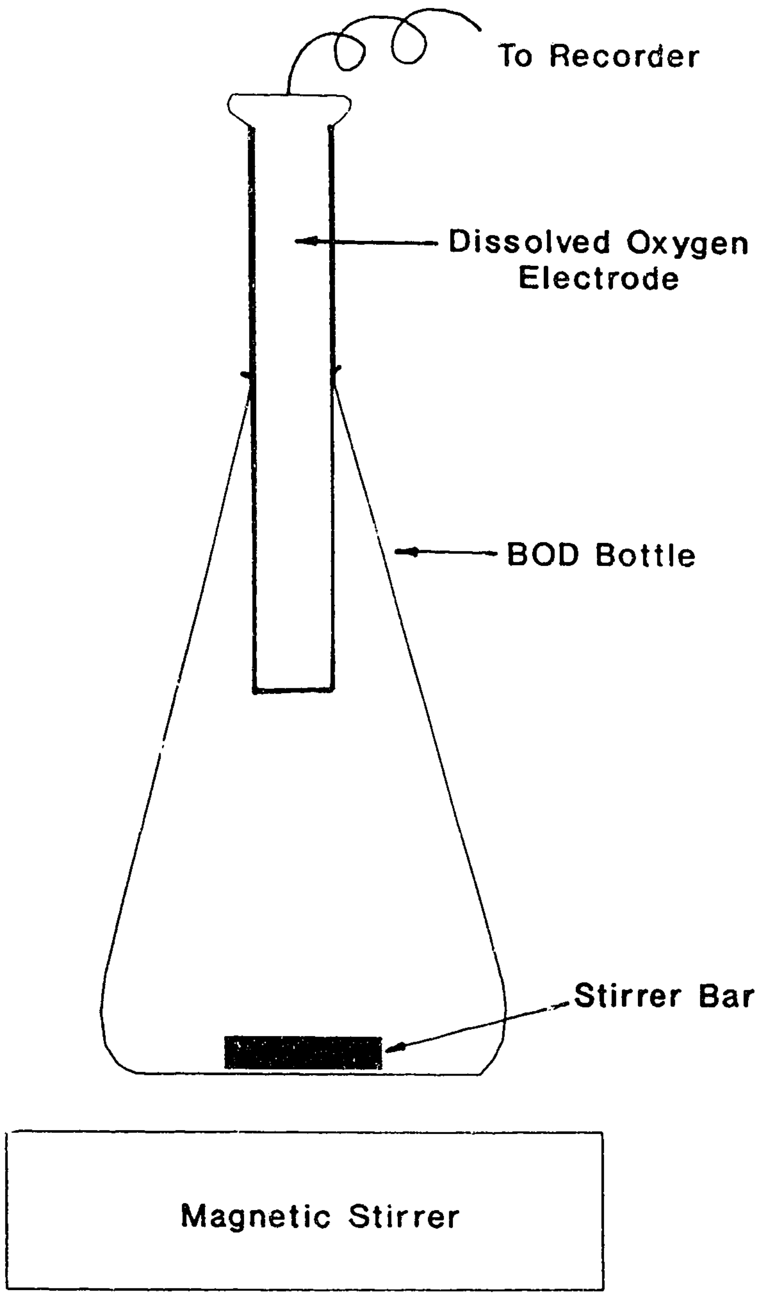


Figure 5. Schematic of the OUR testing arrangement as suggested by OECD (1984).

7. The Need To Redesign An On-line Automated Real-Time SpOUR Monitoring Apparatus

From the previous discussion of all the benefits of SpOUR monitoring, it is obviously desirable to have an automated on-line SpOUR monitoring device that is capable of giving real-time information on the activated sludge treatment process.

Aidun and Smith (1988) developed an automated OUR measurement system using a DO probe. However, the initial design could only test samples taken from the secondary aeration tank. Due to the limitation of the initial apparatus design, the equipment cannot test raw sewage influent at the raw influent headworks at the Gold Bar WWTP. Such a restriction has limited the advance warning ability of the apparatus. An update of the mechanical part of the OUR measurement system is inevitably necessary if an advanced warning is required.

Computer technology has also advanced so much since Aidun and Smith (1988) developed the first prototype that better software and hardware are available nowadays to make the apparatus more "real-time" and efficient. The micro-computer system used previously is a Commodore 2001 Series (PET) with only 32K memory. Both the floppy disk drive and printer were slow and inadequate. Moreover, Commodore computer and its "Basic" software programme are not commonly used nowadays. The more commonly used computer in the industrial or laboratory environment is the IBM or IBM compatible. Therefore, computer software and hardware revamps were required to keep up with the new development and to provide real-time data handling ability.

8. Development of SpOUR Apparatus Prototype

The stages of development of the automated on-line SpOUR apparatus were set as follows:

8.1 conceptualization of the design;

8.2 collecting relevant information for the designing;

8.3 construction process;

8.4 start-up and debugging during trial run;

8.5 final testing run for the completed unit;

8.6 development of practical applications for the apparatus; and

8.7 turning the completed unit into a process control operation.

8.1 Conceptualization

The initial design was originated from Aidun and Smith (1988). Using the principle from the Standard Methods (APHA, *et al.*, 1980), they had developed an apparatus to monitor the OUR of the activated sludge in the secondary aeration tank.

In order to get a better lead time for monitoring toxic and organic loading so that plant operator can have some advance warning, monitoring of the raw or primary sewage is necessary. In this case any toxic or extraordinary loads of raw sewage coming to the plant can be detected. The control operators can have at least the length of time equivalent to the retention time of the primary to decide what to do before the slug reaches the secondary aeration tank. At the Gold Bar WWTP, this retention time is equivalent to 0.7 hour to 2.3 hours (UMA 1976) depending on the flow rate. This average 1.5 hours of advance warning is very valuable for process control management to make a decision and carry out corrective measures. Such an advance alarm enables the operator to be "proactive" rather than "reactive".

It would also be desirable to save the sample that has been tested by the SpOUR unit so that any abnormality in the SpOUR test can be further investigated. A protocol for the control operator to decide what steps to follow if a toxic or heavy loading is suspected from the SpOUR result would also be developed.

8.2 Collecting Relevant Information For The Design

Having identified the above requirements, the following changes and specifications were perceived:

1. The sampling location must be relocated to obtain representative influent sample.

2. The unit must be able to obtain and test the SpOUR of a raw influent sample.
3. A portion of the sample must be stored for later analysis if needed.
4. The result should be automatically recorded and a trend reading plotted out on the computer screen on real-time.
5. The practical application of SpOUR data for the purpose of operational control should be developed.
6. A protocol for action should be developed if the SpOUR measurements reached some pre-set warning limit or showed a special trend.

8.2.1 Selection of Appropriate Sampling Point

In order to get a representative sample from the process stream, choosing a proper sampling location is very important. Figure 6 shows a schematic process flow diagram of the Gold Bar WWTP.

The 420 ML/d plant consists of primary and an air activated sludge biological treatment system. The plant not only treats domestic and industrial sewage from the City of Edmonton but also from the Strathcona Industrial and the residential Leduc - Beaumont areas due to a SWAP agreement with the smaller 90 ML/d Capital Regional Sewage Treatment Plant (CRSTP) located in the Clover Bar area.

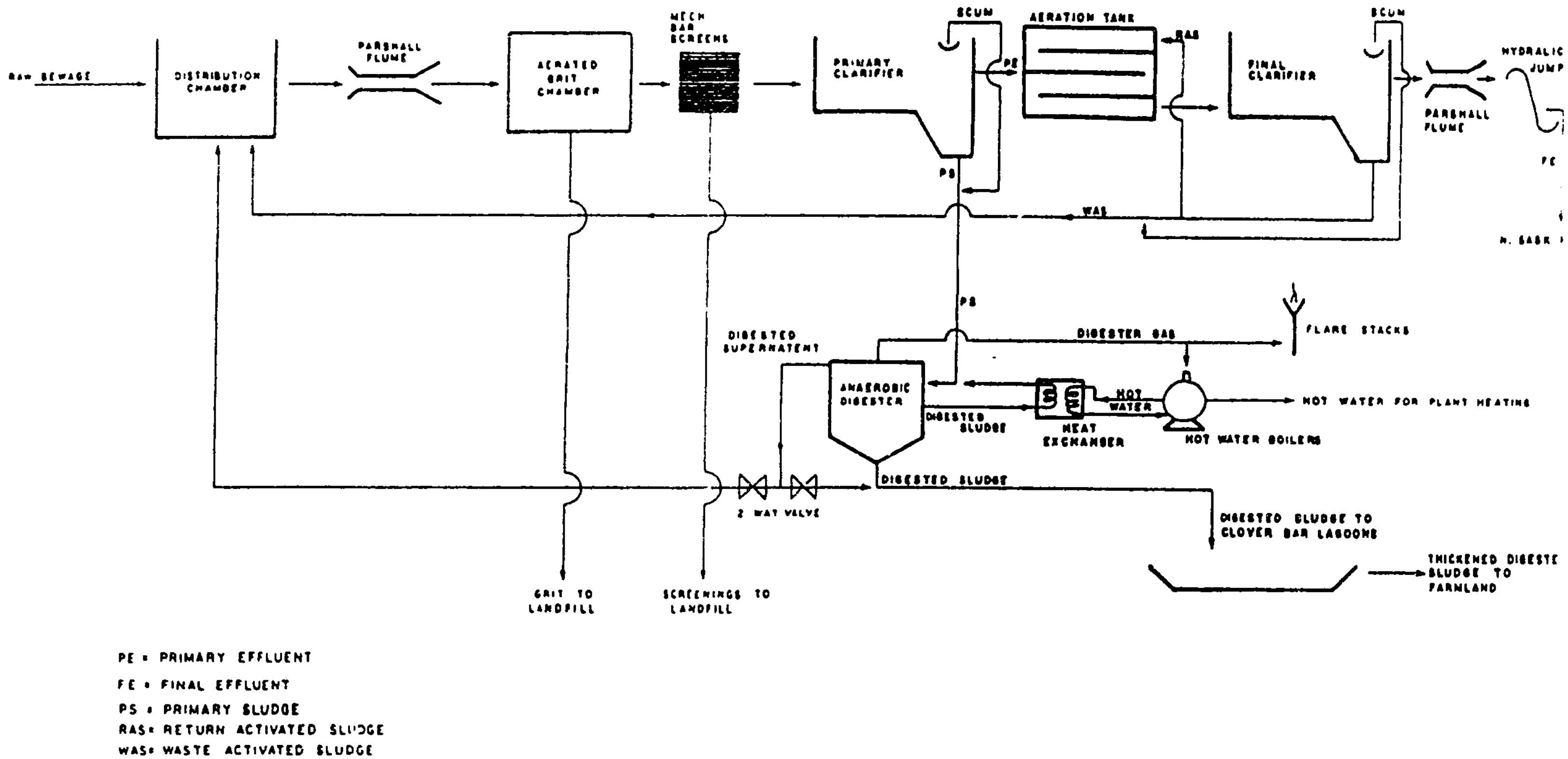


Figure 6. Gold Bar WWTP porcess flow schematic.

The major sources of wastewater flow to the treatment plant can be classified as:

1. Domestic Wastewater: Wastewater discharged from residential source. According to Yee and Hettiaratchi (1989), 71.5% of the sewage comes from domestic source during the dry weather flow (DWF).
2. Industrial Wastewater: 24.8% of the DWF enters the Gold Bar WWTP in the form of industrial and commercial origin. Under the Sewer Bylaw #7118, the City of Edmonton allows certain types of industrial and commercial wastes to be discharged into the sanitary sewage system and the wastes are treated at the Gold Bar WWTP. Many of these discharges may contain pollutants that could have adverse effects on the normal operation of the wastewater treatment system.
3. Inflow and Infiltration: The dry weather flow (DWF) inflow and infiltration come from discharge from manholes, weeping tiles, cross connection from storm and combined sewers, surface runoff, defective pipes, and pipe joints.
4. Storm Water: Some of the storm water in the summer and snow melt in the spring go to the combined sewer and flow to the GBWWTP for treatment. The inflow and infiltration due to storm water can cause a major upset problem for the WWTP. During major storms, the

amount of water going into the WWTP increases significantly so that the activated sludge process may be upset due to the drastic decreases in organic loading but increases in hydraulic loading.

Initially, the same sampling location used by Aidun and Smith (1988) was selected (Figure 7, Legend 7-Aeration Tank) because the returned activated sludge (RAS), plumbing facilities and power were readily available. However, a 200m raw sewage pipe was required to deliver influent to that test location. Such a long sample line is expensive to construct. It can also give rise to plugging, excessive lag time and other maintenance problem. The sampling point had been later selected at the headworks building at the front gate of the plant due to the convenience of existing power and plumbing facilities. Figure 8 shows the detailed sampling location at the headworks of the Gold Bar WWTP. The headworks building is a temperature controlled building with a permanent auto-sampler inside collecting 24-hour composite plant influent on a flow proportional basis.

The building is located on top of the distribution chamber which mixes the raw influents coming from the two inlet conduits. The older conduit is a 2.29m x 1.98m concrete conduit while the newer one is 2.45m x 2.43m. The raw influents coming into the WWTP via the conduits mix in

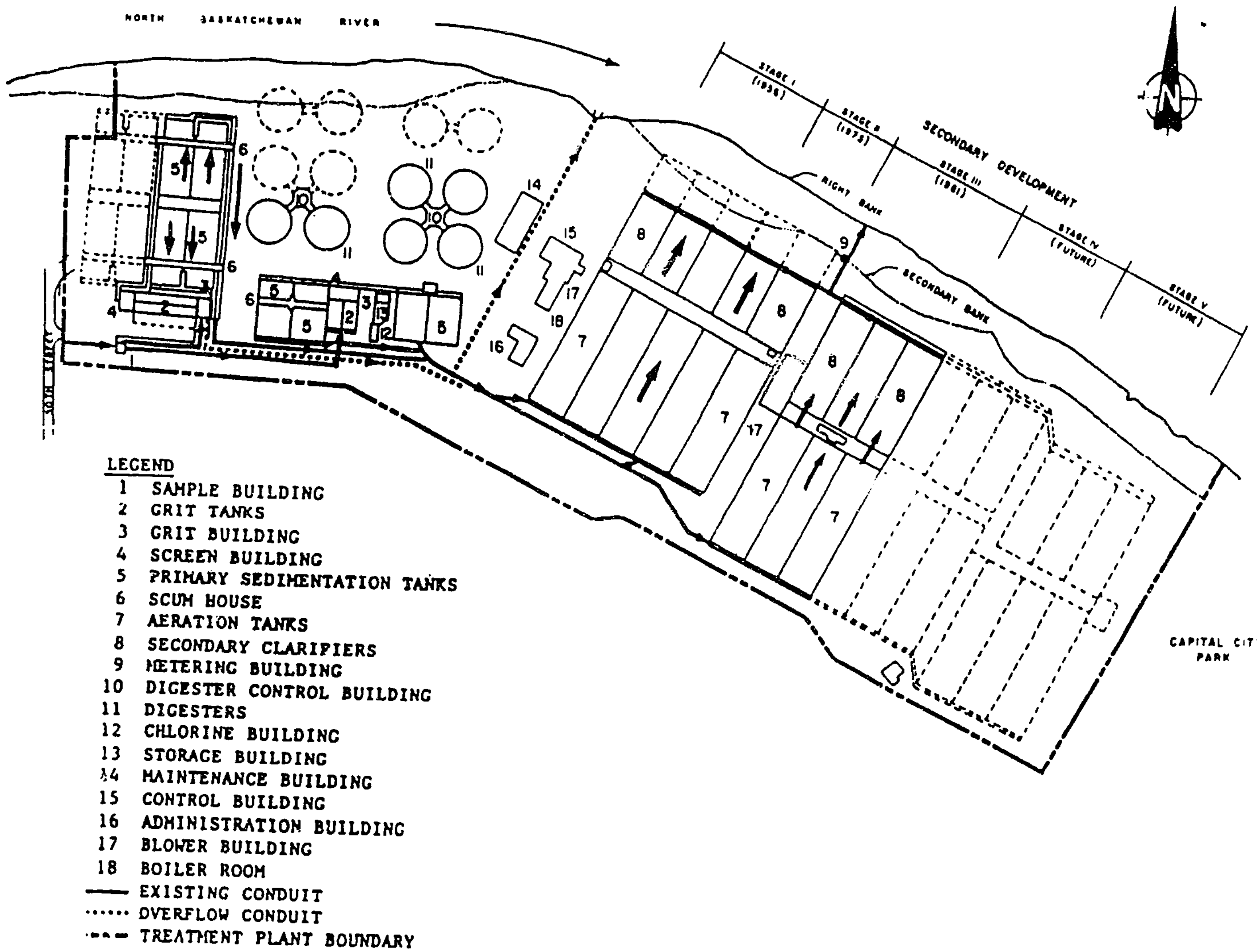


Figure 7. Gold Bar WWTP layout.

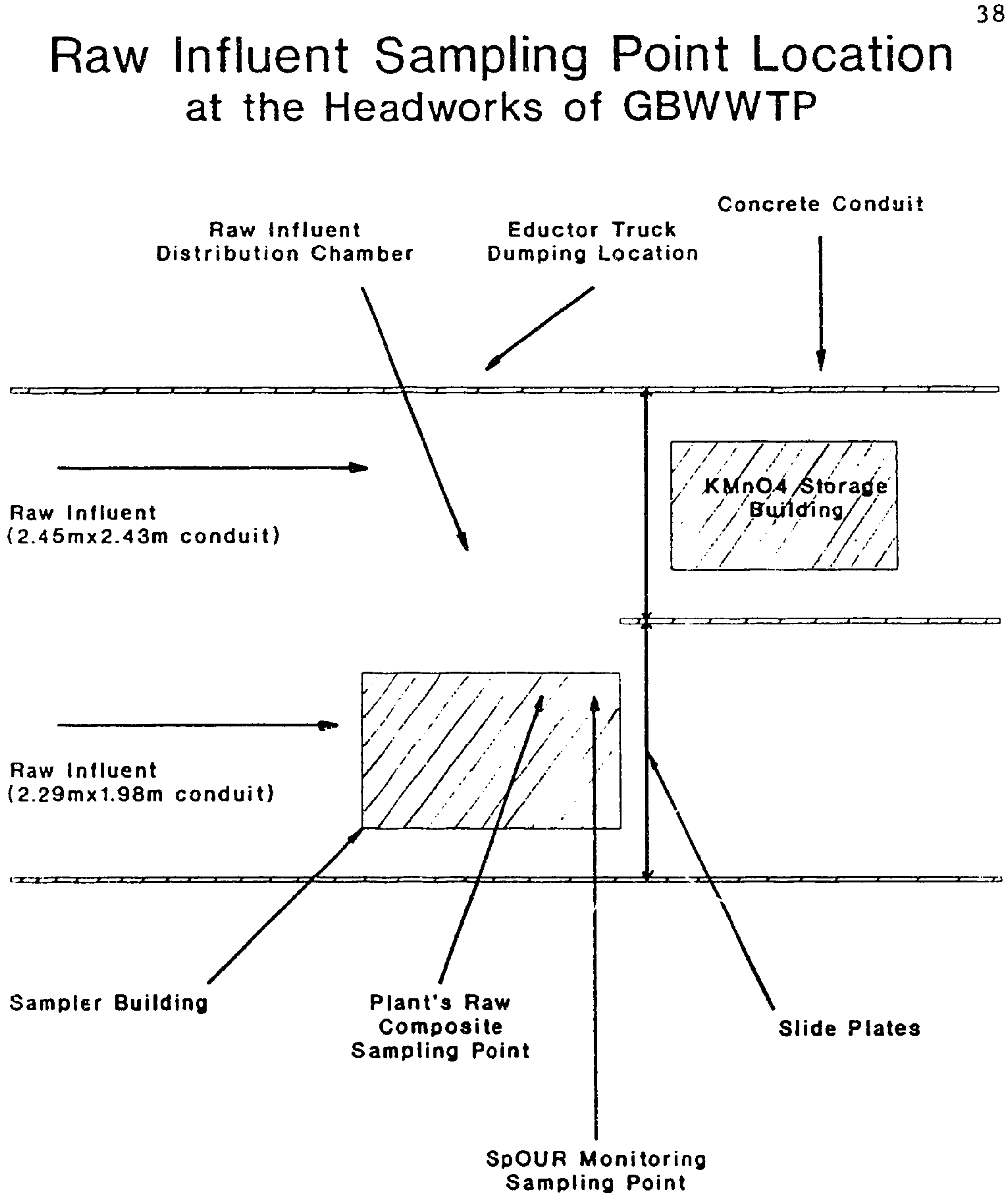


Figure 8. Raw influent sampling point location at the Headworks of GBWWTP.

a small distribution chamber. The mixed wastewater then branches into two channels each of which is equipped with a venturi flume to automatically measure and split flow proportional to the treatment capacity of the eight primary sections.

$KMnO_4$ is added at this point to control odour. There is also an eductor truck dumping station where all the non-hazardous liquid wastes that meet the City of Edmonton's Sewer Bylaw #7118 can be dumped at the location.

The waste activated sludge from the secondary sections and the digester supernatant are also discharged into the influent right after the sample building. The sample point selected was an existing piping adjacent to the plant's influent composite sampling point. This is the best location because:

1. It is located in the distribution chamber where influents are properly mixed.
2. The building's temperature is maintained at room temperature.
3. All electrical and plumbing fixtures are ready for use.
4. It can also pick up eductor truck's dumping if a sample is taken during the truck's unloading. Together with the existing closed-circuit TV monitoring system, a better monitoring programme of

the Eductor truck dumping can be administered.

5. The sampling building can be locked so that unauthorized tampering of instrument and data is minimized.
6. It is the same building where the plant's regular influent composite samples are taken so that operator does not have to make a special trip to check and maintain apparatus if it is installed permanently.
7. It will give an average advance warning time of 1.5 hours depending on flow.

8.2.2 Use of an Auto-Sampler to Obtain Raw Influent Sample

Basically, Aidun and Smith's (1988) OUR apparatus (Figure 9) was used as an initial design protocol. In order to enable the unit to obtain the raw influent, a dependable commercial auto-sampler was used. The City of Edmonton Environmental Services Industrial Wastewater sampling group has been using auto-samplers since 1988 for monitoring wastewater samples. The unit used was a Streamline portable sampler manufactured by the American Sigma, Inc. (American Sigma, 1988). After careful consideration, the above sampler was selected for this project because of the following reasons:

1. Sampler was available for loan from the Wastewater Sampling Crew of the Gold Bar WWTP.
2. The ruggedness and dependability of the instrument

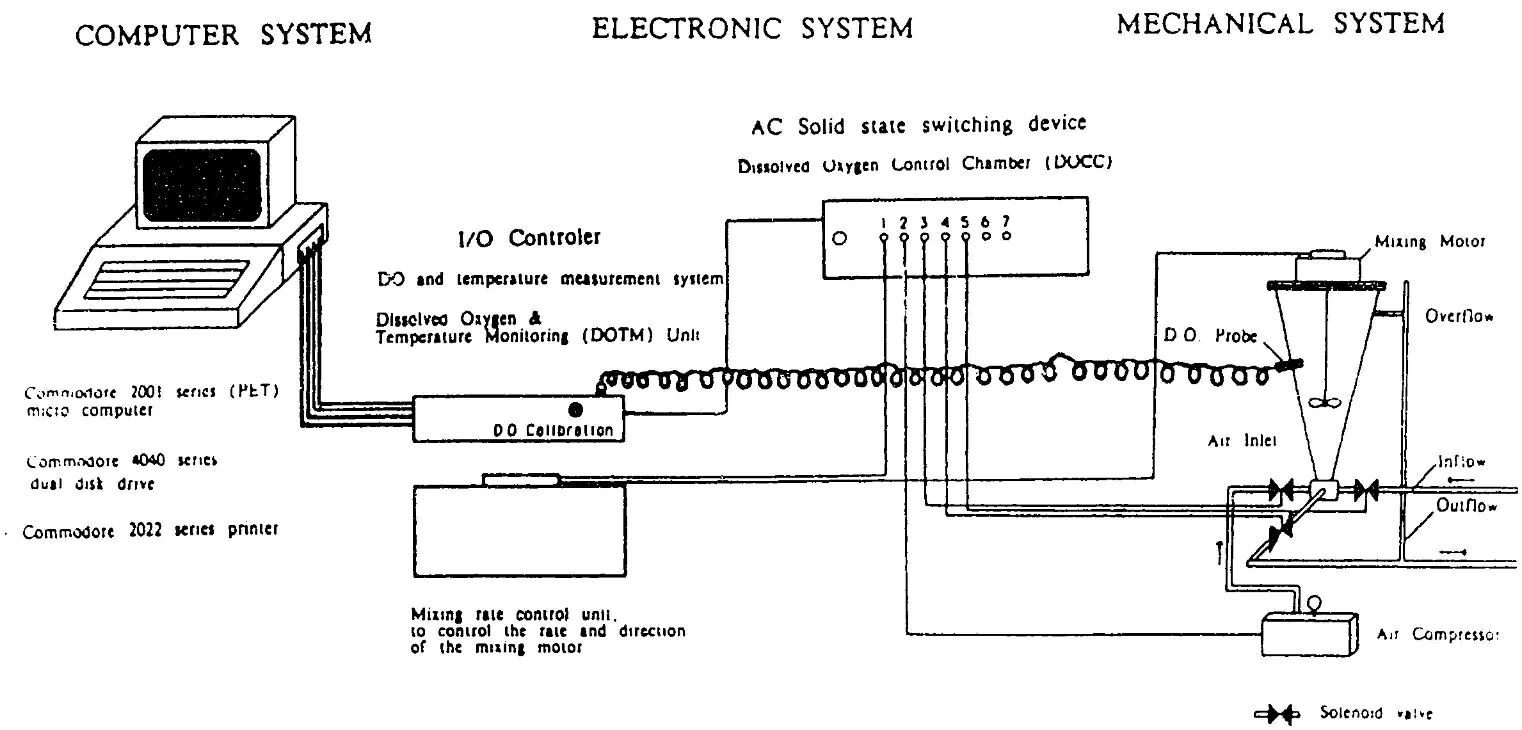


Figure 9. Schematic of OUR apparatus of Aidun and Smith(1988).

have been proven through years of usage.

3. Instrument could be easily adapted to suit this project's purpose. Interfacing with computer was simple and could be easily done.

4. It can automatically collect a desired amount of discrete sample in 24 individual bottles upon the command sent by the micro-controller unit (MCU) in the SpOUR apparatus.

The auto-sampler had been modified as shown in Figure 10. A sample splitter was added so that sample could be delivered evenly to both sampler and the OUR apparatus. A solenoid was also installed at the OUR sample line so that when the sample in the OUR apparatus reached a pre-designed volume, the solenoid would be closed and the rest of the raw influent would be directed to the sampler until the sampler stopped. In this way, an accurate amount of sample delivery to the OUR apparatus would be ensured.

The accuracy and precision of the sample volume being delivered to the SpOUR apparatus through this design were tested. The results for seven tests are as follows:

Design Volume (mL)	Actual Volume (mL)	Standard Deviation
400	405	5.2
600	599	3.9

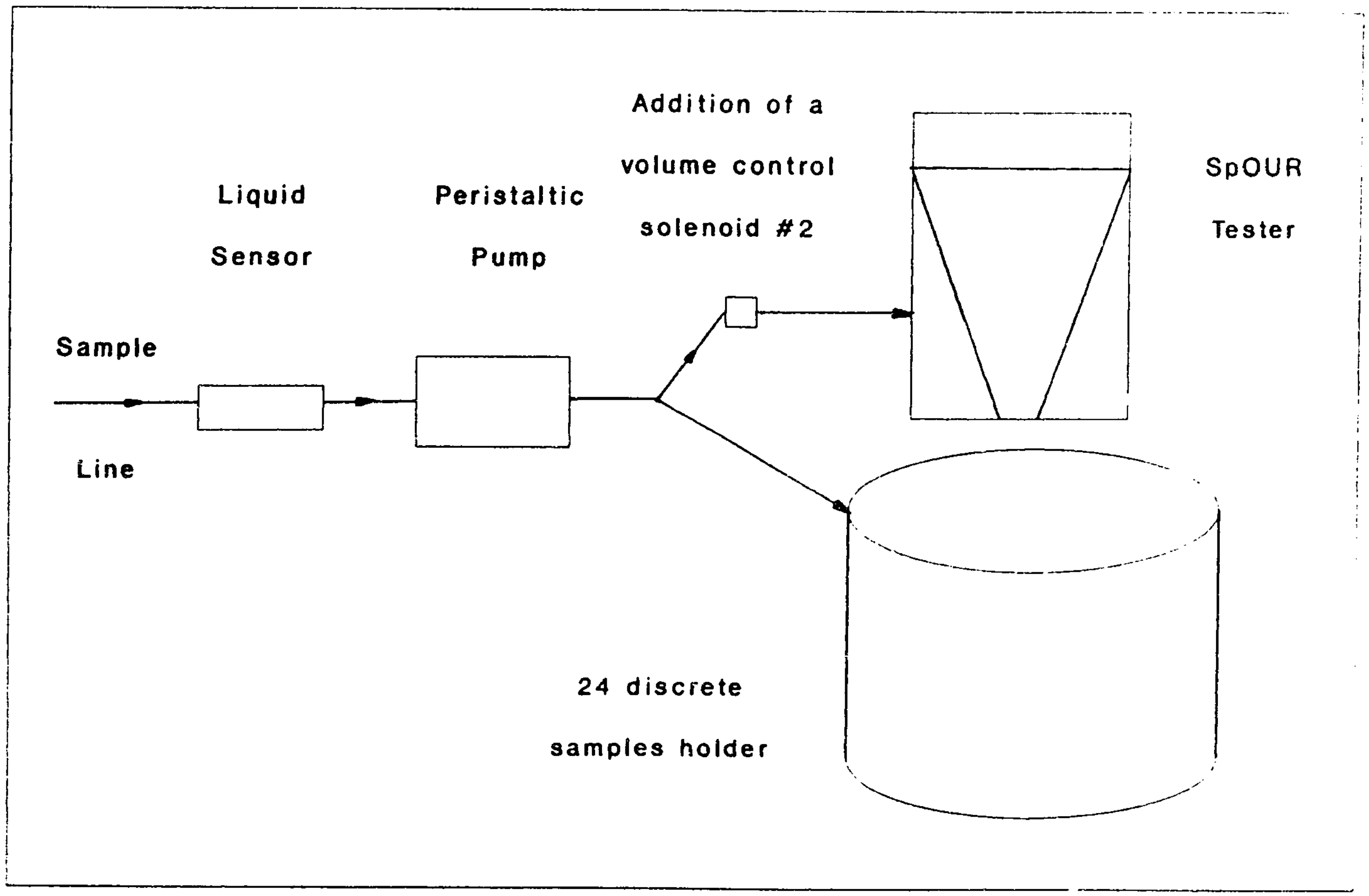


Figure 10. Modification of auto-sampler.

Figure 11 shows the flowchart of the SpOUR operation. The whole concept of the test was to do a series of 25-minute cycles of aerating and mixing of the RAS to obtain the endogenous respiration rate (R_E) and then using the same RAS repeat the process with the raw influent sample obtained on a real-time basis from an auto-sampler. Each test was run with a fresh sample of RAS and raw influent.

Figure 12 shows the schematic diagram of the complete SpOUR apparatus. At the start of the test, the SpOUR apparatus is in a ready mode with solenoids #1,2,3,and 4 closed, DC motor #1 on and #2 off. A command to start is keyed in by the operator as:

C:\HC11\DO2CON46

The computer will call up the software DO2CON version 4.6 in the subdirectory HC11 which will start off with programme to ask for operation instruction input from the operator as follows:

DO2 Data System

Version 4.6 Date June,10/90

Enter Data File Name: (6 char., max.)?

900628

Enter Drive to Store Data (A,B,or C)?

C

Enter Run Number (0-99)?

0

Enter MLVSS in gm?

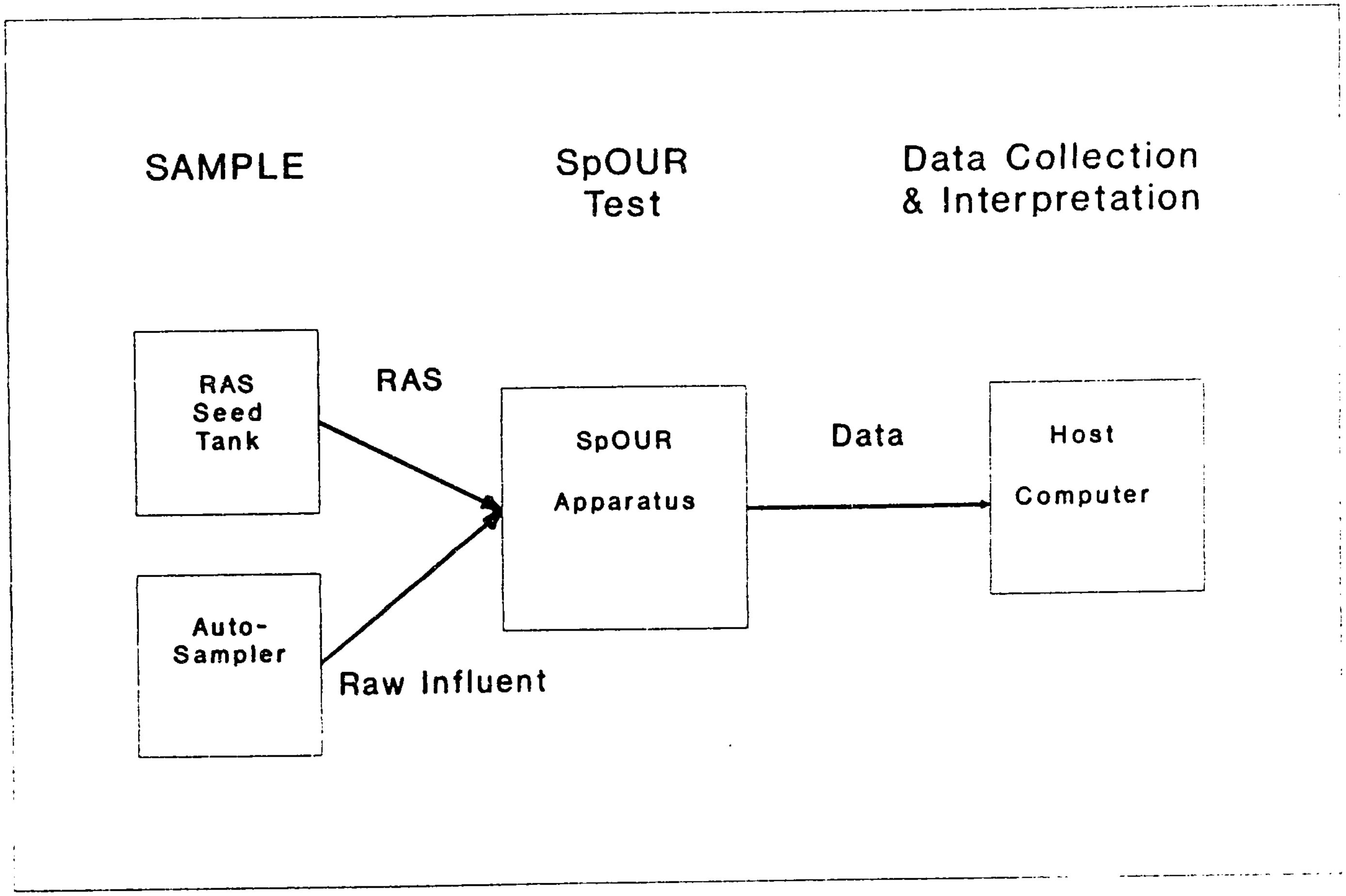


Figure 11. Flowchart of the SpOUR operation.

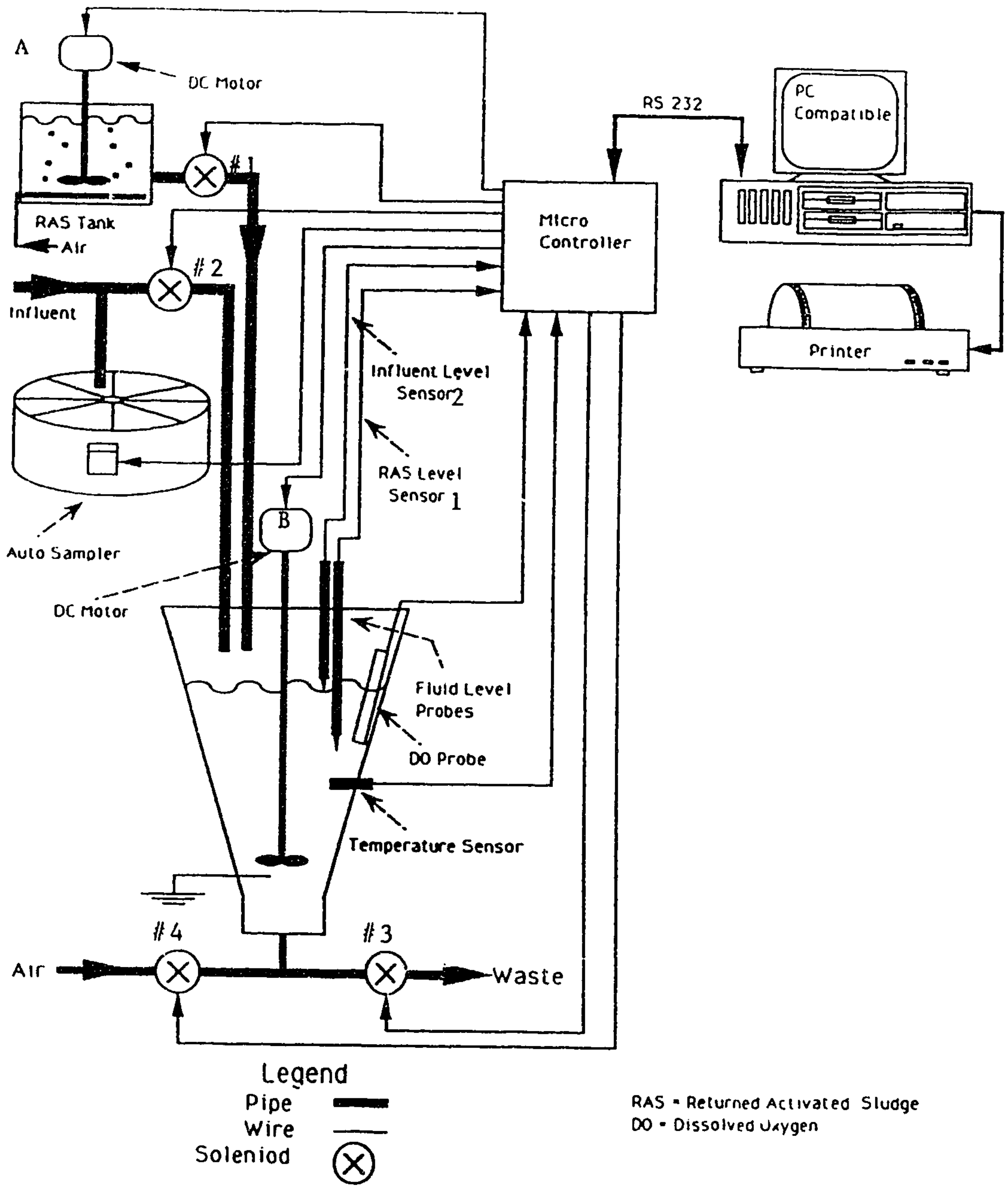


Figure 12. Schematic diagram of SpOUR apparatus.

2.2

Enter the Hour of the Day (24 hour clock)?

08

Enter the Minutes of the Day (24 hour clock)?

12

Enter the Day?

28

Enter the Month?

06

Enter the Year (9C)?

90

Is This Time Correct (Y/N)?

Y

Enter COM Port (1 or 2)?

1

The message : "Sending STARTT command to DO2 System" will show up on the screen while the programme in the SpOUR micro-controller is initialized by the STARTT command from the host computer. All the operational commands of the SpOUR apparatus come from the software DO2VER13.S19 (which is a compiled version of the DO2VER13.C program developed by the Electronic Lab of the Department of Civil Engineering, University of Alberta) in the micro-controller while the host computer just waits to receive the dissolved oxygen and the temperature data.

At the command of STARTT, the micro-controller's DO2VER13.S19 program is initialized. Drain solenoid #3 (Figure 12) is turned on temporary for 10 seconds to drain any liquid that may still remain in the apparatus. The RAS solenoid #1 is then turned on when solenoid #3 has closed. Returned activated sludge from RAS seed tank then flows into the testing chamber until the level sensor #1 has been reached. The level sensor can be calibrated to allow a predetermined amount of liquid entering the testing chamber. In this project 400 mL was the desired volume for the endogenous respiration rate determination. When 400 mL of RAS has been delivered to the mixing chamber, stirrer DC motor B as well as air supply solenoid #4 are turned on by the level sensor so that the activated sludge in the mixing chamber will be aerated and mixed for 4 minutes.

The mixing and aeration are to ensure the sample will have enough supply of oxygen level for later SpOUR testing. After the 4 minutes of aeration, air supply is shut off but the mixing still continues. The micro-controller then starts to collect DO and temperature data every 20 seconds for 30 readings (total reading time = 10 minutes). This length of time is needed to ensure the DO depletion is more than 2 mg/L during the endogenous respiration rate (R_E) measurement.

After the R_E information has been obtained, the micro-controller unit sends a sampling signal to the auto-sampler.

Upon receiving the "wake-up" call, the auto-sampler is activated and carries out the pre-programmed functions of:

1. Purging the hose.
2. Sample a pre-calibrated amount of influent.
3. Purging the hose again when finished so that it is ready for the next sampling call.
4. Stores a portion of each raw influent in a discrete sample bottle.

When the auto-sampler is activated, solenoid #2 also opens simultaneously so that the influent is delivered equally to the sampler's sample bottle as well as the SpOUR apparatus. Level sensor #2 location has been pre-calibrated so that after 600 mL of influent has entered the apparatus, solenoid #2 will then close and the rest of the sample (approximately 600 mL also) goes to the sample bottle until the sampler goes off. This arrangement ensures that there is always exactly 600 mL of influent for testing while the sample container can collect the balance of the sample volume.

The mixture of RAS and influent is again aerated with continuous mixing for 4 minutes for optimum DO level. Recording of DO and temperature are then done every 10 seconds for 30 readings (total reading time = 5 minutes). These readings will all be stored in the appropriate temporary DO and temperature arrays and then dumped to the host computer via RS232 connection. The host computer then assigns a file number to the arrays and calculates the slopes (by least square method) and the corresponding correlation coefficients with the SpOUR value. The SpOUR value is then plotted on the screen in real-time in the form of a strip chart (Figure 13). As a new SpOUR value is plotted, the previous 19 values will also be shown in a graph for comparison purposes so that any unusual trend can be detected easily.

Details of the DO2CON46.PAS and DO2VER13.C programmes are listed in the appendices A and B respectively.

When the sampler has finished taking 24 samples (in about 10 hours) the auto-sampler will then stop functioning until a new sample container is installed. The procedure for changing the sample container is listed in Appendix C.

8.2.3 Selection of DO probes

Three types of good quality DO probes were available at the Gold Bar WWTP. They are:

1. YSI model #5750;
2. Leeds & Northrup (L & N) model #7931;and
3. Capital Controls Series 1865.

The YSI DO probe used by Aidun & Smith (1988) had the problem of easily tarnished anode electrode and a very fragile membrane that had to be replaced and maintained frequently.

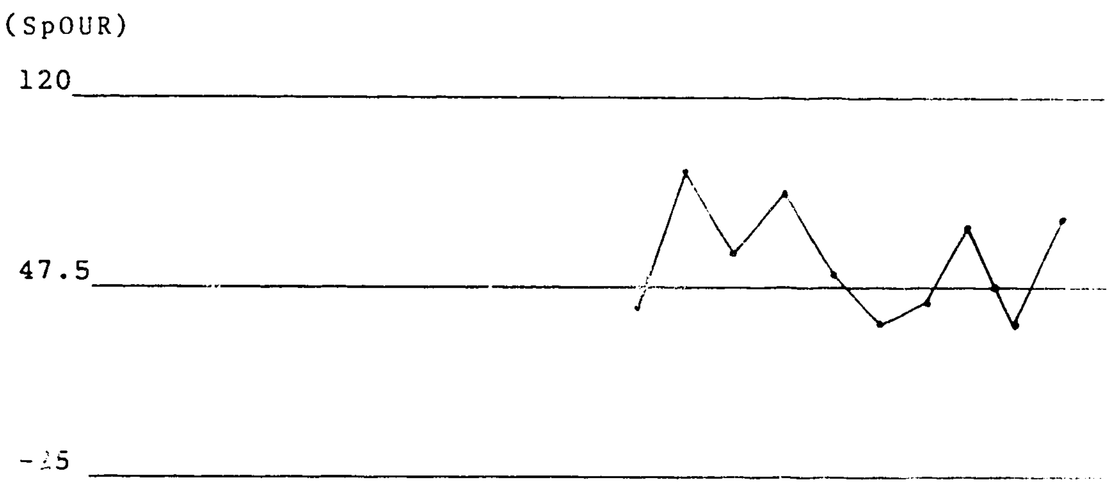
DO2 CONTROL SYSTEM

Present Time:17:41:51
Start Time :17:25:33
Run Time :00:16:38

Data will be stored in drive C:\90111020.PRN

Press [Esc] to Stop/Continue test after this run.

Slope1 = 1.0129991E-0.2
Correlation Coefficient 1 = .9996148
Slope2 = 2.726355E-0.2
Correlation Coefficient 2 = .9996196



SpOUR = 68.47 (Time)

Note: Items in ( ) do not appear on screen.

Figure 13. Readout on Screen During SpOUR Testing

A more reliable and durable DO probe was therefore needed for long-term automated monitoring. Upon investigation, it was found that there were two types of DO probes used for industrial application with which the Gold Bar WWTP had experience. One of these DO probes had been used to monitor the DO level of the mixed liquors at the secondary tanks for quite a long time. According to the service record, only minimal services were required through months of continuous usage even in the very hostile environment such as the activated sludge aeration tank.

The first DO probe is manufactured by Leeds & Northrup. This unit is specially designed for monitoring DO concentration in wastewater treatment. Basically the probe contains three sealed electrodes and a thermistor in a permanent electrolyte. Two electrodes are anode and cathode. The third one is a reference electrode whose primary function is to maintain the correct electro-chemical potential. Because the probe measures partial pressure of oxygen which changes with temperature, a thermistor is used to compensate such difference in feedback loop.

The principle of operation of the probe can be best described by the following reactions

Cathode : $O_2 + 4H^+ + 4e^- \longrightarrow 2H_2O$ (5)

Anode : $2H_2O \longrightarrow O_2 + 4H^+ + 4e^-$ (6)

Net result: Flow of electrons

When the probe is placed in the sample, oxygen diffuses through the membrane due to the tension created from the differences in oxygen concentration. This diffusion process continues until the oxygen tension on both sides of the membrane is equal and an equilibrium exists. The oxygen is reduced at the cathode as shown in equation (5). At the same time, an equal amount of oxygen is generated an the anode. The net result is a flow of electron current that is needed to maintain the equilibrium. The current flow will be directly proportional to the dissolved oxygen that is in the sample being tested.

The advantage of this probe is its sealed membrane and relatively free of fouling. Minimal maintenance has been experienced during the past years of usage by the Gold Bar WWTP. The only drawback is the turn-around time is extremely long if service is required.

The second DO probe that is now being evaluated by the staff of Gold Bar WWTP is a galvanic type with a lead anode and a perforated silver cylindrical cathode as manufactured by Capital Controls Company. The electrodes are surrounded with a gel bicarbonate electrolyte sealed by a polyethylene membrane. The physical design of oxygen diffusion is similar to the Leeds and Northrup probe but the electrochemical reaction at the anode is different.

Cathode : $O_2 + 4H^+ + 4e^- \text{----}> 2H_2O$ (7)

Anode : $2Pb + 2H_2O \text{----}> 2PbO + 4H^+ + 4e^-$ (8)

Net result : $O_2 + 2Pb \text{----}> 2PbO$

Flow of electrons

At the anode, the reaction is a continuous consumption of the lead electrode and a continuous supply of oxygen is needed. Consequently, the cell will be "exhausted" between 18 to 20 months and the plug-in cartridge has to be replaced.

The YSI 5750 probe uses polarographic sensor with a gold cathode and a silver anode. A thin permeable membrane stretched over the sensor isolates the electrodes from outside.

The means of measurement is similar to L and N but YSI uses a thin permeable 0.025mm Teflon membrane. Such a membrane gives the probe an improved sensitivity but also renders the electrodes easier to be fouled and tarnished especially in the hostile environment like the activated sludge or raw sewage.

The simplified descriptions for the reactions at the electrodes are:

Cathode : $O_2 + 4e^- + 2H_2O \longrightarrow 4OH^-$ (9)

Anode : $4Cl^- + 4Ag \longrightarrow 4AgCl + 4e^-$ (10)

Net result : $O_2 + 2H_2O + 4Cl^- + 4Ag \longrightarrow 4AgCl + 4OH^-$

Flow of electrons

The final result is also a depletion of oxygen, the silver electrode and the chloride concentration of the electrolyte filling solution. The silver anode is also very sensitive to the sulphide that is present in the sewage sample. Periodic cleaning and refilling of the electrode are required in addition to the membrane fouling problem.

In order to select the most suitable probes, the factors of cost, sensitivity, durability, maintenance requirement, service, availability, and user's experience should be equally evaluated.

Based on past experience from Aidun and Smith (1988), the YSI probe had the problems of frequent membrane replacement and an easily tarnished electrode. According to the Gold Bar WWTP staff, Capital Control was only used on an experimental basis and its physical size was too big for the SpOUR unit. Leeds and Northrup probes had been used in the activated sludge tanks for years and had little maintenance problems except servicing was not very efficient.

A comparison test on the response time was done on the three probes (all probes were provided by Gold Bar WWTP).

YSI and L & N probes had been used but properly maintained, whereas the Capital Control probe was new. Figure 14 shows the comparison of the response time of the three types of DO probes. Both the Capital and YSI probes responded very quickly to the decrease of DO while L & N was slower. Even after cleaning and calibrating the probe, the response was still very sluggish. It was later found that the L & N probe was defective. Repair by L & N took about four months.

Test results after repair showed that the L and N probe was quite comparable to the YSI (Figure 15).

In order to calibrate the L and N DO meter output with the micro-controller unit (MCU) output, a calibration test was done by reading the DO values of the DO analog meter and recording the corresponding voltage outputs by the MCU. The calibration curve indicated that the DO values of the sample and the outputs were linear within the range of the experimental values as shown in Figure 16.

8.2.4 Temperature Measurement:

Temperature plays a key role in the oxygen uptake rate of the activated sludge. In accordance with the Arrhenius equation, the reaction velocity is increased by 2 to 3 times for every 10°C rise in temperature. Streeter and Phelps (1925) also suggested an empirical relationship of

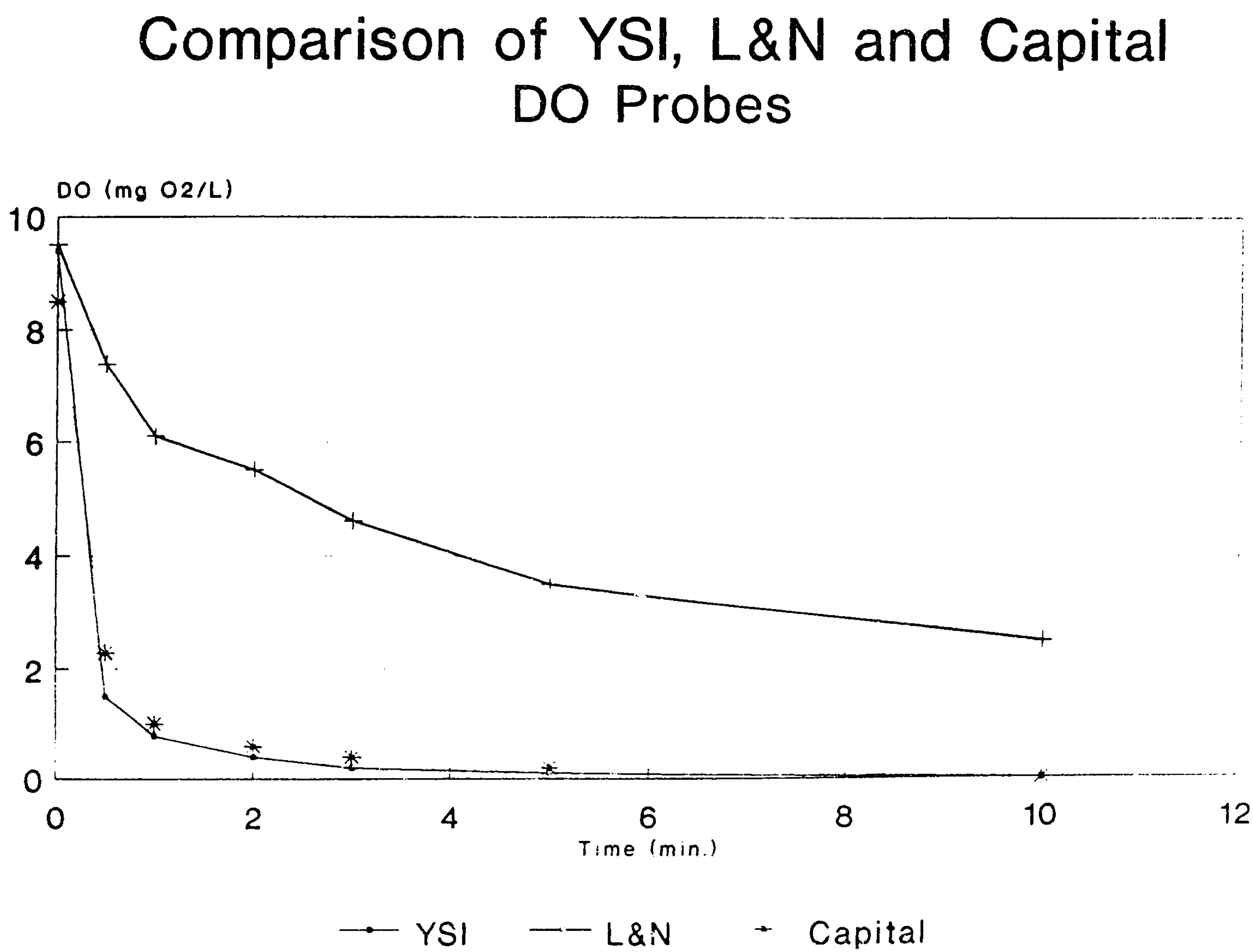


Figure 14. Comparison of YSI, L & N, and Capital DO probes.

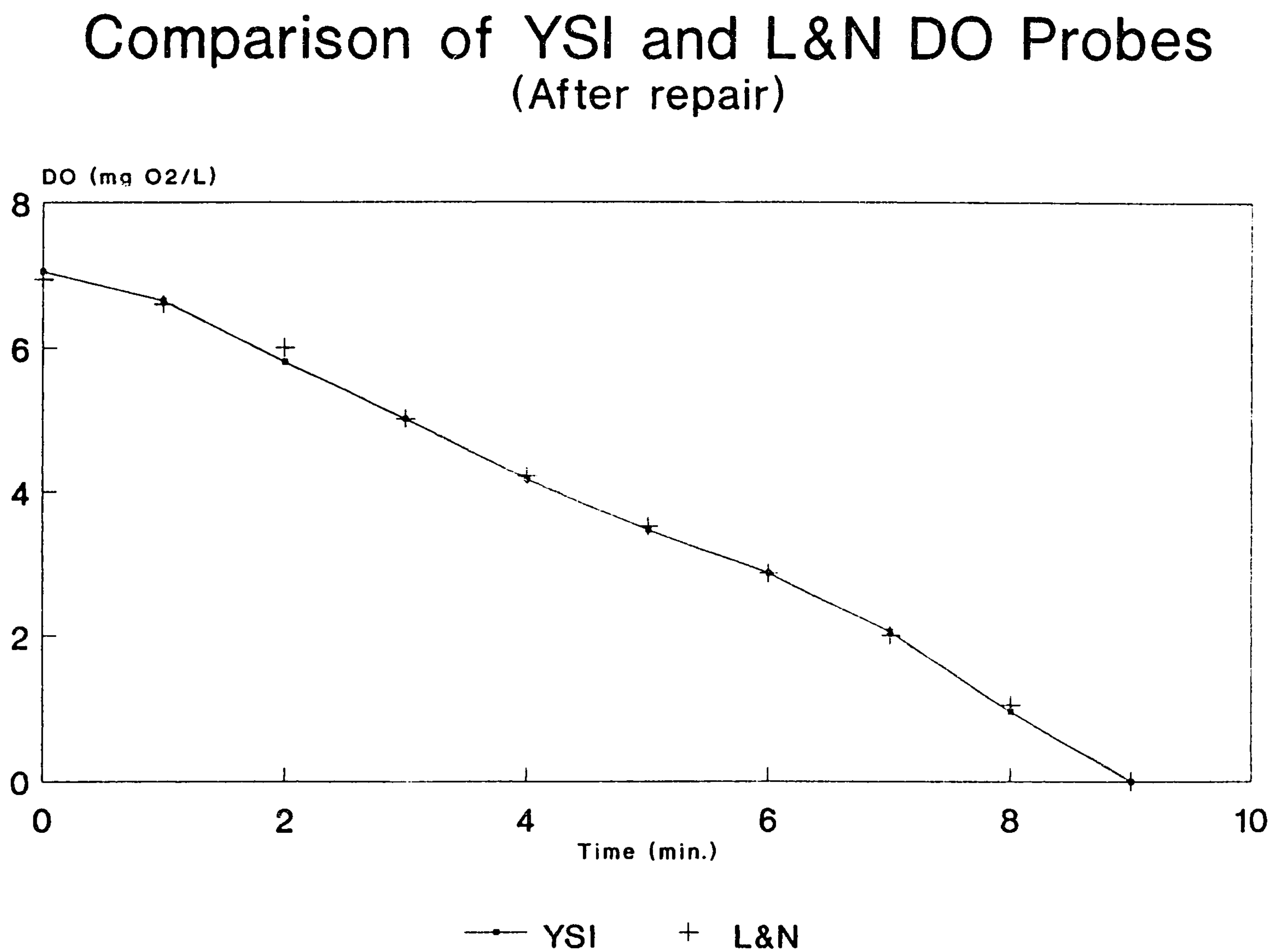


Figure 15. Comparison of YSI and L & N DO probes (after repair).

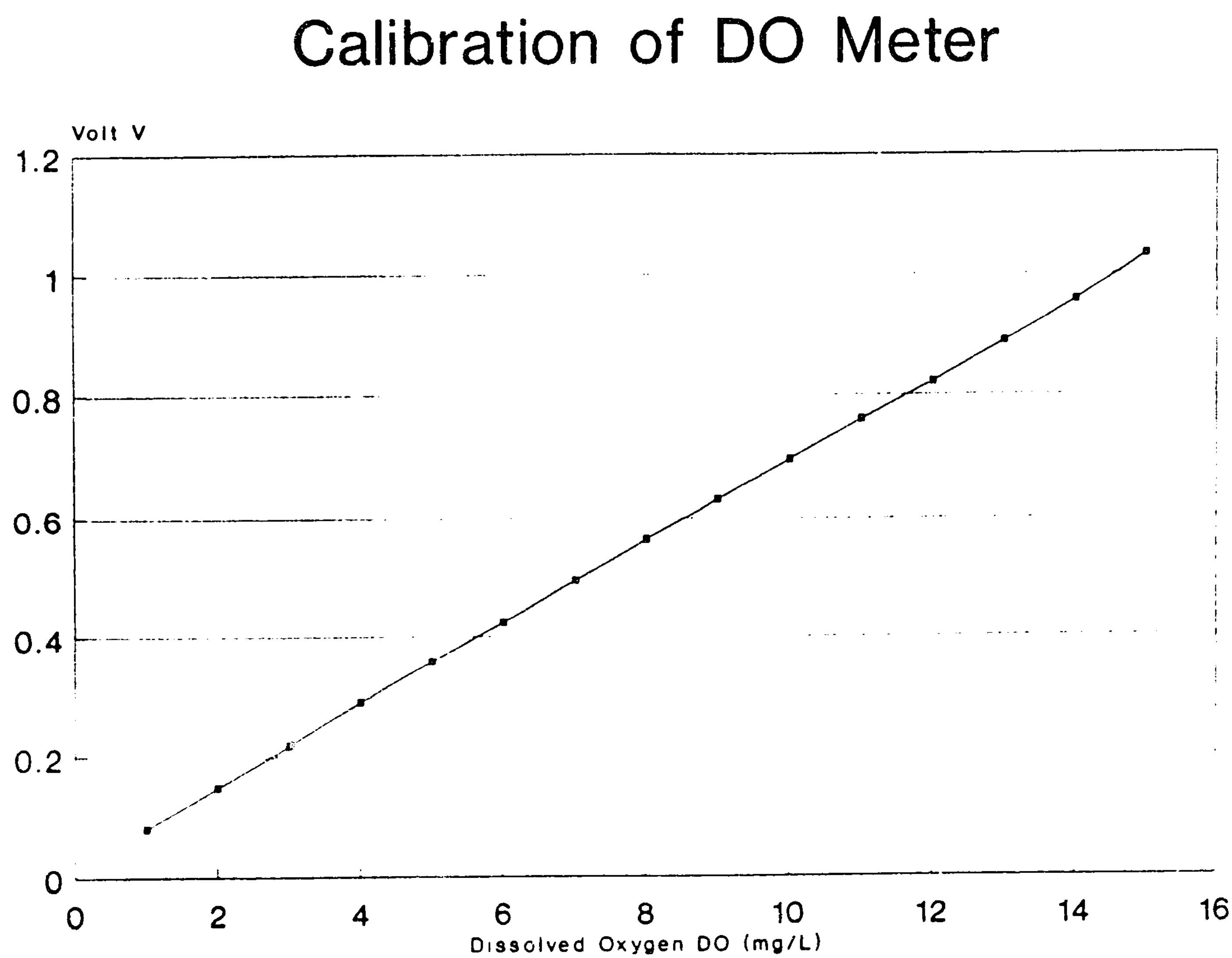


Figure 16. Calibration of DO meter.

$$\frac{K2}{K1} = e^{C(T2-T1)} \qquad (11)$$

Where: K1 , K2 = reaction rate at T1 and T2 mg/(g.h)

T1 , T2 = temperature °C

C = constant (for activated sludge _ 2.6 to 13.5% per °C)

It is obvious that a relatively constant temperature during the experiment is important for the precision of the OUR results. One solution to this is to blanket the testing apparatus with a constant temperature water bath. However, from the experimental data, the maximum temperature difference as measured by the built-in resistance temperature detector (RTD) was less than 1°C. This was much lower than the limits set by the OECD (1984) guideline of 2°C variance. A water bath was therefore not required in this particular design.

In order to ensure the temperature did not vary significantly during the course of testing, a RTD was used to monitor the temperature of the sample. RTD was chosen because of its stability and repeatability over a long period of time. The high signal output makes it ideal for interfacing with computer and reduces effect of interferences.

RTD is made up of a platinum resistor with a temperature coefficient of 0.00385 ohms/ohm/°C. It operates under the principle that the electrical resistance of platinum increases or decreases in a repeatable and predictable manner with temperature changes. At 0°C temperature, the resistance is 100 ohms. By using an electronic system to keep the current at 1mA throughout the resistor, changes in resistance due to temperature change will cause a proportional increase or decrease in voltage output. The computer will record the voltage output as bits. By using various known temperature samples and recorded the corresponding voltage readings in bits, a calibration curve was constructed. Figure 17 shows the calibration of the RTD temperature probe. The relationship was linear over the temperature ranges of 5 to 35°C which were the normal ranges of the temperature of the samples during testing. Figure 18 shows the comparison result of the calibrated RTD readings versus a NBS (National Bureau of Standards, now known as National Institute of Standards and Technology) traceable certified thermometer's readings. This test showed the accuracy of the temperature measurements.

8.2.5 Use of Mixed Liquor Volatile Suspended Solids (MLVSS) as Biomass Indicator

A lot of experiments done by other researchers have reported OUR as mg O_2/(L.h). No consideration is given to the amount of viable biomass in the sample. Such a measurement of relating microbiological activity with the substrate concentration may be misleading. A sludge with

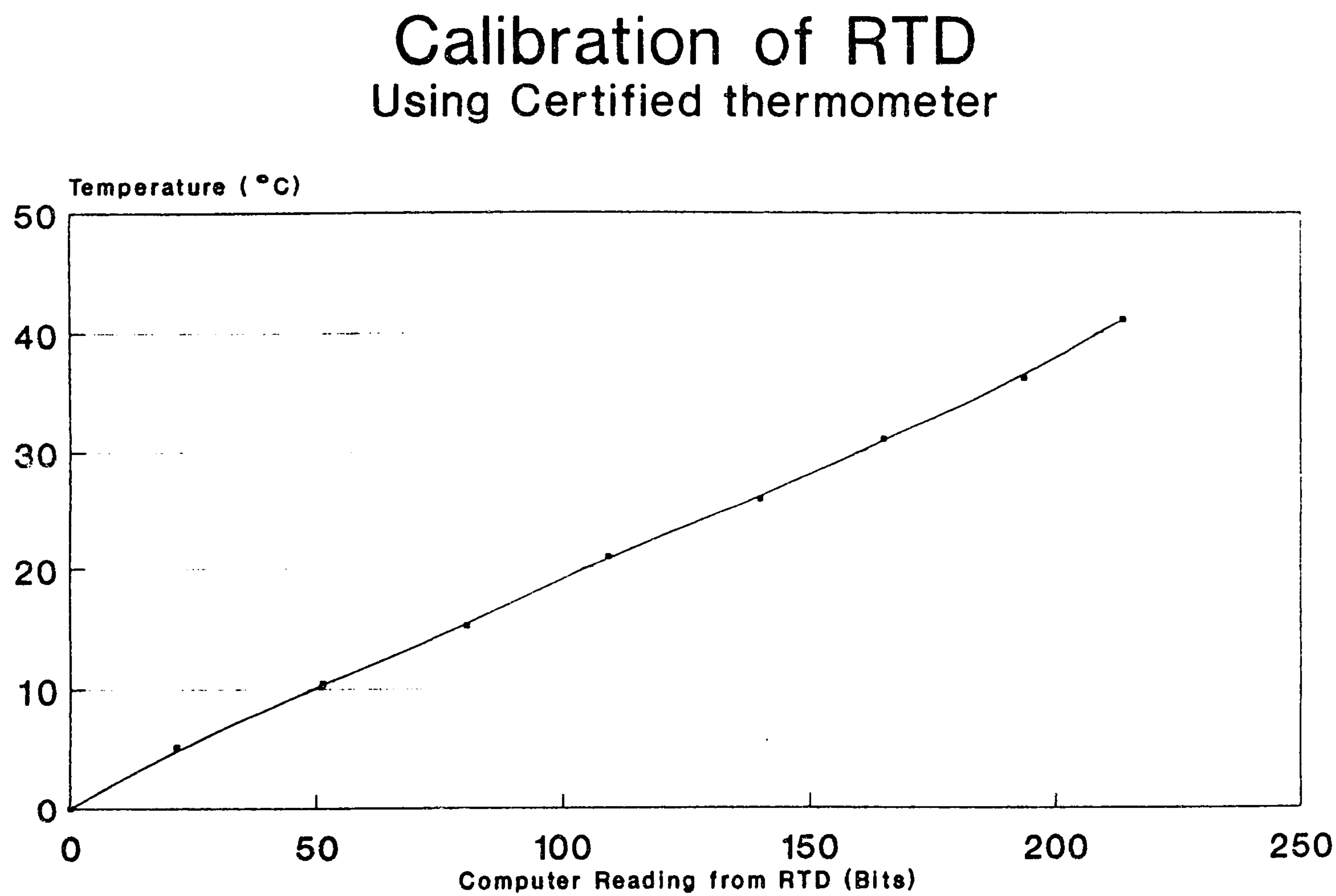


Figure 17. Calibration of RTD using certified thermometer.

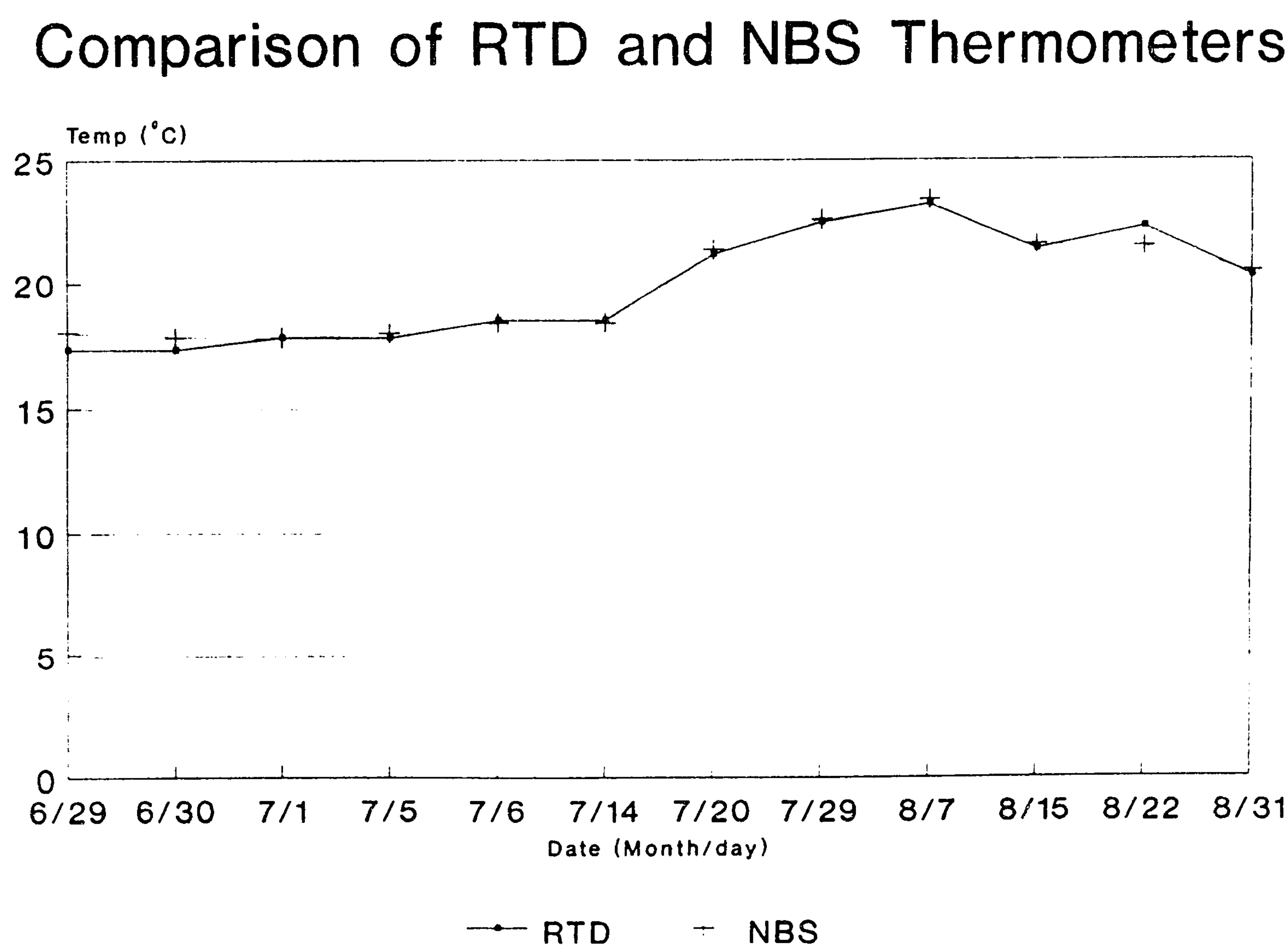


Figure 18. Comparison of RTD and NBS thermometers.

5,000 mg MLVSS/L and 1,000 mg MLVSS/L will have different OUR when tested with same substrate. This typ of discrepency can be eliminated by u 'ng specific OUR instead. Furthermore, use of SpOUR "stardardizes' the measurement criteria and hence makes comparison easier and more meaningful. Advantages of using SpOUR were also cited by Duggan and Cleasby (1976).

The use of MLVSS to indicate active biomass is not without its shortcoming. A significant fraction of the volatile suspended solids are from inactive organics. Factors such as raw waste qualities, temperature, mean cell retention time can all affect the ratio of active to inactive solids. Weddle *et al.* (1974) and Patterson *et al.* (1970) suggested that only 10 to 20% of the conventional activated sludge was viable while McKinney (1962) estimated the ratio to be as high as 25 to 50%.

Other methods of enumerating viable mass such as plate counts, ATP or other enzymatic activities measurements had been investigated but none were as simple and easy to determine as MLVSS. Furthermore, MLVSS is a daily routine test done by the Gold Bar WWTP staff as a process control measurement. In this project, the determination of MLVSS was carried out in accordance to the Standard Methods (APHA, *et al.*, 1989) Method #2540E. A slight modification in the filter paper was made to facilitate filtering the heavy sludge sample. The modified method had been tested and used regularly at the Gold Bar WWTP for monitoring MLVSS.

8.2.6 Order of Addition of SpOUR Samples

The Paptapsco WWTP of Baltimore (Martin, 1988) had conducted a series of experiments to study the effect of various order of addition of sludge, food and toxicants on the outcome of the OUR results. Respirometers were used to test the effects of various combination of order of addition of solutions. The conclusion was the order of addition should make no difference in the OUR reading.

In this project, RAS was always tested first to measure the endogenous respiration rate before the sample of raw influent was introduced. In doing the toxicant test, the toxicant had been mixed with the raw influent first before the mixture was introduced to the testing chamber. In doing the calibration test, the synthetic standard reference was always mixed with the appropriate amount of deionized distilled water to the desired concentration before being tested.

8.2.7 Effect of Mixing/Storage to RAS in Seed Tank

A 25-L plastic container was used as a RAS seed tank to provide a uniform source of activated biomass for use in the SpOUR apparatus. This sludge was taken from the returned activated sludge line at the secondary tanks and was kept mixed, aerated and ready for use any time during the testing period. The tank was covered to prevent any excessive loss of moisture. Since the activated sludge was pre-aerated for more than 12 hours before being used, the variability of the MLVSS was questioned. Five sets of duplicate analyses done on five different days were examined to investigate the effects of aeration on MLVSS values. Experiments done on the sludge taken from the tank outlet showed that after 12 to 19 hours of aeration, the range between the initial and the final MLVSS values was 4.3% with a standard deviation of 2.2%. This is well within the range of experiment error.

Microscopic examinations suggested by Brown and Nowak (1983) were also done on these sludge samples to monitor if there were any changes during the aeration and storage. No significant differences had been observed in both the speciation and percent population of the micro/macro faunae. The endogenous respiration rates of these stored sludge samples were in the range of 12 to 36 mg O_2/(L.h) with an average value of 18 mg O_2/(L.h). This is slightly higher than the value obtained by Hanel (1988) of 7 to 22 mg O_2/(L.h), but agrees with the value of 18.4 mg O_2/(L.h) given by Sollfrank and Gujer (1990).

8.2.8 Aeration Rate and Time For SpOUR Apparatus and Seed Tank

According to Aidun and Smith (1988) the optimum aeration time for the SpOUR apparatus was 4 minutes. Since the basic physical design of this apparatus was very similar to that of Aidun and Smith (1988), no optimum aeration time testing was done. However, basing on experimental observation, the 4 minutes aeration time was adequate.

The aeration rate can also have effect on the physical properties of the sludge (Hanel, 1988). Vigorous aeration can cause shear and damage to the floc and hence affect the SpOUR reading. On the other hand, lower aeration rate will not provide enough oxygen to the sample within the 4 minutes aeration time.

An experiment was performed to investigate the optimum rate of aeration by using different air flow rates and observing the time required for the sludge to attain a certain level of DO. Microscopic examination of the sludge was also done to observe if any significant physical damage to the floc was done.

The aeration air was provided by a 746 watt capacity portable air compressor which could provide a tank pressure of 552 kPa and had a regulator to adjust air supply. It was found that setting the regulator to provide the final air flow of 1 to 2 L/min at 138 kPa pressure gave the best aeration rate.

8.2.9 Effect of Mixing

During the testing of the SpOUR a stirrer was used to keep the sample constantly mixed. The main purpose of this was to maintain a homogenous sample for the DO probe. The other benefit was to keep the solids from sinking to the bottom of the apparatus.

The speed of the stirrer was carefully controlled so that it would not overstir and cause any damage to the floc or re-introduce any air into the sample during testing.

An experiment was done to decide the best mixing rate for the stirrer. A stroboscope was not available to measure the exact RPM of the stirrer. However, by installing a speed control potentiometer on the stir motor, the mixing speed could be manually adjusted to set at the lowest speed at which no sedimentation of sludge and introduction of air were physically visible. Sludge was examined microscopically before and after 24 minutes of stirring. No significant difference in floc composition and microscopic count were observed.

8.2.10 Development of More Efficient Computer Hardware and Software for the SpOUR apparatus

At the Gold Bar WWTP, most of the computer usage was primarily in the area of process control and data acquisition. The plant's process control operation section and the laboratory section used computers independently. There was only a few process control units that could be linked with laboratory results via micro-computer to give the operational staff a real-time monitoring device.

After the successful development of an automated OUR apparatus by Aidun and Smith (1988), the beneficial combination of on-line laboratory microbial bioassay and computer to process control was clearly demonstrated. However, it was also immediately realized that such information would be more useful if obtained by monitoring SpOUR at various stages of the wastewater treatment process. In order to do so, several SpOUR units, each with a computer of its own, would be required.

It is very impractical and uneconomical to have so many individual computers each working on its own. The best solution is to have a host computer connected to each individual SpOUR unit strategically located at selected control points. Figure 19 shows the schematical layout of the connection. Each individual SpOUR unit will have a micro-controller unit (MCU) programmed to do just the required operations and sends back the collected data to the host computer via a RS-232 connection. In this way, only one computer is needed to do the controlling and data handling job.

8.2.10.1 Computer Hardware Development

Because of the limited memory of the Commodore PET computer that was used by Aidun and Smith's OUR Apparatus, the BASIC programme that the computer can process has become "primitive" compared to what is available nowadays. The

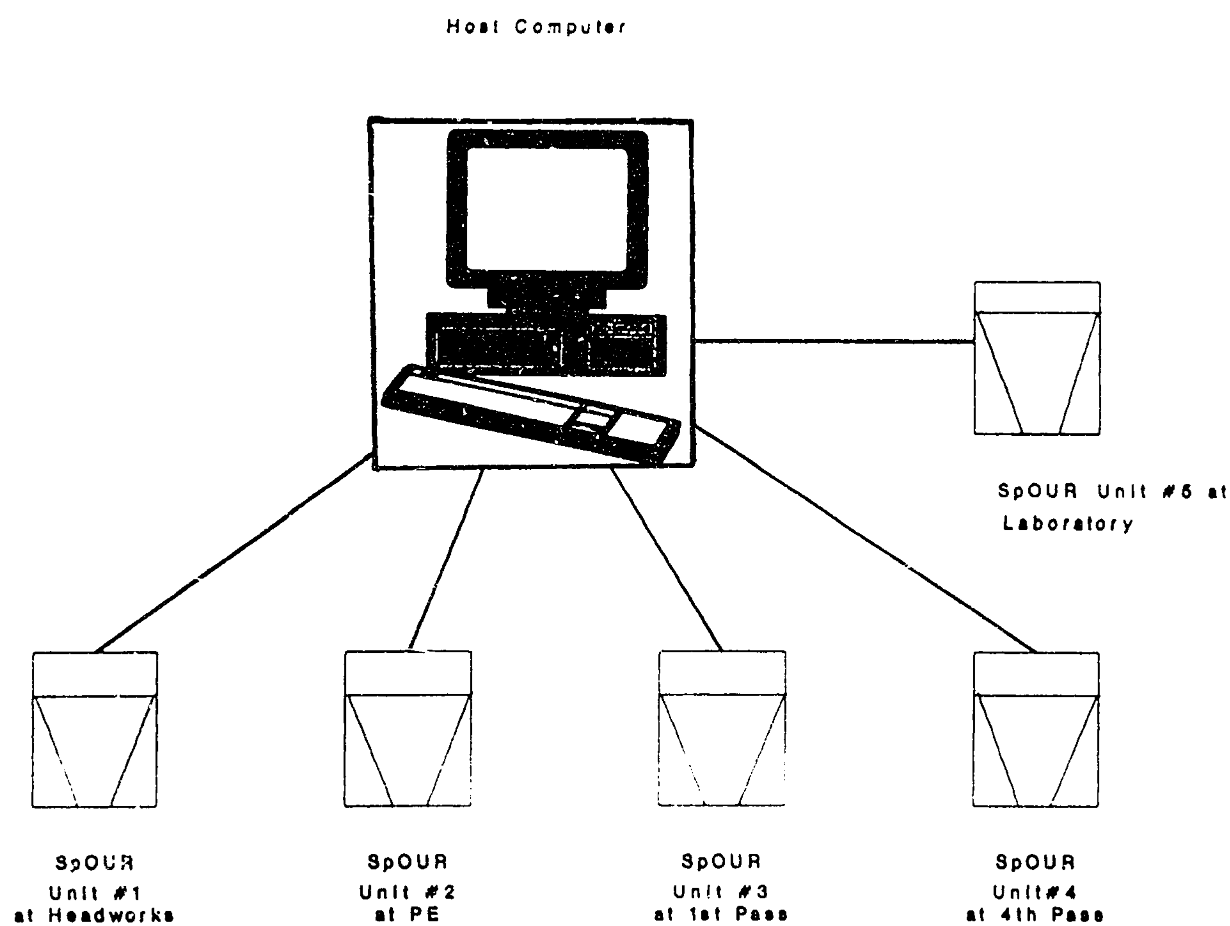


Figure 19. Schematic layout of SpOUR units with host computer.

Commodore PET computer is therefore not suitable for fulfilling the increasing requirement of the new SpOUR apparatus.

Since the 1980's, IBM-PC has become very common in the laboratory instrumentation and commercial fields. An inexpensive IBM-XT compatible computer had been chosen to demonstrate that only a minimal investment was required for this switch-over. The specification of the IBM-XT compatible computer is as follows :

- 100% IBM-XT compatible
- 640K of Random Access Memory (RAM)
- 5 1/4" 360K External floppy drive
- 10 MByte Hard Drive
- Microsoft Disk Operation System (MS-DOS™) V.3.3
- Monochrome graphic monitor

A computer of similar or better capacity is inexpensive and common in the laboratory or business world. At the Gold Bar WWTP, there were more than 10 computers of similar or better capacity being used in different areas of the plant.

Besides the computer switch, the most important part of the hardware revamp was the addition of a high density complimentary metal oxide semiconductor (HCMOS) micro-controller unit (MCU) model MC68HC11F1 manufactured by Motorola Inc. This MCU has 512 bytes of electrically erasable programmable read-only memory (EEPROM) and 8K of

RAM. This tiny chip of 25 mm x 25 mm has the memory capacity of storing the file needed for the operation of the SpOUR apparatus, temporary holding the data collected and sending them over to the host computer when the test has finished. One of the ways to enable this separation of duty from the host computer with the MCU is to have an efficient programming language which is the next stage of the SpOUR apparatus development.

8.2.10.2 Software Development

Once the computer had been chosen, the next stage was to select an appropriate computer language. Since BASIC (Beginners' All-Purpose Symbolic Instructional Code) is still one of the most commonly used languages for laboratory environment, the rewriting of the programme had been still centered on BASIC. BASIC was favoured because of its simplicity, wide acceptance, ease of use, and long history of user experience. The drawback of the older version of Commodore BASIC is its lack of speed and cumbersome commanding programme. Because of its usage of an interpreter, the micro-processor of the Commodore computer cannot directly execute the BASIC statement. Instead, the computer has to interpret each statement as it is executed. This line-by-line translation takes place every time the programme is used. Consequently, the speed of execution suffers.

Alternatively, a compiler can be used to convert the whole BASIC programme in machine language before use. The disadvantage of using such compilation is a lot of time is required in creating an error-free programme. Every time a bug is found in the programme, a correction has to be made on the original file and recompiled. Such an experience has been the nightmare of many programmers.

In this project, a new version of BASIC was used to deal with this programming problem. The programme is called MicroSoft QuickBASIC™ (Version 4) Which is specifically designed for IBM-PC and PC-compatible computers. It combines the immediate interactive strength of the interpretive BASIC and the efficiency and speed of the compiler BASIC.

The simplicity of the programme can be seen from the few lines of codes required compared to otherwise written in other types of BASIC languages. Furthermore, the programme is very user-friendly so that people without much programming knowledge can easily make the necessary correctional changes on the programme.

Programme DO2CON46 was written in QUICKBASIC to start the apparatus, open new files for raw data, collect data, calculate slopes with statistical results, plot SpOUR in real-time and store the final results in a summary file.

For the operation of the apparatus itself another efficient and powerful high-level language called C was used. C is the shorthand version of the assembly language. The number of statements and functions required in C is very small but the execution speed is very fast. After compilation the entire compiled programme for carrying out the required SpOUR operation can be stored in the MCU in less than 2K memory space. The simplicity of the programme can also be seen from the ease of making changes such as the delay on/off time of the solenoids and motors, the length and number of the DO readings etc.

The programme DO2VER13.C was written in C language for the operation of the SpOUR unit by the MCU. A small C compiler programme SMC11.EXE and HC11 optimizer were used to compile and optimize DO2VER13.C to a DO2VER13.S19 compiled file which was then sent to the MCU memory via EELOAD3.EXE and E1PROGIX.BIN programmes. Once the DO2VER13.S19 has been downloaded to the MCU memory, the programme can be retented up to 10 years. Programmes DO2CON46 and DO2VER13.C are listed in the Appendix A and Appendix B respectively. All the other relevant programmes are listed in the Appendix D.

All these downloadings are done through the serial RS-232 interface. The proper downloading procedure is shown in Appendix E. It is important that the exact downloading procedure is followed in order to assure the proper operation of the apparatus.

The general flowchart of the SpOUR apparatus software is listed in Figure 20. When the host computer is turned on and

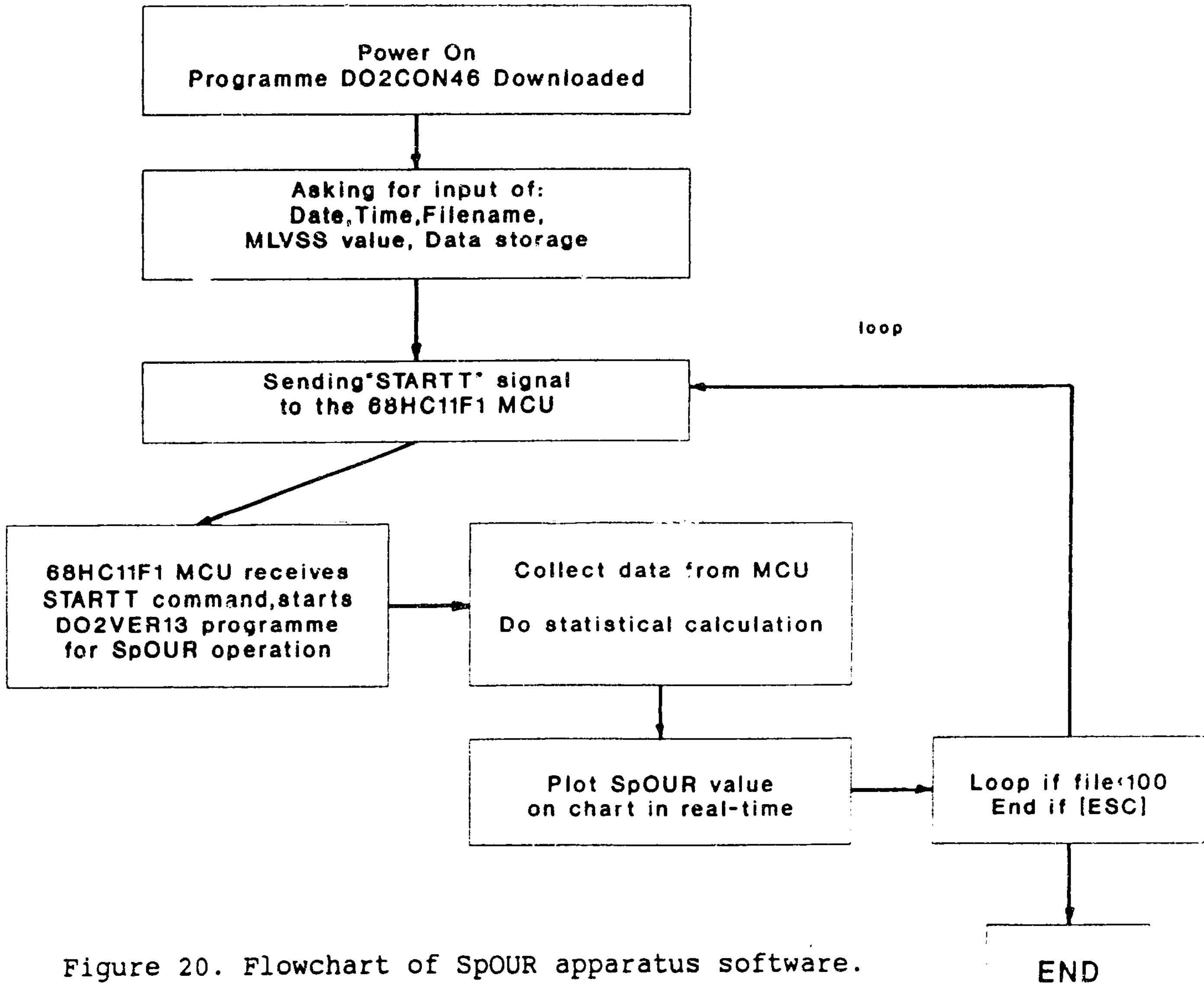


Figure 20. Flowchart of SpOUR apparatus software.

the file DO2CON46 is loaded, the dimensions of the various data arrays are set and memory storage location allocated. A series of vital information are required from the operator to input before the apparatus will begin operation through the sub-routines STARTT, PORT.

Once the hand-shaking of the host computer and the MCU has completed the SpOUR apparatus will start operation according to the programme DO2VER13.C.

8.3 Construction Process

The apparatus was built with the idea of providing a dependable and easy to use on-line monitoring equipment for the wastewater treatment plants. Due to the possible harsh environment that could happen at the sampling site, the following special requirements and precautions were made:

-Heavy industrial grade framework for the apparatus was used so that it could withstand the rough wastewater treatment plant environment.

-Industrial standards for electrical wiring was used for added safety.

-Optical isolators were used for the MCU to prevent electrical spiking and interferences to the computer unit.

-Use of a heavy duty industrial auto-sampler to ensure a dependable source of samples.

-Use of the L & N DO probe which had been proven to require only minimal maintenance.

-Water and moisture-proof for the entire electronic portion of the apparatus.

-RTD and liquid level sensors were all made of stainless steel and coated with plastic except the necessary portions to prevent rusting and short-circuiting.

-Industrial-type solenoid valves were used for long lasting operation.

-Stirrer coupler bearing was sealed with O-ring to prevent moisture entering the bearing.

-Use of a very long RS232 line so that host computer could be separated from the harsh environment in which the SpOUR apparatus was located.

-Apparatus was put on a sliding trolley for easy movement during maintenance.

-DO probe, liquor level indicators, mixing motor and stirrer were designed so that they could be replaced easily.

8.4 Start-up and Debugging During Trial Run

Series of changes were done on the software during the debugging period. The apparatus software had changed from version 1.0 to version 1.3 while the data handling software for the host computer had been altered from version 1.0 to version 4.6. All these changes were performed to improve the apparatus to a real turn-key instrument for the operators.

Figure 21 shows the set-up of the completed SpOUR apparatus at the headworks of the Gold Bar WWTP. Figure 22 shows the SpOUR apparatus sample chamber.

During the startup of the apparatus, several mechanical problems were noticed :

-The stirrer motor overheated during the test run and burned the 1 Amp fuse. It was found that wastewater had splashed into the bearing and eventually seized the shaft of the motor. A rubber ring with sealing cream was added together with a sealed bearing to prevent such a seizure. Aluminum heat sink was also added to the transistor to help dissipate the heat generated. A variable resistor was also installed to control motor speed so that motor would not overheat but still maintained a satisfactory mixing.

-The solenoid for the drain pipe was clogged with debris for many times causing some missing data. Several attempts were made to solve the problem. These included using an on-line strainer to prevent clogging, flushing the container after each test run, and change new solenoid. No perfect solution was found. However, when the solenoid was installed vertically instead of horizontally, the debris tended to be flushed away easier and faster. Similar solenoids installed in GBWWTP at the returned activated sludge outlets are all installed in a

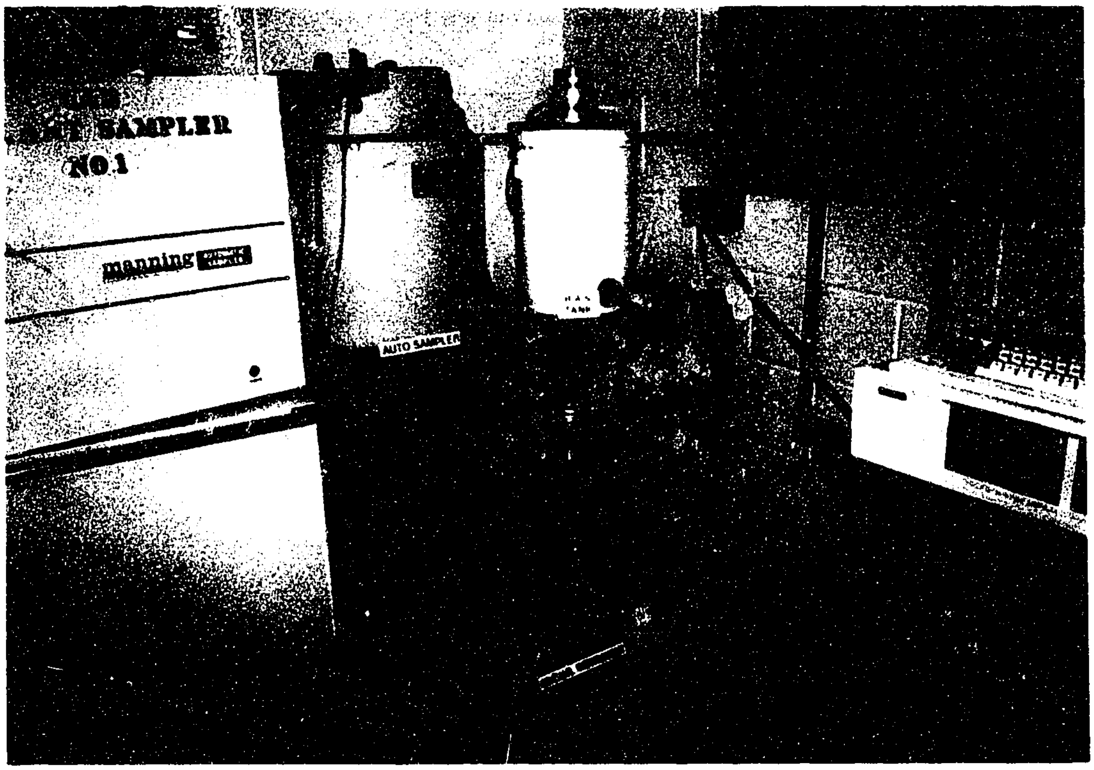


Figure 21. Picture of the completed SpOUR apparatus

Figure 22. Picture of the SpOUR apparatus sample chamber

vertical position and have no serious clogging problems. Nevertheless, routine checking and maintaining of the solenoid are strongly recommended even if the solenoids are installed vertically.

-Although the DO meter had been performing satisfactorily, the accuracy of the data had been affected by the occasional coating of the sensor by the oil and grease or sometimes the sticky organic scum formed from aeration. Such coating caused the oxygen sensor slow to respond to DO changes and thus produced erroneous results. The solution to this was to check the probe more frequently and to set up a good preventive maintenance program. A spare DO probe should always be ready to replace one that malfunctions. The apparatus may also require a slight modification to allow a quick changeover of the new probe. At Gold Bar WWTP, the SpOUR apparatus is located next to the plant's raw influent composite sampler. Since the operators do routinely check the composite sampler, this extra monitoring of the SpOUR DO probe will not be a burden if it was installed as a permanent monitoring apparatus.

Although the OUR of the activated sludge process is proven to be of a predictable diurnal nature, the inhibitory or toxic characteristics of the raw influent are expected to be sporadic.

In order to develop some relationship of the inhibitory action of the toxicants on the SpOUR data, various known concentrations of the selected toxicants were added as spike with the regular samples. Percent reductions in SpOUR versus concentrations of toxicants added were recorded together with the derived EC50 values. Such information will become the database for future reference. This experiment also showed that the apparatus is sensitive to various levels of toxicants on a single chemical basis. The effects of mixture of toxicants were not investigated in this particular test. Details and results of the tests are discussed in Section 8.6.1.

Another preliminary test that had been done before the start-up was to confirm that the SpOUR obtained was due to the metabolic activities of the microorganisms only. Several blank runs (ie, deionized distilled water was used instead of raw influent) were done and the average SpOUR value obtained was 3.0 mg O_2/(g.h). To further show that SpOUR was not due to any other physical or chemical demand, a test with only tap water (ie, tap water was used instead of RAS and raw influent) was done, and a SpOUR reading of 0.15 mg O_2/(g.h) was obtained.

To check the accuracy and precision of the apparatus, parallel runs were done with the same source of raw influent and RAS using both the SpOUR apparatus and Standard Methods

(APHA, *et al.*, 1989). Results obtained from these different methods were done in two separate days as shown in Table 3.

According to OECD (1984), the two control runs should be within fifteen percent of each other for a valid comparison. Also, using the modified statistical t-test (NBS Handbook 91, 1966) at a confident level of 99.0%, there is no reason to believe that the two sets of data listed in Table 3 are different. Furthermore, using L and N DO probe on the SpOUR apparatus also gave lower standard deviation because data collected are done by computer and is therefore more precise.

From the above comparison results, the SpOUR apparatus data are therefore equivalent to those obtained by using the Standard Methods (APHA, *et al.*, 1989).

Another possible factor that could affect the data is nitrification. Activated sludge contains a mixture of micro faunae with heterotrophic and autotrophic microorganisms. The aerobic heterotrophs obtain their energy from the oxidation of organic compounds using oxygen as their terminal electron acceptor.

Some autotrophs, on the other hand, utilize CO_2 as the C source and NH_4^+ as the overall electron donor. The bacteria involved are

Nitrosomonas : $NH_4^+ + 1.5\ O_2 \dashrightarrow NO_2^- + H_2O + 2H^+$

Nitrobacter : $NO_2^- + 0.5\ O_2 \dashrightarrow NO_3^-$

Overall : $NH_4^+ + 2O_2 \dashrightarrow NO_3^- + H_2O + 2H^+$

TABLE 3.

Comparison of OUR obtained by Standard Methods (APHA, *et al.*, 1989) and SpOUR apparatus.

	OUR mg O_2/h Method Used		No. of replicates
Sample A	Std. Methods	SpOUR apparatus	
RAS	27.6 SD = 0.3	28.0 SD = 0.4	3
RAS + RAW	47.5 SD = 1.0	43.3 SD = 0.7	3
Calculated SpOUR mg O_2/(g.h)	46.3 SD = 1.3	40.9 SD = 1.1	3
Sample B			
RAS	26.4 SD = 2.4	28.0 SD = 0.9	10
RAS + RAW	122.4 SD = 6.7	126.4 SD = 4.5	10
Calculated SpOUR mg O_2/(g.h)	107.5 SD = 7.0	110.8 SD = 4.4	10

RAS = Returned Activated Sludge
RAW = Raw Influent
SpOUR = Specific Oxygen Uptake Rate, mg O_2/(g.h)
SD = Standard Deviation

The amount of oxygen required by these nitrifiers was clearly demonstrated by Sollfrank and Gujer (1990). In their study, a laboratory-scale WWTP was at endogenous respiration of 0.6 mg O_2/(L.min.). A dose of ammonium (28 mg NH_4^+-N) was spiked into the aeration basin. The OUR rose immediately to 1 mg O_2/(L.min.) indicating extra oxygen was needed to convert the ammonium to oxidized nitrogen.

In Aidun's experiments (Aidun, 1986), he also noticed that OUR reading was higher during the hot summer months than the colder spring period. One of the reasons may be due to the greater activity of nitrifying bacteria during the hot summer months. Duggan & Cleasby (1976) had also indicated the effect of nitrification and other variations in oxygen uptake measurement. A safety factor of 1.2 to 1.5 was suggested to compensate such effects.

A concern was therefore raised during the initial design of the SpOUR apparatus in regard to the effect of the nitrifying bacteria to the accuracy of SpOUR measurement.

A laboratory test was done to investigate this problem. NO_2^--N, NO_3^--N, and NH_4^+-N values were determined on the following samples: RAS, RAS (after aerated for 20 h), RAW, and RAS + RAW (after aerated for 4 min).

The results are shown in Table 4 and indicate that after 20 h of aeration, a significant amount of NO_2^--N and NO_3^--N were formed. However, since the aerated RAS already

TABLE 4.

Effect of Nitrifying Bacteria on Various Types of Wasterwater Samples

Sample	NO_2^--N(mg/L)	NO_3^--N(mg/L)	NH_4^+-N(mg/L)
RAS	0.060	1.135	24.28
RAS (after 24 h Aeration)	11.63	14.18	17.30
RAW	0.007	0.109	17.40
RAS + RAW (after 4 min aeration)	4.431	7.702	16.99
RAS + RAW + N-inhibitor	4.092	6.171	24.28

had quite a high NH_4^+-N content after aeration, the addition of raw sewage would not produce such a profound effect on SpOUR as was demonstrated by Sollfrank and Gujer (1990). A similar experiment done by Huang *et al.* (1985) indicated that the OUR by nitrification was "relatively insignificant".

In summary, the results showed that:

- RAS contained high level of NH_4^+-N by itself and considerable amount of NO_2^--N and NO_3^--N were produced during the 20 hours of aeration indicating high level of nitrification activity already existed before the SpOUR determination.
- When RAS and raw influent were mixed, no significant amount of extra oxidized nitrogen occurred indicating the extra nitrification reaction in this SpOUR test was not as profound and instantaneous as reported by Sollfrank and Gujer (1990). This can be partially explained by the long generation time for *Nitrosomonas* (31.6 h) and *Nitrobacter* (23.1 h) respectively.
- When N-inhibitor was added, a slight curbing of nitrification was suspected.

Hence, extra nitrification oxygen demand due to nitrifying bacteria was not as significant as had been suspected.

8.5 Final Testing Run For The Completed Unit

A final test run was done during the period of June 28 to Sept. 1, 1990 . During the 9 weeks continuous of testing, a total of 2998 individual tests were done with a total of 2.2 megabytes of raw data collected.

The apparatus ran and recorded data continuously and automatically except during data retrieval and scheduled and unscheduled maintenance. During the close to three thousand tests performed, there were 29 incidents of malfunctioning and thus some data were missing. The summary of the malfunctions is as follow:

- -9 incidents of solenoid leakage due to debris blocking valve.
- -5 incidents of DO probe malfunctioning due to oil and grease or scum coating the oxygen sensor.
- -5 incidents of auto-sampler malfunction.
- -3 incidents of raw influent level too low.
- -1 incident of computer problem.
- -6 incidents of miscellaneous problems.

The ratio of successful runs versus malfunctioning is 99:1. With the implementation of the new vertical arrangement of solenoid and regular maintenance programme on the DO probe, the frequency of malfunctioning is expected to be even lower.

An example of the raw data file (called the PRN file) obtained from each individual test is shown in Appendix F. The daily summary file (called the COF file) is shown in Appendix G.

A typical plot of DO readings versus time for both endogenous and sample mixture runs is shown in Figure 23. The slopes obtained were then used for calculating the SpOUR. Appendix H shows the summary of the 3000 tests done during June 28 to Sept. 1, 1990. The SpOUR versus time were also plotted as shown in Appendix I to monitor trends.

Judging from the diagrams of the daily SpOUR versus time plots, the raw influent entering the wastewater treatment plant is constantly changing in strength as indicated by the fluctuating SpOUR values (Figure 24). However, a slight daily diurnal pattern can still be observed. SpOUR values increase from noon to midnight and reach their lowest values in the morning. The weekly patterns of low SpOUR during Saturday and Sunday, and high SpOUR values during weekdays are also apparent. Application of these observations will be discussed in the section 8.6.

8.6 Development of Practical Applications For The Apparatus

In order to develop some practical applications for the SpOUR apparatus, experiments were conducted to investigate the various possible uses of the apparatus. Some of the more interesting possible applications of the SpOUR apparatus are

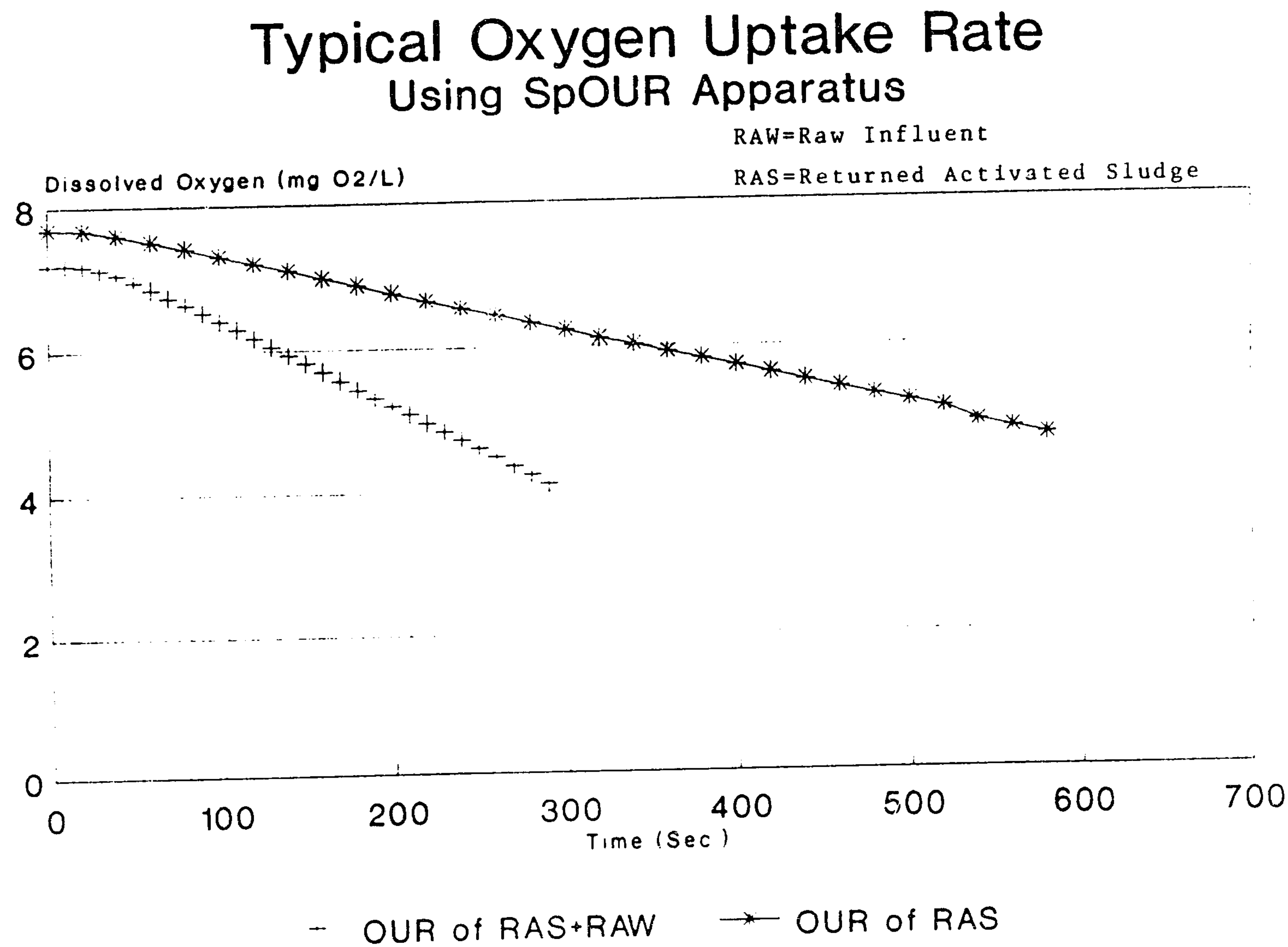


Figure 23. Typical OUR using SpOUR apparatus.

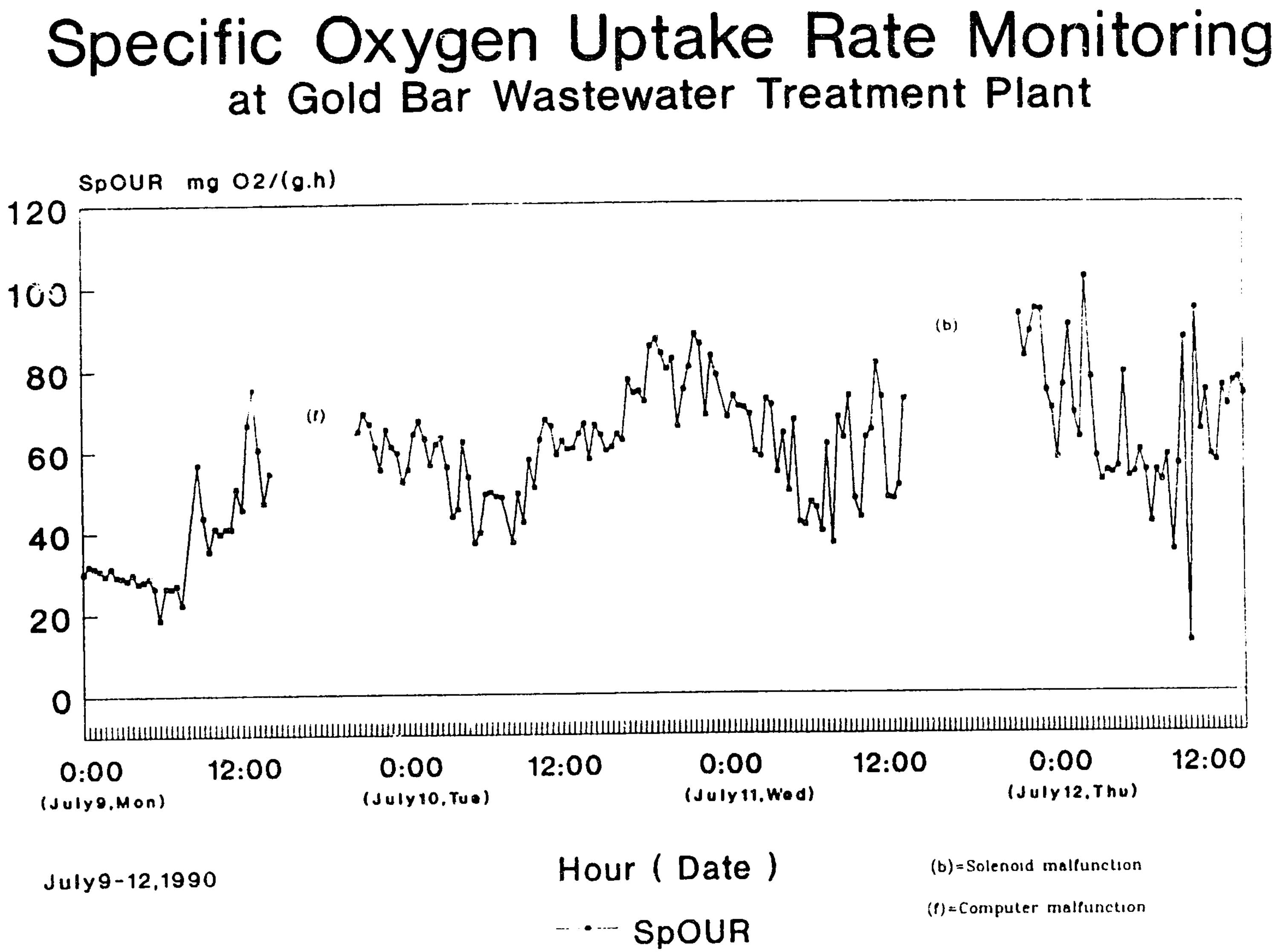


Figure 24. Example of SpOUR monitoring at Gold Bar WWTP.

the monitoring of the toxicity of the influent, rapid BOD_5 prediction, tolerability studying, and F : M ratio etc.

8.6.1 Monitoring of Toxicity

Tests were done to determine the sensitivity of the SpOUR apparatus and its relationship with other types of toxicity testing procedures. The testing method used was a modified synthetic activated sludge technique from Kwan (1988). All tests were conducted in triplicates except otherwise specified. The toxicants selected were chromium (K_2CrO_4), lead ($Pb(NO_3)_2$), zinc ($ZnSO_4.7H_2O$), 2,4-Dichlorophenol(2,4-DCP), and 3,5-Dichlorophenol(3,5-DCP). Each toxicant was examined at a minimum of 3 different concentrations, each one logarithm apart, i.e. 0.1 mg/L, 1 mg/L, 10 mg/L, 100 mg/L. Preparation of the metal solutions was done by first dissolving the proper amount of metal salt in distilled water to make a 10,000 mg/L stock solution. Appropriate amount of metal stock solution was then added to the sample to make the desired metal concentration. Preparation of the chlorinated phenol solutions was made as described by OECD (1984).

To test each toxicant, 400 mL of RAS had first been run for endogenous respiration rate (OUR1), 600 mL of reference raw influent plus toxicant was then added to test the OUR (OUR2). SpOUR was then calculated according to the formula:

$$SpOUR = \frac{2.5(OUR2)-(OUR1)}{MLVSS} \qquad (12)$$

2.5 = Dilution factor

The percent ratio of the SpOUR with toxicant and the regular uninhibited sample as control can be expressed as:

$$\%R = \frac{SpOUR_T}{SpOUR_B} \times 100\% \qquad (13)$$

%R = Percent SpOUR when under a specific amount of toxicant

$SpOUR_T$ = Specific oxygen uptake rate of control + toxicant, mg $O_2/(g.h)$.

$SpOUR_B$ = Specific oxygen uptake rate of control, mg $O_2/(g.h)$.

By plotting the corresponding %R versus the different concentrations of the toxicant in a semi-log graph paper, the EC_{50} (i.e. the inhibition concentration of a toxicant that will decrease the SpOUR by 50% under the specific testing conditions using the SpOUR apparatus) value can be obtained.

Figures 25 to 29 show the EC_{50} graphs for Pb, Cr, Zn, 2,4-DCP, and 3,5-DCP respectively. When a comparison of the EC_{50} values obtained from the SpOUR apparatus was done with the other literature values, a slightly higher EC_{50} values were obtained from the SpOUR apparatus (Table 5). This was

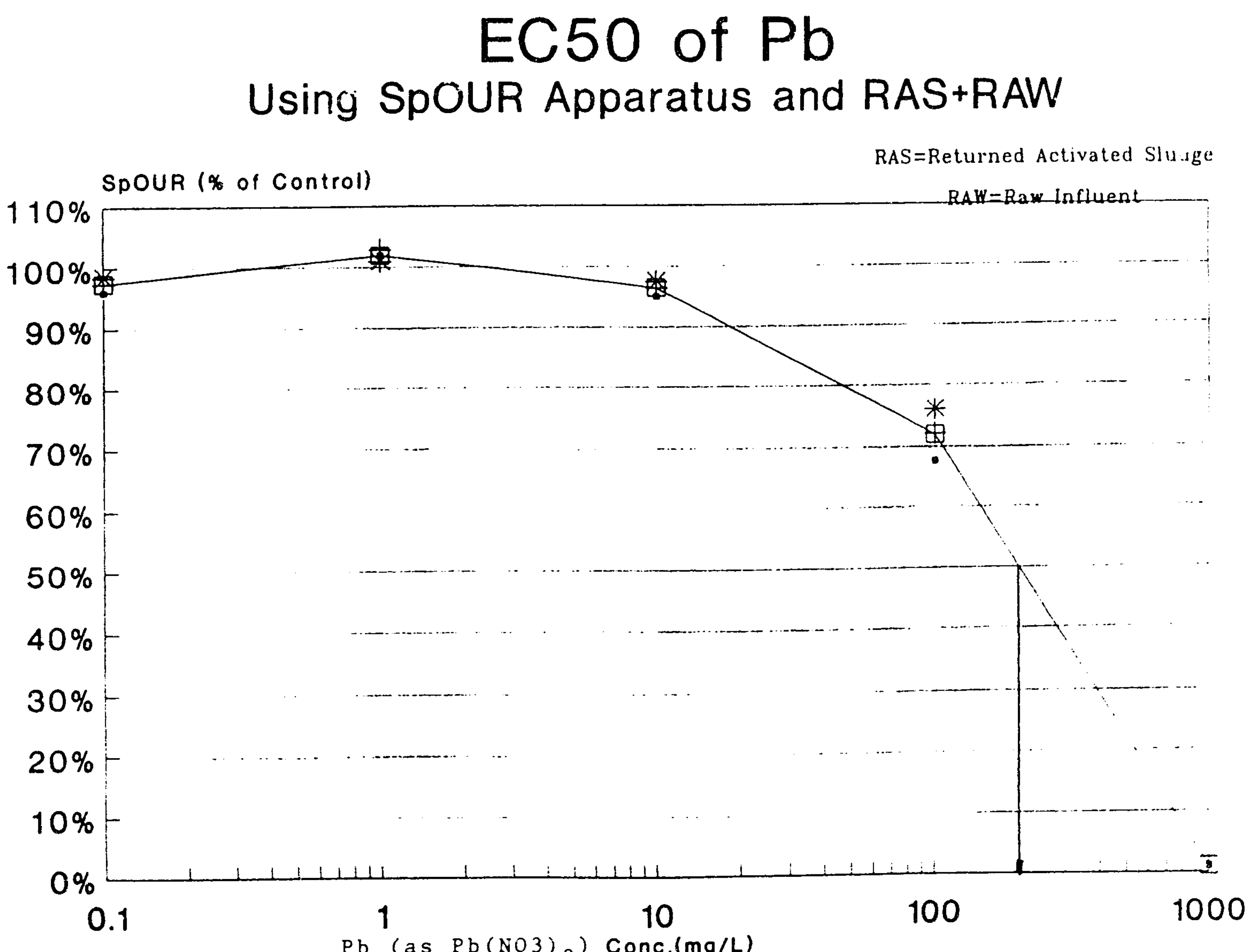


Figure 25. EC50 of Pb using SpOUR apparatus and RAS+RAW.

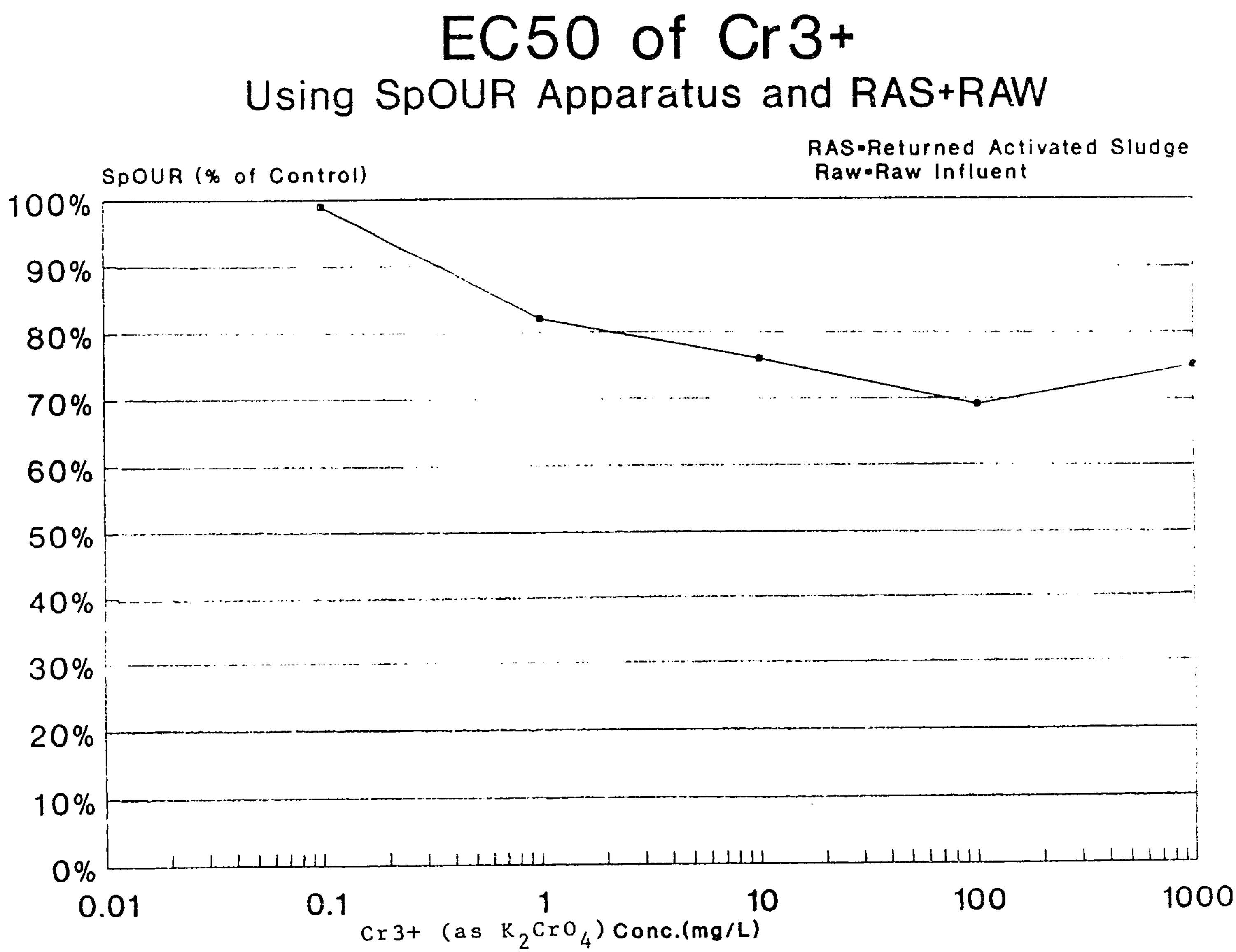


Figure 26. EC50 of Cr3+ using SpOUR apparatus and RAS+RAW.

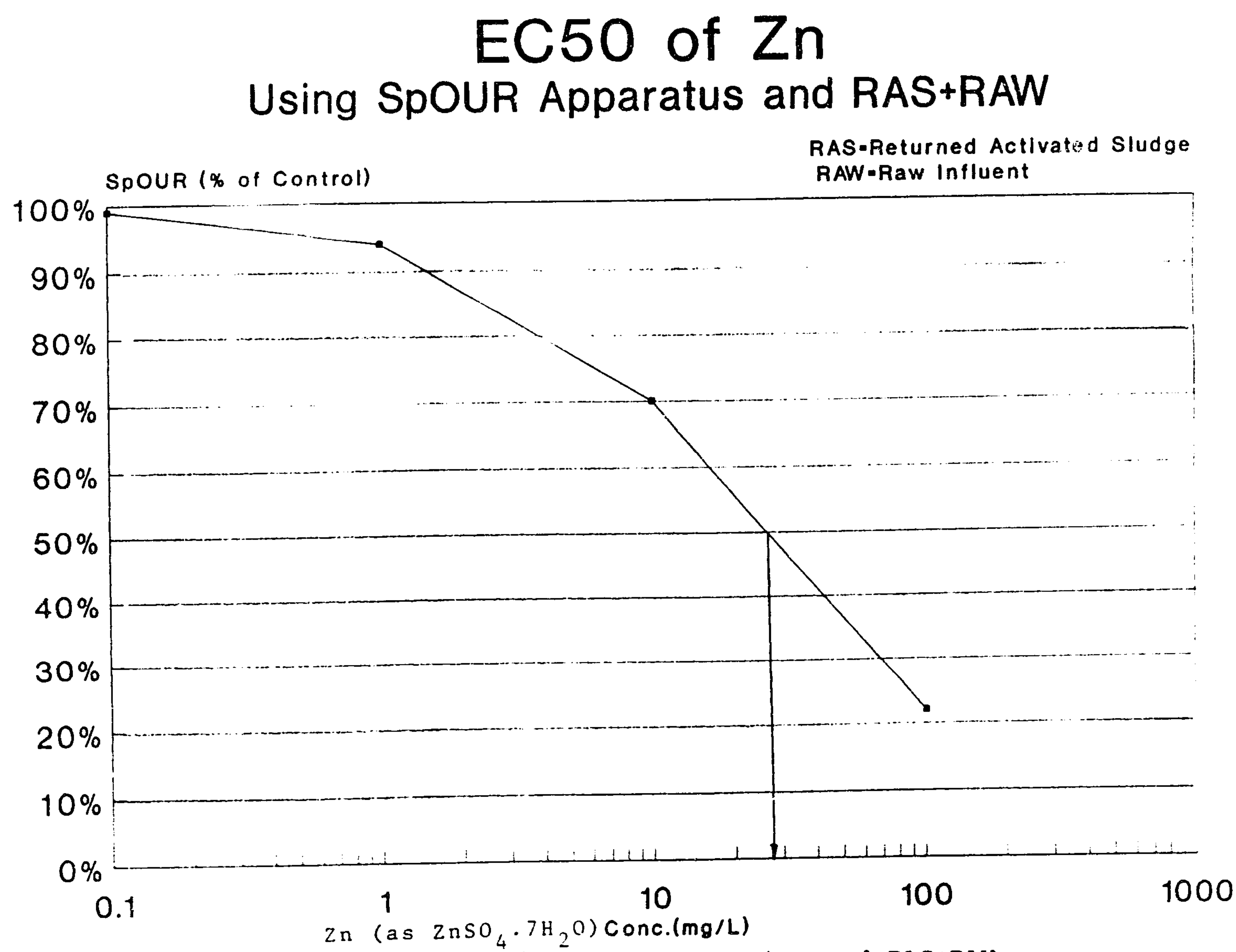


Figure 27. EC50 of Zn using SpOUR apparatus and RAS+RAW.

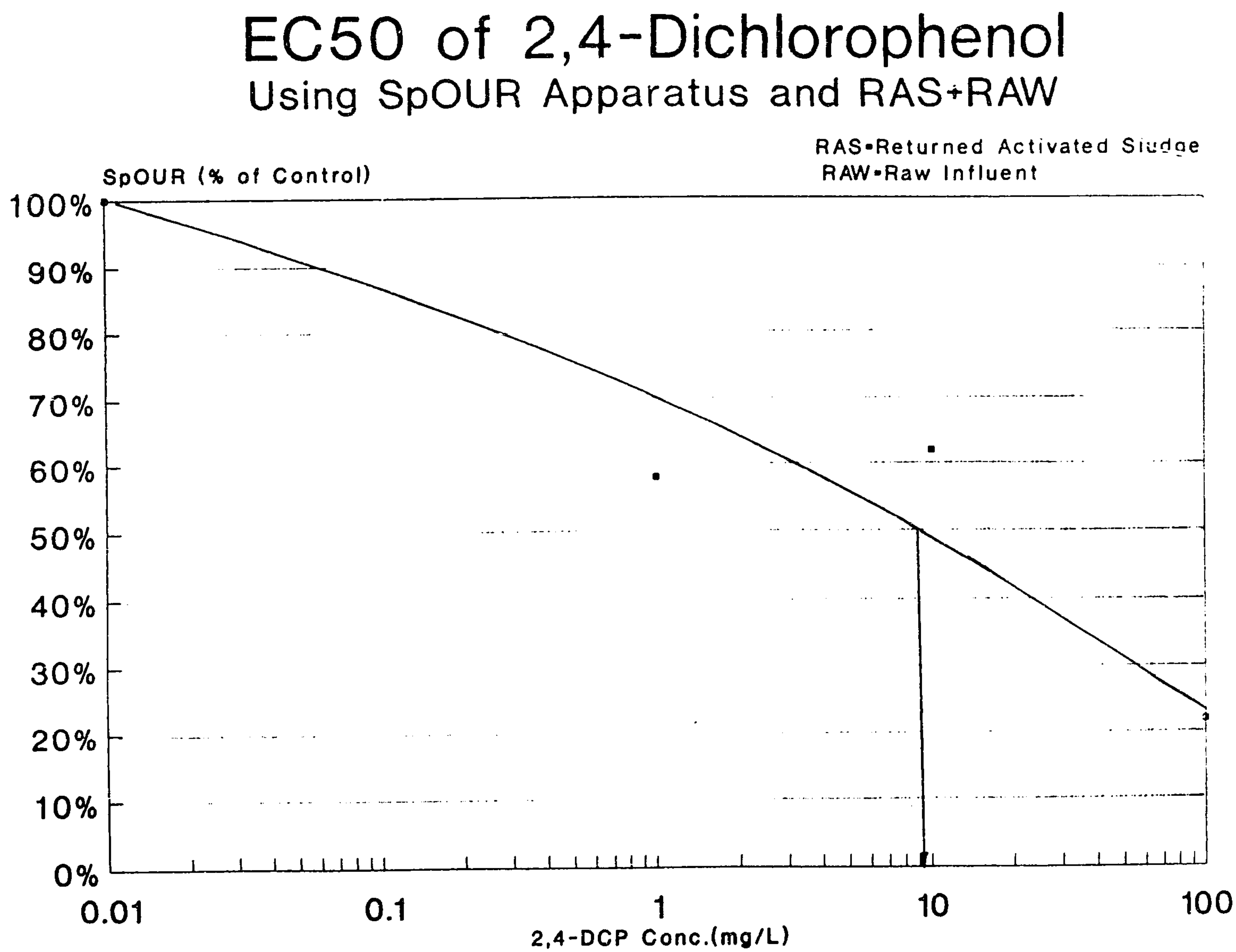


Figure 28. EC50 of 2,4 DCP using SpOUR apparatus and RAS+RAW.

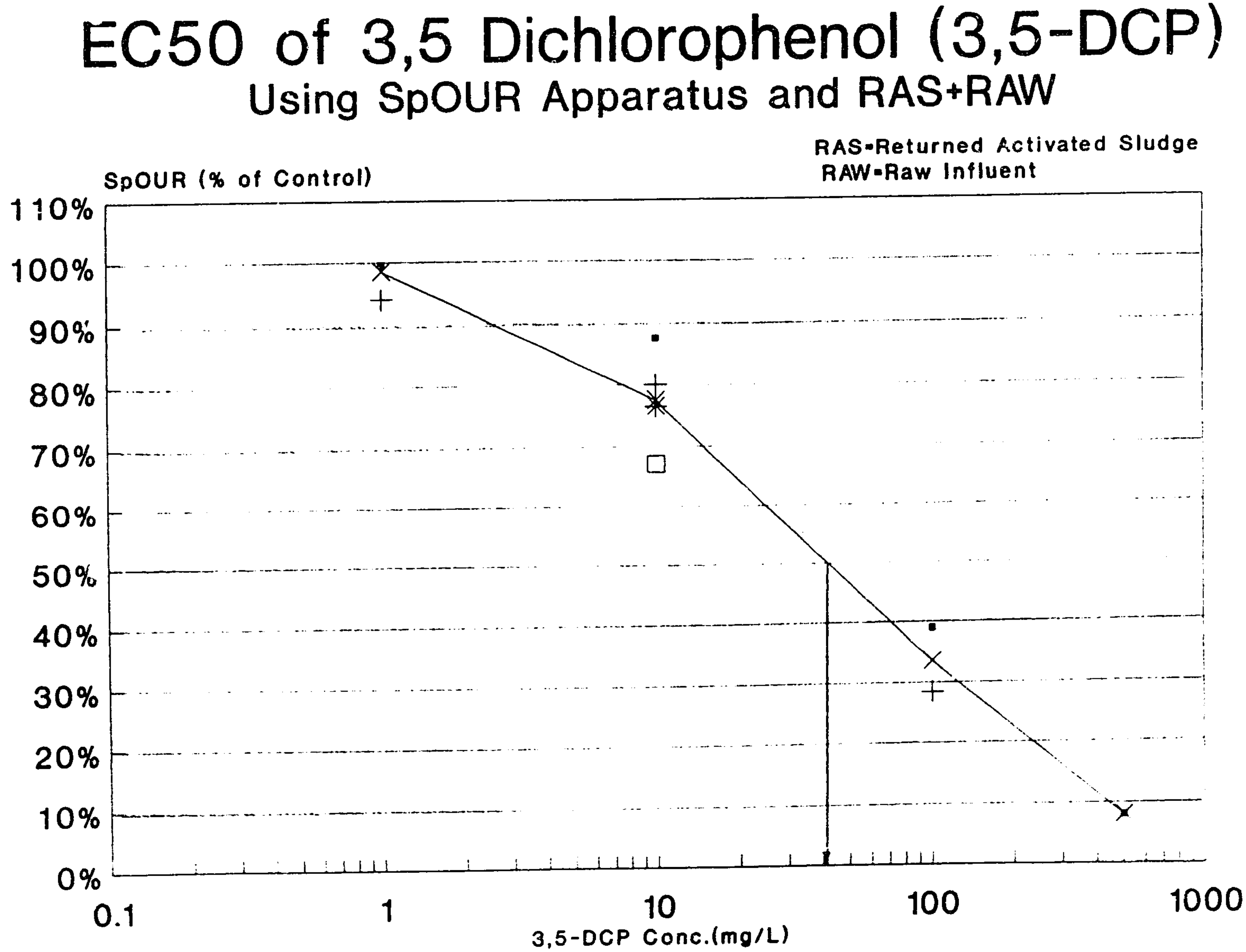


Figure 29. EC50 of 3,5 DCP using SpOUR apparatus and RAS+RAW.

TABLE 5

Comparison of EC50 Values for Cr (3+), Pb, Zn, 2,4-DCP, 3,5-DCP.

Toxicant	Literature Value (mg/L)	Experimental Value (mg/L)
Cr (3+)	N/A	N/A
Pb	350[a]	200
Zn	1.2[a] 6.1[c]	30
2,4-DCP	N/A	10
3,5-DCP	30.2[a] 6-20[b] 38[c]	40

[a] Dutka and Kwan (1984)
[b] Volskay and Grady (1989)
[c] Dutka *et al.* (1983)
N/A = Not Available

probably due to the shorter time used for testing compared to the 3 hours standard time recommended by the OECD (1984), and the mixed activated sludge was used instead of a pure cultivated culture. Another possible cause was the use of a real raw sewage as a background reference rather than synthetic sewage. In spite of that, the sensitivity of the SpOUR apparatus for toxicant is still very comparable to other methods of microbial-bioassay.

The conditions for the validity of the test have been set by OECD (1984) as:

- The 2 control respiration rates are within 15% of each other.
- The EC_{50} (3 h) of 3,5-DCP is in the range of 5 to 30 mg/L.

These two conditions set by OECD (1984) were also very closely monitored during the testing period. The "15%" criterion was followed but the 3,5-DCP value obtained was slightly higher than specified due to the reasons explained above.

A microscopic examination using the activated sludge analysis method presently used by the Gold Bar WWTP laboratory was also done after each toxicity test to confirm the SpOUR reading. The examination was a modified method used by Himebaugh (1981) for a microscopic evaluation of the activated sludge. According to the Gold Bar WWTP data, for a healthy activated sludge, the percentage of the following four groups of microorganisms should be as follow:

(a) amoebic < 10% ;

(b) flagellates < 10% ;

(c) free swimming ciliates 40 to 60% ;and

(d) stalked ciliates & rotifers 20 to 50% .

Any abrupt changes in composition or number indicate changes in sludge conditions such as toxic material present, lack of oxygen or food supply. A very close relationship was observed between the EC_{50} and the result of the microscopic examination during the experiment. Figure 30 shows the photographic picture of the sludge before toxicant was added. Figure 31 shows the breaking up of the floc after the addtion of toxicant at concentration above the EC_{50} value.

Together with the microscopic examination (as effects identification tool) and other appropiate supplementary chemical tests (as cause identification tool), the SpOUR is a very promising method for toxicity monitoring in the wastewater treatment plant environment.

8.6.2. Rapid BOD_5 prediction

The BOD_5 test is one of the most important treatment

Figure 30. Picture of the RAS before toxicant was added. (eye piece x objective power = 125).

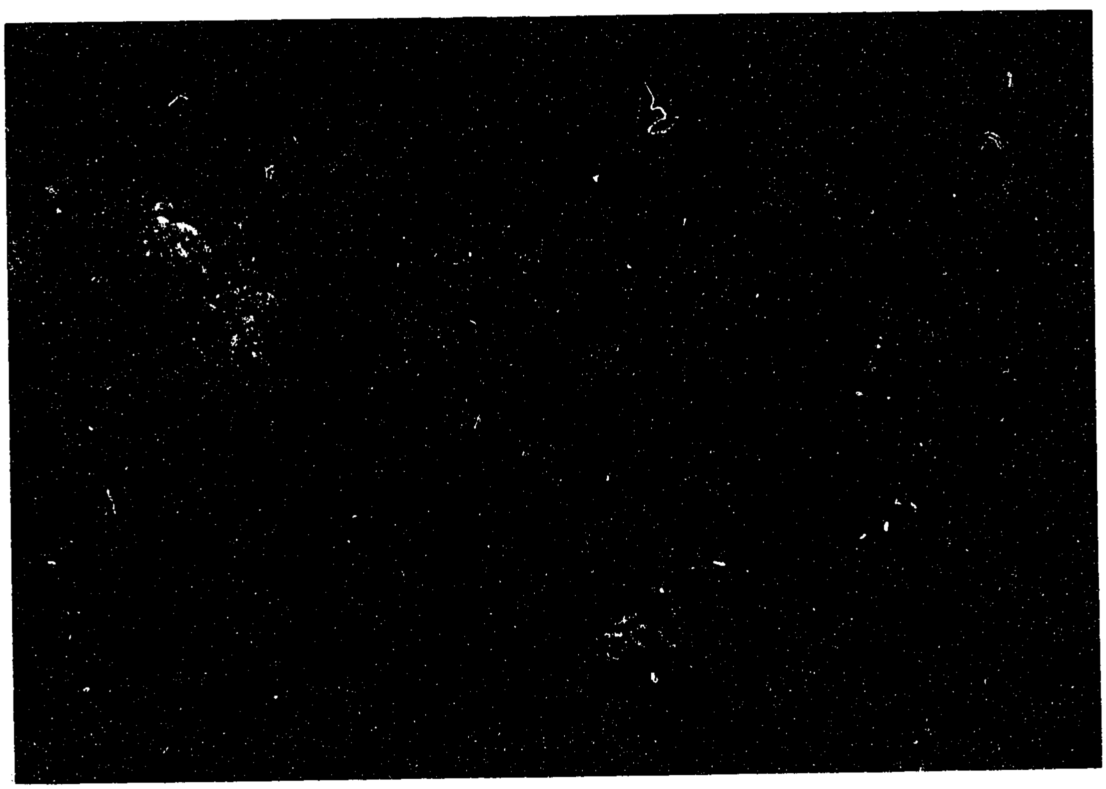


Figure 31. Picture of the RAS after toxicant was added. (eye piece x objective power = 125).

plant performance indicators used by the various regulatory agencies to determine compliance with pollutant discharge elimination system licence requirement. However, since the test requires a five-day incubation period, a wastewater treatment plant can conceivably be in a poor performance period without the management knowing for five days. Also, if there is any change in the raw influent property in terms of BOD_5, it would be ideal for the operator to know in advance so that appropriate actions can be implemented to obtain the maximum treatment efficiency.

There are many reports of experiments done to predict BOD_5 value by the use of the OUR. As early as 1928, respirometer was used to predict BOD values (Sierp, 1928). Through years of subsequent studies, improved methods have been developed. More recently, Nichols (1982) had demonstrated that influent BOD_5 could be predicted with an accuracy index of 5% by using the OUR method.

Therien and Ilhan (1983) had proposed a Michaelis-Menten relationship of

$$R_s^* = \frac{C_3 * BOD_5^*}{C_4 + BOD_5^*} \qquad (14)$$

R_s^* = OUR/Biomass related parameter, eg.MLVSS

BOD_5^* = BOD_5/Biomass related parameter, eg.MLVSS

C_3 , C_4 = constants

In addition, they had shown that a linear relationship is observed when biomass is not limiting the assimilation process. The relationship could be expressed as:

$$R_s^* = C_1 * BOD_5^* + C_2 \qquad (15)$$

C_1 , C_2 = constants

Values of C_1 = 0.19865 1/h

C_2 = 0.00053 mg O_2/(g.h)

C_3 = 0.06038 mg O_2/(g.h)

C_4 = 0.2357 mg O_2/g

were reported for the specific wastewater treatment plant that they had tested.

By using the SpOUR apparatus, an attempt was done to investigate the possibility of predicting the BOD_5 of the raw influent. Split raw influent samples that had been saved by the auto-sampler during the trial run period were randomly tested for BOD_5 using the Standard Methods (APHA, *et al.*, 1989). The corresponding SpOUR values were recorded and studied for any correlation with the BOD_5 values. After 170 individual comparisons using linear, polynomial, logarithmic, and exponent plots were done, low but significant values of correlation coefficients were obtained. Figure 32 shows an example of such linear plot, a R value of 0.455 was obtained indicating significant linear relationship between the BOD_5 and SpOUR values as indicated by equation (15).

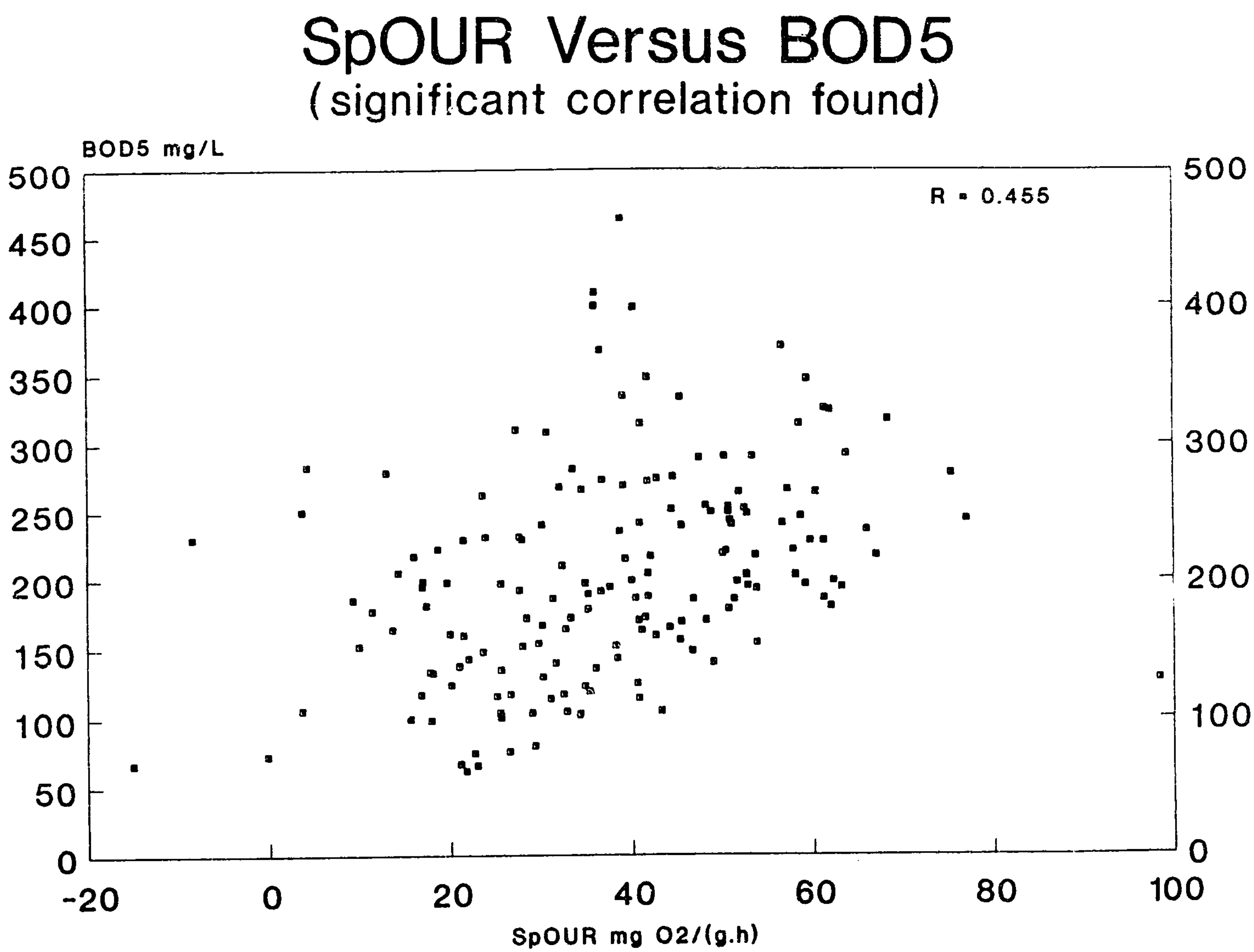


Figure 32. Linear plot of SpOUR versus BOD_5 (Significant correlation found)

An attempt was also tried to study the response of the microbial population in the returned activated sludge to the synthetic substrate during the SpOUR measurement. BOD_5 reference solution was prepared as follow (Standard Methods, APHA, *et al.*, 1989. Method #5210.B):

150 mg glucose

150 mg glutamic acid

1 mL Phosphate buffer (8.5 g KH_2PO_4 + 21.75 g K_2HPO_4 + 33.4 g $Na_2HPO_4.7H_2O$ + 1.7 g NH_4Cl dissolved in 1L of deionized distilled water.)

27.5 mg $CaCl_2$

0.25 mg $FeCl_3.6H_2O$

22.5 mg $MgSO_4.7H_2O$

dissolved in 1 L of deionized distilled water. For higher substrate concentrations, larger amounts of glucose, glutamic acid and other trace nutrients were added accordingly but the phosphate buffer was not. The SpOUR apparatus was then run with different concentrations of the BOD_5 reference solutions added as raw influent.

The SpOUR values versus various concentrations of BOD_5 references obtained are shown in Figure 33. A negative SpOUR was obtained with increasing value of the references i.e. sample added was inhibitory. The reasons for this phenomenon are due to:

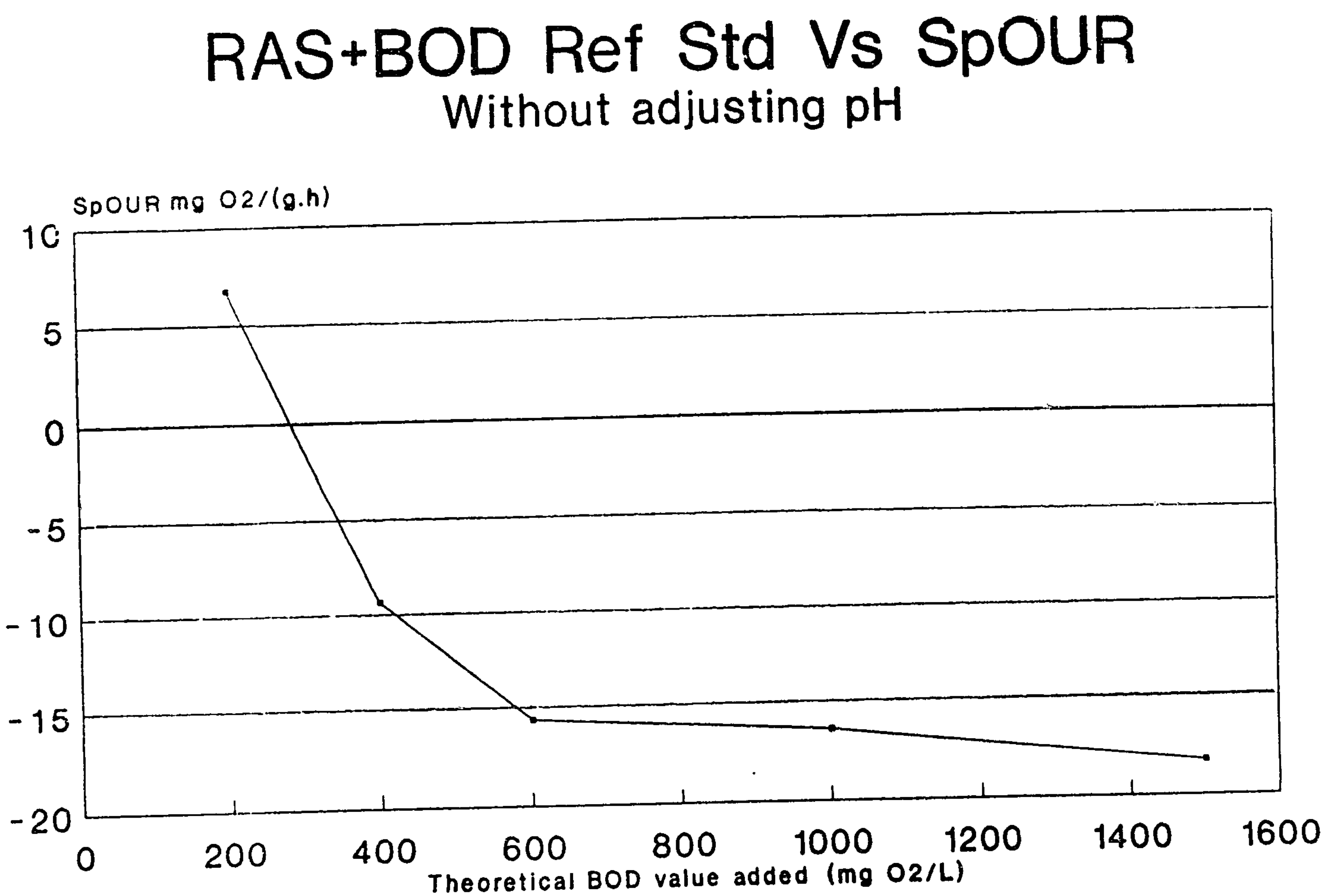


Figure 33. RAS+BOD reference standard versus SpOUR (without adjusting pH).

-pH of the sample added was inhibitory due to the glutamic acid added. Slight buffering capability of the RAS was able to handle the acidity due to small dose of glutamic acid such as 150 mg/L. However, higher concentrations of glutamic acid started to lower the pH of the sample down to 3.5 so that the respiratory activities of the microorganisms were affected. This test shows the sensitivity of the SpOUR test to low pH samples. The low pH was probably due to the inadequate amount of the phosphate buffer solution being added to the test sample.

-When the pH of the reference had been adjusted to 7, the tests were repeated. The results of the tests are shown in Figure 34. The SpOUR increased slowly but linearly with increases in reference concentrations up to 600 mg/L and then declined. Duggan and Cleasby (1976) had also investigated this effect and explained that if a microbial population was in endogenous respiration for an extended period of time, they used substrate reserve such as glycogen and protein for metabolism. A sudden injection of large quantity of glucose could inhibit the enzyme of the citric acid cycle and caused an inhibition of respiration according to the Haldane relationship of:

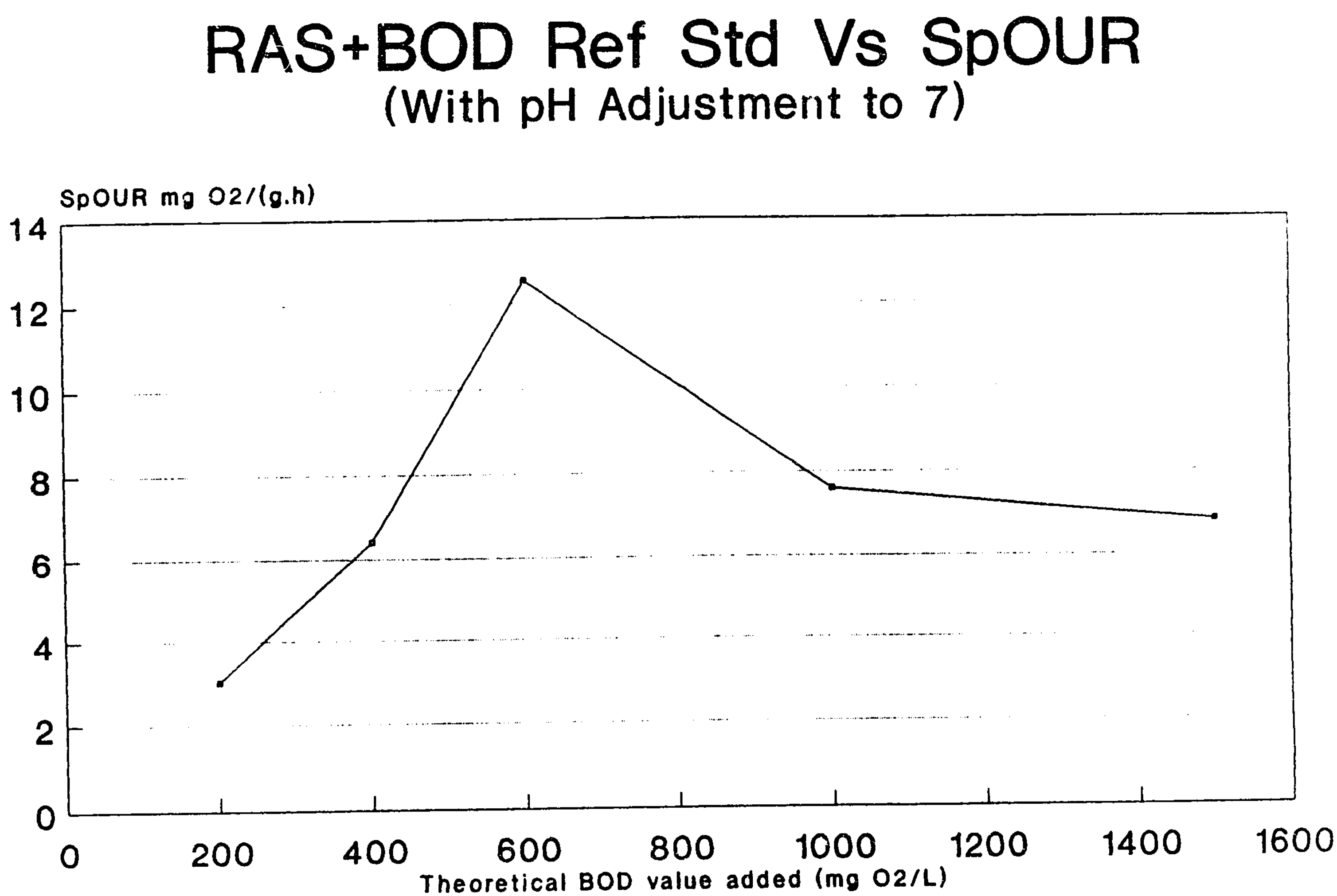


Figure 34. RAS+BOD reference standard versus SpOUR (with pH adjustment to 7).

$$U = \frac{U_{max}\ S}{K_s + S + S^2/K_i} \tag{16}$$

U = SpOUR, mg O_2/(g.h).

U_{max} = Maximum SpOUR, mg O_2/(g.h).

S = Substrate concentration, mg BOD/L

K_s = Maximum saturation constant, mg BOD/L

K_i = Inhibition constant, mg BOD/L

A small numerical value for the K_i indicates greater inhibition or toxic effect. With a toxic or inhibitory substance, an increase in substrate concentration results in increased SpOUR activity over a limited range. After the critical substrate concentration, the inhibitory effect of the substrate causes a decrease in SpOUR. This effect was also described by Hanel (1988) as the "Crabtree Effect".

A second experiment was then done with the synthetic reference sewage recommended by OECD (1984) and Kwan (1988). The following amounts of substances were dissolved in 1 L of deionized distilled water:

16.0 g Peptone

11.0 g Beef Extract

3.0 g Urea

0.7 g NaCl

0.4 g $CaCl_2.2H_2O$

0.2 g $MgSO_4.7H_2O$

2.8 g K_2HPO_4

pH = 7.5

Various concentrations of the synthetic reference sewage were used for SpOUR testing with the RAS from activated sludge seed tank. The strength of the synthetic reference sewage added was measured separately by COD and BOD.

Results of the experiment (Figure 35) show the responses of SpOUR versus various synthetic sewage strengths follow the classical Michaelis-Menten relationship shown in equation (3) for both BOD and COD. This relationship has been demonstrated by many other reports (Vargas-Lopez 1989; Therien and Ilhan 1983; Huang and Cheng 1984). By applying the Lineweaver - Burk relationship, a linear plot of 1/SpOUR versus $1/BOD_5$ was obtained with R = 0.999 (Figure 36). From equation (4), the U_m^0 obtained was 710 mg O_2/(g.h) and K^0 = 113 mg BOD/L. When this relationship is used to relate some of the raw influent samples using the same testing condition, a good prediction of influent's BOD is obtained (Figure 37). However, when the above results are used to compare other batches of SpOUR results using different source of RAS, poor correlation occurs. This phenomenon may be due to the many variables that can affect the SpOUR data. Some of these variables are the physiological state of the RAS, the amount of mixing, pH, concentration of solids, temperature, presence of nitrifying bacteria, wastes

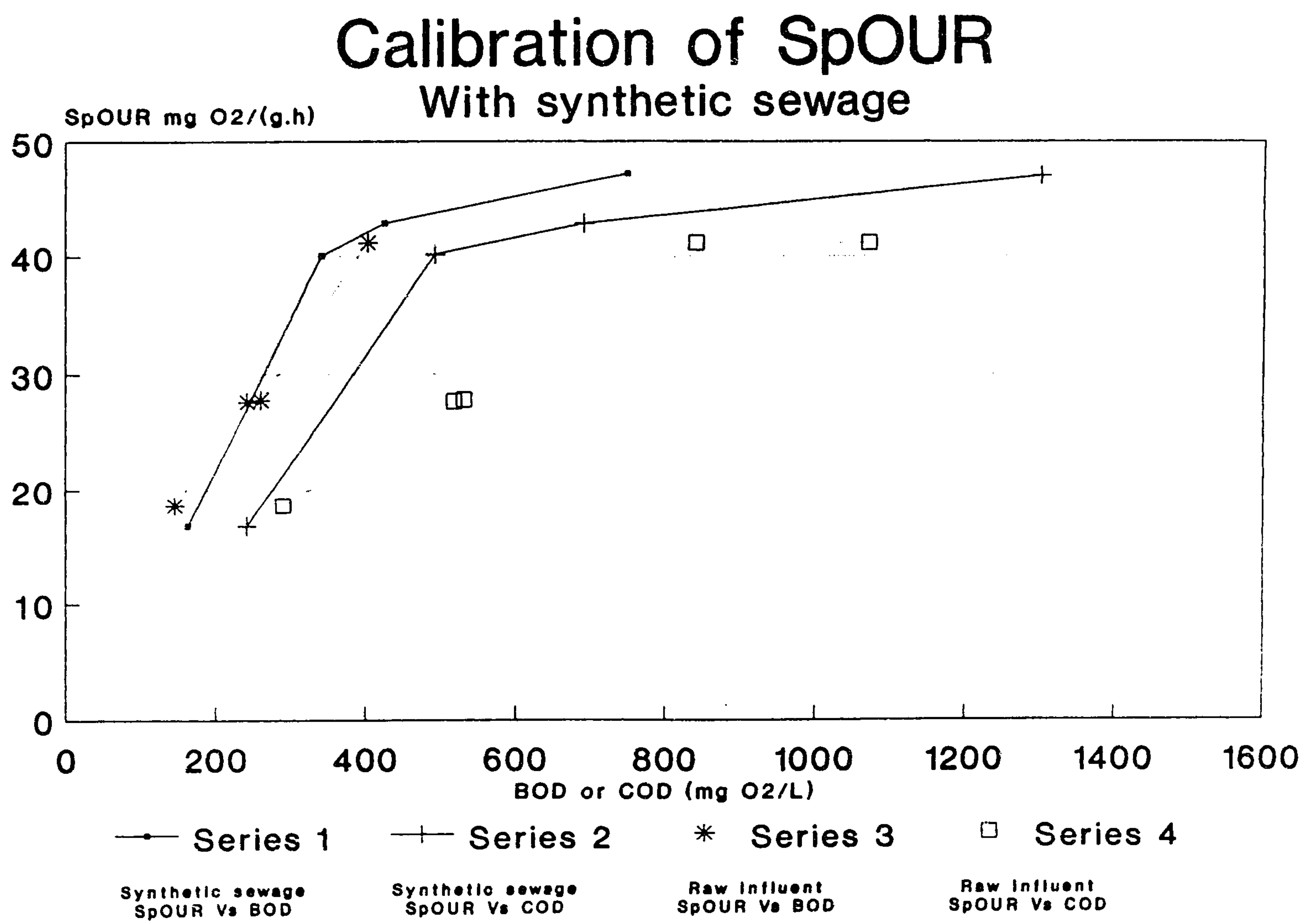


Figure 35. Calibration of SpOUR with synthetic sewage.

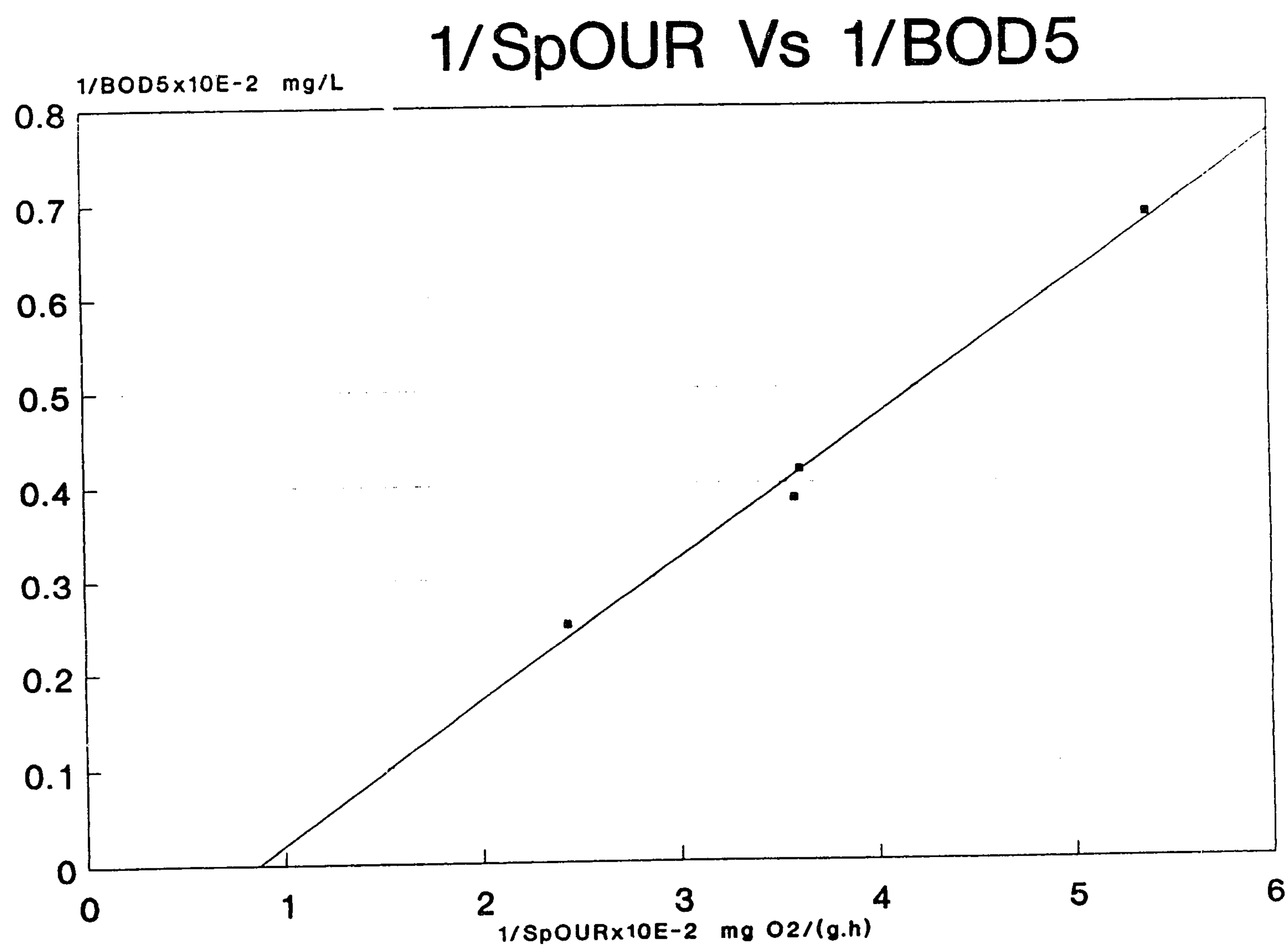


Figure 36. Linear plot of 1/SpOUR versus 1/BOD_5.

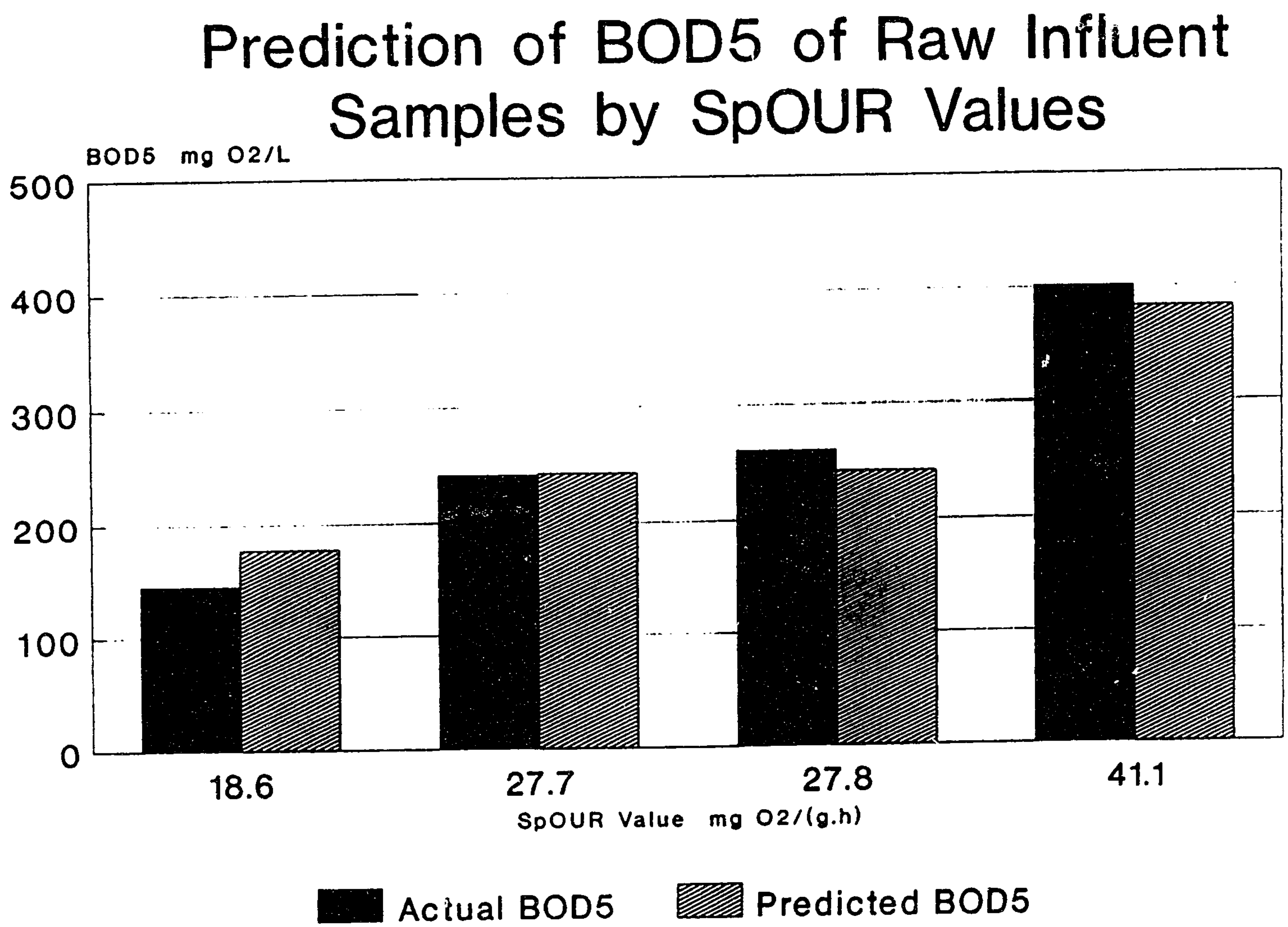


Figure 37. Prediction of BOD_5 of raw influent samples by SpOUR values.

composition, presence of toxic materials, etc.

The lack of a standardized method that would take account of all the variables mentioned is probably the major reason for the highly fluctuating data obtained when a correlation of the individual BOD and SpOUR is attempted.

It is therefore advisable to run a calibration run with various concentrations of synthetic reference solutions before using each batch of the RAS from the seed tank. Once the relationship of the SpOUR versus BOD of a particular batch of RAS has been determined, the subsequent SpOUR data using the same RAS can be used for prediction of the BOD of the raw influent more accurately. Figure 38 shows that when the daily average SpOUR value of a particular batch of a RAS seed is plotted against the BOD of the same day's composite raw influent sample, a very close relationship is observed. The weekly diurnal fluctuation of the BOD values matched closely with the corresponding SpOUR data. Such a relationship can also be used to obtained a more realistic prediction of the BOD of the daily raw influent composite sample. A computer programme can also be added to calculate such predicted BOD values on a real-time basis with a certain degree of confidence when enough data-base has been developed.

Use of an automated instrument and a much larger sample size also help reduce the data variability and cut down labour requirement. The other advantage that can be seen is

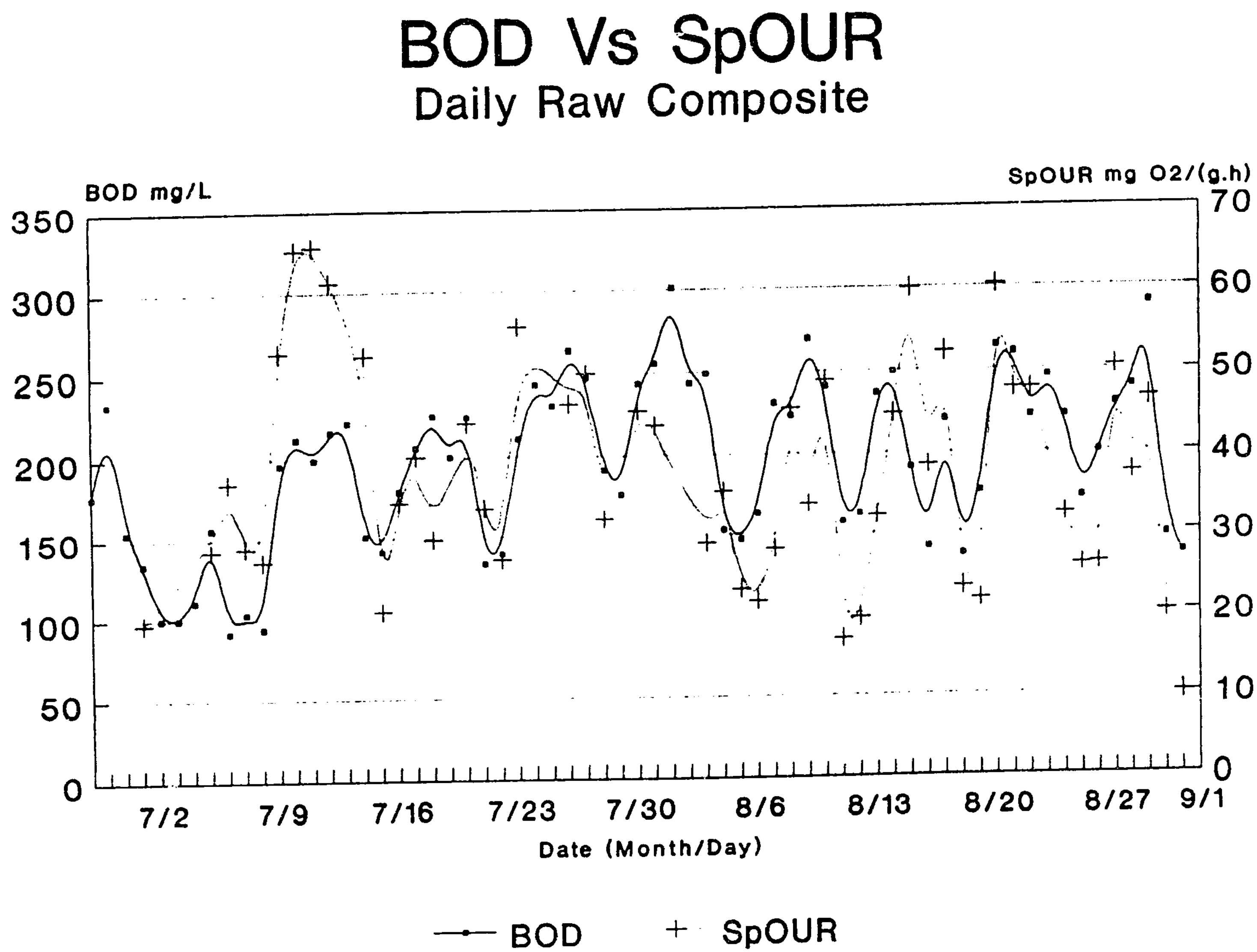


Figure 38. BOD_5 versus SpOUR (daily raw composite).

the more accurate prediction of the oxygen requirement in the aeration treatment process because nitrification oxygen demand can also be calculated from the data obtained.

Together with a good maintenance program to ensure other important areas such as DO probes, solenoid values are all functioning properly, the SpOUR monitoring can be a great tool for WWTP process control.

8.6.3 Tolerability Study

According to Yee and Hettiaratchi (1989), eductor truck dumping has been one of the areas where more screening and monitoring are required. Every day 375,000 L or more of the industrial and commercial liquid wastes are disposed at the Gold Bar WWTP. Due to the increasing tightening of the effluent quality requirement, Gold Bar WWTP has initiated an eductor truck monitoring programme. Wastewater transported by the eductor truck has to obtain permit and manifest before being allowed to discharge the load at the two selected sites in Edmonton. At the present, only pH screen and periodic monthly spot-checks are done on selected samples as a monitoring measure. Such testings are inadequate to prevent any toxic loadings entering the treatment system. Upsets can easily occur if these liquid wastes contain any mixtures that are toxic or inhibitory to the activated sludge.

Many screening tests have been developed by the laboratory staff of the Gold Bar WWTP to provide a quick, on-the-spot checking on the liquid wastes delivered by the haulers. However, these tests are either too specific or too time consuming. Most of the time, due to the complex nature of the matrix, interferences mask the determination of the desired constituents. The advantage of using SpOUR for checking the toxicity or the tolerability of the activated sludge to such liquid wastes over the other methods are:

-it is generally not affected by any colour, turbidity or other physical properties that would usually mask the results of other chemical screening tests;

-it takes only five to ten minutes to test if the endogenous respiration rate is predetermined;

-its result tells the direct impact of the wastes to the microbial population in the secondary tanks;

-it does not require any special skills for performing the screening test;

-it is "reagentless" and costs very little to test.

The only thing that has to be cautioned is the waste should not contain any chemicals that will use up oxygen chemically or physically.

The on-line SpOUR can be used as bench top equipment for monitoring tolerability of the activated sludge on an individual basis. The on-line sampler can be detached from the apparatus so that RAS and the sample to be tested can be introduced manually in the tolerability test. To start the test, 400 mL of RAS is first manually introduced into the apparatus for the determination of the endogenous respiration rate. Basing on the report from Nichols (1982), a stock synthetic reference sewage made from peptone and beef extract as recommended by OECD (1984) is used to improve the sensitivity of the test. A standard reference solution (Std. Ref. Soln.) with 16 mL of the stock synthetic reference sewage + 584 mL deionized distilled water (with a resulting BOD value of 460 mg/L) is prepared. This is then mixed with the RAS to obtain the basal SpOUR. The test is then repeated with a fresh RAS but the composition of the standard reference solution is changed to a mixture of 16 mL of stock synthetic reference sewage + 484 mL deionized distilled water + 100 mL of the sample to be tested for tolerability. The SpOUR of the combined solution is then obtained. The tolerability criteria is then determined by the following guidelines:

$$\text{Relative SpOUR} = \frac{\text{SpOUR(RAS+Mixture)}}{\text{SpOUR(RAS+Std.Ref.Sol.)}} \times 100\% \qquad (17)$$

Relative SpOUR > 100% = Acceptable wastewater.

90% < Relative SpOUR <100% = Inhibitory wastewater.

Relative SpOUR < 90% = Toxic Wastewater.

Successful results were reported by Patapsco WWTP (Martin 1989) by using the similar "10%" rule and a respirometer to examine the treatability of the liquid wastes entering the treatment facility.

Sometimes it is difficult to differentiate between a sample that is slightly toxic and one that is not easily treated. Such a sample can produce insufficient metabolism in the activated sludge system causing high BOD in the final effluent. Further laboratory testing may be required for such sample so that appropriate treatment can be applied.

Together with a manifest programme and close-curcuit TV supervision, the SpOUR apparatus is an excellent complimentary tool for eductor truck liquid wastes monitoring.

8.6.4 Food to Microorganisms Monitoring Using SpOUR

The traditional strategy to control return sludge is to use a fixed percentage of the plant flow. The percentage used varies according to different operation conditions in an attempt to match the quantities of "food" entering the aeration tank with adequate microorganisms. The rule of thumb generally used is to mix 40% returned activated sludge with 60% of primary effluent.

However, due to industrial flow, infiltration/inflow or storm water contribution, a change in flow does not necessarily means a change in the amount of "food" entering the aeration tank. A more realistic way of determining F : M relationship is to determine the volatile suspended solids of the returned activated sludge as M and the primary effluent BOD_5 entering the aeration tank as F. Nevertheless, determination time is lengthy and results may not be indicative of the actual viable microbial population or the proper amount of "food".

In an attempt to develop better methods of determining the rate of sludge return, Arthur (1983) suggested using the respiration rate of the microorganisms in the returned sludge and the mixed liquor at the inlet to the aeration tank. The F:M ratio is expressed as:

$$\frac{F}{M} = \frac{SpOUR_{ML}\ (Q + Q_{RAS}) - SpOUR_{RAS}\ Q_{RAS}}{SpOUR_{RAS}\ Q_{RAS}} \qquad (18)$$

Whereas $SpOUR_{ML}$ = Specific oxygen uptake rate of mixed liquor at inlet, mg O_2/(g.h)

$SpOUR_{RAS}$ = Specific oxygen uptake rate of returned sludge, mg O_2/(g.h)

Q = Plant flow, ML/h

Q_{RAS} = Returned activated sludge flow, ML/h

NOTE: It is not necessary to determine MLVSS for SpOUR since it cancels out.

Thus basing on the real-time information provided by the SpOUR apparatus, F:M ratio can be updated every half an hour. This is much quicker and better than using the conventional BOD and MLVSS because both do not tell much about the biological conditions of the microorganisms in the aeration tanks and require a much longer time to obtain data.

Furthermore, by rearranging equation (18) Q_{RAS} can also be updated once F:M ratio is obtained. Thus

$$Q_{RAS} = \frac{SpOUR_{ML} * Q}{(1 + F/M) SpOUR_{RAS} - SpOUR_{ML}} \qquad (19)$$

Further investigation of the above application should be done once the SpoUR monitoring has become a routine practice.

9. Protocol for the Management of Unusual SpOUR data:

Since it has been developed from previous experiments that SpOUR can give an imminent warning of any unusual raw influent, an effective management protocol must be developed to deal with any unusual SpOUR data for proper treatment plant operation.

The causes for unusual trends or results in SpOUR coming from the raw influent can be generalized as shown in Table 6. Such trends or results usually indicate a warning for biological upsets to the secondary treatment system. A

TABLE 6.

Summary of unusual trends or results in SpOUR due to raw influent variability

Sample Origin	Possible SpOUR Response	Proposed Corrective Solutions
Organic loading of		
(a) Highly biodegradable materials	+	Increase number of microorganisms
(b) Toxic origins	-	Divert flow to holding tank after primary treatment
(c) Inhibitory or difficult to treat materials	-	Check for possible acclimatization or treatment
Extreme acid or basic condition	-	Neutralization before primary
Temperature		
(a) High	-	Diversion after primary
(b) Low	-	Diversion after primary
Heavy metals	-	Diversion or precipitation after primary
Excessive oil or grease	-	Separation or diversion after primary

+ = increase

- = decrease

flowchart of the steps for managing such possible biological upsets is shown in Figure 39.

Basically, the capacities of the various process streams should be identified. The purpose is to find out the retention time that is available once a toxic or unusual slug is detected. Knowledge of actual sizes of various treatment facilities such as the sizes of the primary setting tanks can allow management to make quick decisions on reactive measurement.

A spare tank for raw influent or primary effluent diversion should be available because toxic slug can then be diverted temporarily until proper analyses have been done to identify problems and decision on best treatment has been made.

Once the cause of unusual SpOUR readings has been identified, corrective actions should be implemented. Adequate time should be allowed for the biological system to adjust to the new corrective condition.

10. Discussion

During the two months of continuous round-the-clock trial run periods, the SpOUR apparatus performed satisfactorily in both hardware and software areas. Appendix H shows the summary of all the testing information while Appendix I shows the plots of SpOUR versus time during the entire testing period. Several interesting observations we'

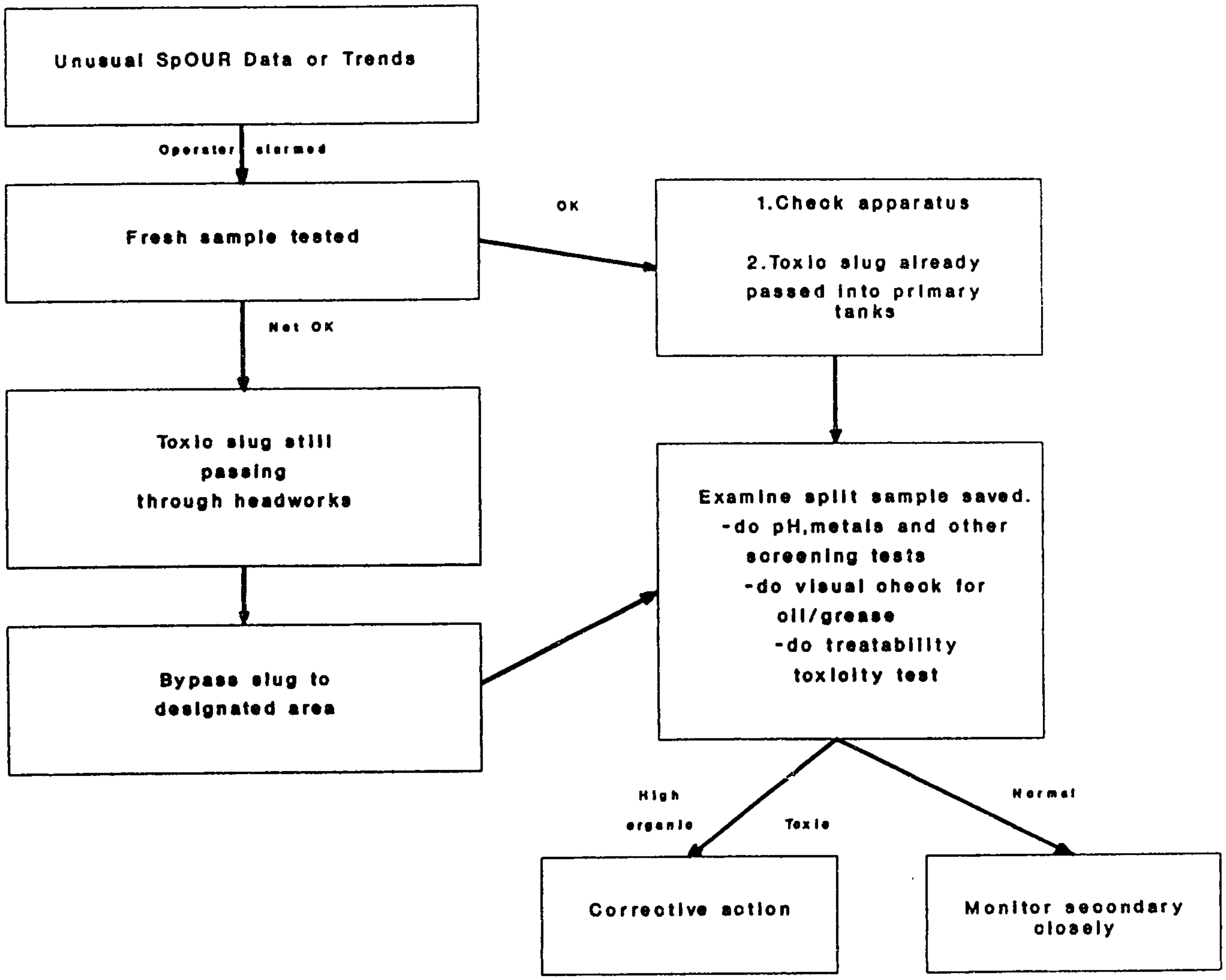


Figure 39. Flowchart of biological upsets management.

made from the daily SpOUR versus time plots:

(1) The raw influent entering Gold Bar WWTP varied greatly in strength even within very short periods of time during the testing period. This can be seen from data on July 9 to 12, August 10 to 12, and August 17. Such a big fluctuation can cause treatment problems if not properly taken into consideration.

(2) The daily diurnal pattern of highest sewage strength around midnight and lowest around noon, the weekly pattern of higher sewer strength during weekdays and lower during weekends were also noticable during the entire testing period

(3) During rain or thunderstorm, the SpOUR readings were low and also smoothened out as indicated by the rain or thunderstorm during July 19 to 20, July 25 to 26, and August 31 to September 1.

(4) There are many incidents of SpOUR readings that were significantly higher than normal (greater than 50% of the previous value). A good example can be seen from July 5 to 8 and August 10 to 11 SpOUR monitoring plots from Appendix I.

(5) There are incidents of SpOUR readings that were significantly lower than normal (lower than 50% of the previous value). Examples can be seen from July

12, July 29, and August 16 SpOUR monitoring plots from Appendix I.

Two important areas have to be addressed before the apparatus can be put into on-stream monitoring. The first one is oil and grease in the raw influent.

Due to the nature of the sample, DO probe was constantly interfered by the oil and grease in the raw influent. This could be seen from the prominent continuous downward trends of the SpOUR as indicated by the daily SpOUR monitoring versus time plot shown in the Appendix I during the period of July 23-26. Immediately after the DO probe had been cleaned, the SpOUR values increased significantly to a higher sets of readings as indicated by the footnote "g = DO probe cleaned" shown in various places in the Appendix I. Such a jump in SpOUR values could give a false positive indication of higher organic loading entering the treatment facilities. Or conversely, the previous lower SpOUR reading could be underestimated readings so that incorrect operational measurements were done causing deterioration of the effluent quality.

Daily routine cleaning of the DO probe seems to be the easiest solution to the above problem. A clean spare DO probe can be put into use while the used DO probe is taken out from the apparatus for cleaning. Such a changeover takes only a few minutes. A calibration should also be done using standard reference solution to update the correlation of the SpOUR and BOD values. Standard reference toxicant such as 3,5-DCP should be used regularly to ensure the sensitivity of the sludge is normal. This procedure is recommended by the OECD (1984) and should be included in the Standard Operation Procedure (SOP) as part of the quality assurance programme.

If the SpOUR apparatus is put into other locations such as primary effluent (PE) outlet, secondary aeration tanks (SAT), such problems would not be as serious due to the removal of oil and grease in the primary treatment.

Another serious problem encountered during the trial period was the constant blockage of solenoid by debris from the raw influent. Due to the nature of the sample, particles of various types were included in the sample. Although a strainer was used to prevent larger particles entering the apparatus, substances that were small enough to pass through the strainer could sometimes block the solenoid's sealing membrane and caused blockage and malfunctioning of the apparatus.

Experience from Gold Bar WWTP on the solenoids was to put them on vertical drain instead of horizontal. This would help flush out the debris. Such redesigning of the drainage solenoid is strongly recommended.

Again, this problem seems to be inherent with the nature of the raw influent. Samples taken from PE and SAT will not expected to have such problems.

Except for the two problems discussed above, the hardware and software of the SpOUR apparatus worked very well and proven to be very reliable. The use of MCU enables multi-points monitoring to be done by one host computer and hence cuts down significantly on the cost.

Althought EC_{50} values were developed in this project, the assessment of toxicity by this method only shows the impact of the specific compound on the ability of the activated sludge microorganisms to remove normal biogenic compounds from the wastewater. Furthermore, in this test there is no indication of the toxicity effect of the toxicant to the anaerobic digestor or other ecosystem that the effluent is to be discharged.

Moreover, the toxicity identified is only shown as acute toxicity under the specified conditions of testing, bacterial population in the secondary aeration tanks may acclimatize during the treatment process and reduces the toxicity effect. Some toxicants may also be precipitated or settled as sludge before reaching the secondary treatment. More specific toxicity testing should be done to address these issues.

Busch (1982) suggested that in the OUR test, the major variable is the bacterial seeds used and felt that it could be controlled by the use of laboratory pure culture. Many other studies (Dutka *et al.* 1983, Dutka and Kwan 1984) also showed that each bacterial species and test procedure has its own level of sensitivity pattern to various toxicants. They eventually suggested using a mixture of several species made up from the laboratory pure cultures to give a more reproductive result. However, the merits of using the bacterial culture taken from the secondary aeration tank of the treatment facility are obvious. These advantages include:

- It is readily available and cost nothing to obtain.
- The parameters required (MLVSS, microscopic examination) are routinely done by the operational staff at Gold Bar WWTP, hence no extra burden of workload would be required.
- The reaction of the seed sludge to the raw influent will tell exactly the direct impact of the influent to the secondary treatment system. Such in situ testing could save a lot of time in correlating test data with impact to the treatment system.
- The SpOUR tells directly the oxygen requirement in the aeration tank including the nitrification requirement.

One disadvantage associated with the use of MLVSS as an indicator of microbial mass is the variability in data. This could cause a lot of difficulties when interpretation of the results is required. In order to assure accuracy and precision of the data generated, a routine calibration procedure should be included in the SOP of the instruction. Such calibration procedure would include the following steps:

-A daily change of a clean calibrated DO probe or whenever it is required.

-When a new RAS is used, the system should be calibrated with a standard reference solution for updating the correlation of SpOUR and BOD.

-A standard reference toxicant such as 3,5-DCP should be used on a weekly basis to ensure the sensitivity of the apparatus.

In our experiment, a close relationship was also observed for the BOD_5 (24 h composite sample) and the SpOUR (24 h average) readings. Such relationship has been shown previously to be linear. However, when individual data were compared, no linear relationship was found. This could be due to various factors such as biomass limiting the assimilation process, toxicity present in the raw influent or variability in the DO probe.

In order to improve the working range of this linear relationship, higher biomass should be used by (a) using more RAS i.e. instead of 400 mL of RAS use 600 or 700 mL, or (b) by centrifuge RAS and resuspend in a phosphate buffer solution as reported by Vargas-Lopez *et al.* (1989).

More work should also be done to validate the above relationship although many other researchers had already reported such correlation.

11. Conclusion

Except for a few incidents of oil and grease or debris in the raw influent interfering with the testing, the hardware and software of the SpOUR apparatus worked very well during the two months of continuous testing and proven to be very reliable. The use of a MCU and efficient programming languages enabled multi-point monitoring to be done by one host computer and hence cuts down significantly on the cost.

The monitoring of SpOUR is not only a useful on-line tool for screening unusual organic or toxic loadings, but is also useful in providing information such as prediction of BOD_5. Further investigations of using the SpOUR data for F : M ratio control and activated sludge aeration requirement F:M ratio and aeration requirement are recommended.

The SpOUR apparatus can also be used as an individual laboratory bench-top device for individual sample testing on toxicity of liquid wastes and tolerability of the activated sludge to such wastes.

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Appendix A : DO2CON46 programme.

```
'------------------------------------------------------------------------
'                                                                       -
'-            DO2CON46 - Disolved Oxygen Control Program                -
'-                                                                      -
'-            Version 4.6                                               -
'-                                                                      -
'-            Written By: Dale Lathe                                    -
'-                                                                      -
'-            Date: June 27 / 90                                        -
'-                                                                      -
'------------------------------------------------------------------------
'-                                                                      -
'-      This program starts the DO2 Controller and then waits for the   -
'-      data to be returned to the PC. These data are stored and a linear -
'-      regression of the data is performed to find the Oxygen uptake   -
'-      rate. The Oxygen uptake rate is then also stored to the disk.   -
'-                                                                      -
'-      Version 4 plots the value of SpOUR of the wastewater sample     -
'-      in the form of a strip chart. This means that the plot moves from -
'-      right to left across the screen showing the last 20 values of the -
'-      SpOUR.                                                          -
'-                                                                      -
'-                                                                      -
'------------------------------------------------------------------------
'-                                                                      -
'-      All Control of the DO2 is done from the software in the Contoller -
'-                                                                      -
'------------------------------------------------------------------------


DIM do$(120)

DIM do2%(60)

DIM temp%(60)

DIM SpOUR(20)

DIM shdat2(60)

DIM dat2(60)

'-------------------------------------------------------------------------

START:

ON ERROR GOTO erlist

        CLS
        SCREEN 2

        GOSUB Title

        LOCATE 5, 1

        INPUT "Enter Data File Name: (6 char. max.) "; DFN$
```

```
IF LEN(DFN$) > 6 THEN GOTO START

'--------------------------------------------------------------------

DO

 LOCATE 7, 1

 INPUT "Enter Drive to Store Date (A,B, or C)"; DN$

 DN$ = UCASE$(DN$)

LOOP UNTIL DN$ = "A" OR DN$ = "B" OR DN$ = "C"

 DN$ = DN$ + ":\"

LOCATE 9, 1

   INPUT "Enter Run Number (0-99) "; lopcont%

   CLS

GOSUB Title
'--------------------------------------------------------------------

OPEN "FCLC.set" FOR INPUT AS #1

        INPUT #1, fdp%            'First data point of slope
        INPUT #1, ldp%            'Last data point of slope
        INPUT #1, ymin%           'Y axis minimum value
        INPUT #1, ymax%           'Y axis maxium value
CLOSE 1

IF ymin% >= 0 THEN ymid = (ymax% - ymin%) / 2
IF ymin% < 0 THEN ymid = (ymax% + ymin%) / 2


LOCATE 9, 1
INPUT "Enter MLVSS in gm. "; MLVSS

DO

  LOCATE 11, 40
  PRINT "           "
  LOCATE 12, 49
  PRINT "       "
  LOCATE 13, 1
  PRINT "                              "
  LOCATE 14, 1
  PRINT "                              "

LOCATE 11, 1
INPUT "Enter the Hour of the day (24 hour clock). "; hh$
```

```
IF LEN(DFN$) > 6 THEN GOTO START

'----------------------------------------------------------------------------

DO

 LOCATE 7, 1

 INPUT "Enter Drive to Store Date (A,B, or C)"; DN$

 DN$ = UCASE$(DN$)

LOOP UNTIL DN$ = "A" OR DN$ = "B" OR DN$ = "C"

 DN$ = DN$ + ":\"

LOCATE 9, 1

   INPUT "Enter Run Number (0-99) "; lopcont%

   CLS

GOSUB Title
'----------------------------------------------------------------------------

 OPEN "FCLC.set" FOR INPUT AS #1

        INPUT #1, fdp%          'First data point of slope
        INPUT #1, ldp%          'Last data point of slope
        INPUT #1, ymin%         'Y axis minimum value
        INPUT #1, ymax%         'Y axis maxium value
 CLOSE 1

 IF ymin% >= 0 THEN ymid = (ymax% - ymin%) / 2
 IF ymin% < 0 THEN ymid = (ymax% + ymin%) / 2


 LOCATE 9, 1
 INPUT "Enter MLVSS in gm. "; MLVSS

DO

   LOCATE 11, 40
   PRINT "           "
   LOCATE 12, 49
   PRINT "       "
   LOCATE 13, 1
   PRINT "                              "
   LOCATE 14, 1
   PRINT "                               "

 LOCATE 11, 1
 INPUT "Enter the Hour of the day (24 hour clock). "; hh$
```

```
        LOCATE 12, 1
        INPUT "Enter the Minutes of the day (24 hour clock). "; mm$

        TIME$ = hh$ + ":" + mm$ + ":00"


          LOCATE 16, 40
          PRINT "              "
          LOCATE 17, 49
          PRINT "       "
          LOCATE 18, 1
          PRINT "                               "
          LOCATE 19, 1
          PRINT "                                "
          LOCATE 20, 1
          PRINT "                                                   "
          LOCATE 21, 1
          PRINT "                                                   "
          LOCATE 22, 1
          PRINT "                                                   "
          LOCATE 23, 1
          PRINT "                                                   "

        LOCATE 16, 1
        INPUT "Enter the Day "; DD$
        LOCATE 17, 1
        INPUT "Enter the Month "; MO$
        LOCATE 18, 1
        INPUT "Enter the Year (90) "; YY$


        TIME$ = hh$ + ":" + mm$ + ":00"
        DATE$ = MO$ + "/" + DD$ + "/" + YY$

       DO
        LOCATE 20, 1
        PRINT "Time = "; TIME$
        PRINT "Date = "; DATE$

        LOCATE 23, 1
        PRINT "Is this time correct (Y/N) ?"
        yn$ = INKEY$


        yn$ = UCASE$(yn$)

       LOOP UNTIL yn$ = "N" OR yn$ = "Y"

      LOOP UNTIL yn$ = "Y"
'-----------------------------------------------------------------------------

PORT:   LOCATE 19, 1

        INPUT "Enter COM PORT (1 or 2) "; cp$

         cp$ = LEFT$(cp$, 1)
```

```
        IF (cp$ = "1" OR cp$ = "2") THEN GOTO OP

        GOTO PORT

OP:     OP$ = "COM" + cp$ + ":1200,n,8,1,CS,DS,CD"

        OPEN OP$ FOR RANDOM AS #1

        'lopcont% = 0

        CLS

        ck% = 0

'----------------------------------------------------------------------------

        LOCATE 3, 1
        PRINT "Sending STARTT command to DO2 System"
        GOSUB SENTSTART


'----------------------------------------------------------------------------


        GOSUB empty              'Clear Serial Buffer


        CLS

        runcount% = 0

nextloop:


        st$ = TIME$

        IF runcount% = 0 THEN GOSUB GRAPH
        runcount% = 1

        HOURS% = VAL(MID$(TIME$, 1, 2))
        MINS% = VAL(MID$(TIME$, 4, 2))
        SECS% = VAL(MID$(TIME$, 7, 2))

        lopcont$ = STR$(lopcont%)
        lopcont$ = RIGHT$(lopcont$, LEN(lopcont$) - 1)

        LOCATE 1, 30
        PRINT "DO2 CONTROL SYSTEM"
        LOCATE 3, 59
        PRINT "START TIME "; st$
        LOCATE 3, 1
        PRINT "Data will be Stored on drive - " + DN$ + DFN$ + lopcont$ + ".PRN"
        LOCATE 5, 1
        PRINT "Press [Esc] to STOP/CONTINUE Test after this run. "


'----------------------------------------------------------------------------
'
'                          Main Loop
'
```

```
'
'-------------------------------------------------------------------------

        'IF lopcont% > 0 THEN GOSUB slope

     DO

        GOSUB TMCAL       'Calulate run time
        GOSUB ptime       'Print present, run, start, time.

     LOOP UNTIL LOC(1) > 100

        GOSUB retrieve            'Retrieve data and store to disk
        GOSUB slope               'CALULATE THE SLOPE OF GRAPH

        GOSUB SENTSTART
        GOTO nextloop
'--------------------------------------------------------------------------

empty:

        DO WHILE LOC(1) > 0
                INPUT #1, garbage$
        LOOP

        RETURN
'--------------------------------------------------------------------------

delay:
        t = TIMER + .5
delay1: IF TIMER > t THEN RETURN
        GOTO delay1

getdo:
                GOSUB getdata
                do2% = VAL(do$)
                RETURN
'--------------------------------------------------------------------------

gettemp:
                GOSUB getdata
                d$ = (MID$(do$, 4, 1))
                GOSUB getdec
                fd% = rd%
                d$ = (MID$(do$, 3, 1))
                GOSUB getdec
                sd% = rd% * 16
                temp% = fd% + sd%
                RETURN
'--------------------------------------------------------------------------

getdec:
```

```
        IF d$ = "A" THEN rd% = 10
        IF d$ = "B" THEN rd% = 11
        IF d$ = "C" THEN rd% = 12
        IF d$ = "D" THEN rd% = 13
        IF d$ = "E" THEN rd% = 14
        IF d$ = "F" THEN rd% = 15
        IF d$ = "9" THEN rd% = 9
        IF d$ = "8" THEN rd% = 8
        IF d$ = "7" THEN rd% = 7
        IF d$ = "6" THEN rd% = 6
        IF d$ = "5" THEN rd% = 5
        IF d$ = "4" THEN rd% = 4
        IF d$ = "3" THEN rd% = 3
        IF d$ = "2" THEN rd% = 2
        IF d$ = "1" THEN rd% = 1
        IF d$ = "0" THEN rd% = 0

        RETURN
'----------------------------------------------------------------------------

getdata:

        do$ = ""
        DO
           dat$ = INPUT$(1, 1)
           do$ = do$ + dat$

        LOOP UNTIL dat$ = CHR$(13)

        lf$ = INPUT$(1, 1)

        RETURN
'----------------------------------------------------------------------------

quit:   END


slope:

    n% = (ldp% - fdp%)

    FOR sl% = 1 TO 2

     s3 = 0
     s4 = 0
     s7 = 0
     s8 = 0
     s9 = 0
     t2 = 0
     t3 = 0
     t4 = 0

     XTIME = 0
     YTIME = 0


     IF sl% = 2 THEN
```

```
                    fdp% = fdp% + 30
                    ldp% = ldp% + 30

        END IF
'-------------------------------------------------------------------------

'           Shift Data Into New Array

'-------------------------------------------------------------------------


        FOR MOVEARRAY% = fdp% TO ldp%
                    shdat2(MOVEARRAY% - fdp%) = dat2(MOVEARRAY%)
                    'LPRINT MOVEARRAY% - fdp%; shdat2(MOVEARRAY% - fdp%)
        NEXT MOVEARRAY%


'-------------------------------------------------------------------------


       FOR i% = 0 TO n% - 1

                IF sl% = 1 THEN XTIME = i% * 20
                IF sl% = 2 THEN XTIME = (i% - 30) * 10
                YTIME = shdat2(i%)
                s3 = s3 + XTIME
                s4 = s4 + (XTIME ^ 2)
                s7 = s7 + YTIME
                s8 = s8 + (YTIME ^ 2)
                s9 = s9 + (XTIME * YTIME)

       NEXT i%



        IF sl% = 2 THEN
                    fdp% = fdp% - 30
                    ldp% = ldp% - 30

        END IF

       t2 = ABS(s4 - (s3 ^ 2) / n%)
       t3 = ABS(s9 - (s3 * s7) / n%)
       t4 = ABS(s8 - (s7 ^ 2) / n%)

       IF sl% = 1 THEN

                SLOPE1 = t3 / t2
                CORRCOFF1 = t3 / (SQR(t2 * t4))

       END IF

       IF sl% = 2 THEN

                SLOPE2 = t3 / t2
                CORRCOFF2 = t3 / (SQR(t2 * t4))
```

```
END IF

NEXT sl%

SpOUR = (((SLOPE2 * 2.5) - SLOPE1) * 3600) / MLVSS

tt$ = MID$(TIME$, 1, 2) + MID$(TIME$, 4, 2) + MID$(TIME$, 7, 2)
dt$ = MID$(DATE$, 1, 2) + MID$(DATE$, 4, 2) + MID$(DATE$, 9, 2)

OPEN DN$ + DFN$ + ".COF" FOR APPEND AS #2

 PRINT #2, SLOPE1; CORRCOFF1; SLOPE2; CORRCOFF2; SpOUR; " "; tt$; " "; dt

CLOSE 2

LOCATE 9, 10
PRINT "SLOPE1 = "; SLOPE1;
LOCATE 11, 10
PRINT "SLOPE2 = "; SLOPE2
LOCATE 10, 10
PRINT "CORRELATION COEFFICIENT 1  = "; CORRCOFF1
LOCATE 12, 10
PRINT "CORRELATION COEFFICIENT 2  = "; CORRCOFF2

FOR FIFO% = 0 TO 19
                      SpOUR(FIFO%) = SpOUR(FIFO% + 1)
NEXT FIFO%

SpOUR(20) = SpOUR

RUNNUM% = RUNNUM% + 1

 IF stopflag% = 1 THEN
                  CLOSE
                 END
 END IF

GOSUB NEWGRAPH

RETURN
'-----------------------------------------------------------------------------

GRAPH:

 VIEW (50, 100)-(638, 190), , 1
 WINDOW (0, ymin%)-(20, ymax%)

 FOR x = 1 TO 19
 LINE (x, ymin%)-(x, ymax%)
 NEXT x

 LOCATE 13, 1
```

```
        PRINT ymax%;
        LOCATE 24, 1
        PRINT ymin%;
        LOCATE 19, 1
        PRINT ymid;

        LOCATE 25, 37
        PRINT "SpOUR = "; SpOUR;

        FOR x = 1 TO 20
        LINE ((x - 1), SpOUR(x - 1))-(x, SpOUR(x))
        NEXT x

        LINE (0, ymid)-(20, ymid)

        RETURN
'------------------------------------------------------------------------

delay2:
        RETURN
        t1 = TIMER + .1

        DO
        LOOP UNTIL TIMER > t1
        RETURN
'------------------------------------------------------------------------


NEWGRAPH:

        CLS
        GOSUB GRAPH

        RETURN
'------------------------------------------------------------------------


TMCAL:
        TN$ = TIME$
        HOUR% = VAL(MID$(TN$, 1, 2))
        MIN% = VAL(MID$(TN$, 4, 2))
        SEC% = VAL(MID$(TN$, 7, 2))

        IF SEC% < SECS% THEN
                        SEC% = SEC% + 60
                        MIN% = MIN% - 1
        END IF

        TSEC% = SEC% - SECS%

        IF TSEC% < 10 THEN
                       TSEC$ = RIGHT$(STR$(TSEC%), 1)
                       TSEC$ = "0" + TSEC$
        END IF

        IF TSEC% >= 10 THEN
```

```
                TSEC$ = RIGHT$(STR$(TSEC%), 2)
        END IF


        IF MIN% < MINS% THEN
                MIN% = MIN% + 60
                HOUR% = HOUR% - 1
        END IF

        TMIN% = MIN% - MINS%
        IF TMIN% < 10 THEN
                TMIN$ = RIGHT$(STR$(TMIN%), 1)
                TMIN$ = "0" + TMIN$
        END IF

        IF TMIN% >= 10 THEN

                TMIN$ = RIGHT$(STR$(TMIN%), 2)
        END IF


        IF HOUR% < HOURS% THEN
                HOUR% = HOUR% + 24
        END IF
        THOUR% = HOUR% - HOURS%

        IF THOUR% < 10 THEN
                THOUR$ = RIGHT$(STR$(THOUR%), 1)
                THOUR$ = "0" + THOUR$
        END IF

        IF THOUR% >= 10 THEN

                THOUR$ = RIGHT$(STR$(THOUR%), 2)
        END IF

        RETURN
'--------------------------------------------------------------------------

ptime:
        LOCATE 2, 57
        PRINT "PRESENT TIME "; TIME$
        LOCATE 4, 61
        PRINT "RUN TIME "; THOUR$; ":"; TMIN$; ":"; TSEC$;

        IF INKEY$ = CHR$(27) THEN

                IF stopflag% = 0 THEN

                        stopflag% = 1
                        LOCATE 7, 1
                        PRINT "Test will STOP after this run.     "
                        GOTO GETOUT
                END IF

                IF stopflag% = 1 THEN

                        stopflag% = 0
                        LOCATE 7, 1
```

```
                              PRINT "Test will CONTINUE after this run. "
                    END IF

GETOUT:  END IF

         RETURN
'----------------------------------------------------------------------------

retrieve:

        LOCATE 8, 1
        PRINT "Data Are Now Being Transmitted"
        lopcont$ = STR$(lopcont%)
        lopcont$ = RIGHT$(lopcont$, LEN(lopcont$) - 1)

        OPEN DN$ + DFN$ + lopcont$ + ".PRN" FOR OUTPUT AS #2

        lopcont% = lopcont% + 1


indata:
        FOR count% = 1 TO 60
        GOSUB getdo
        do2%(count%) = do2%
        NEXT count%

        FOR count% = 1 TO 60
        GOSUB gettemp
        temp%(count%) = temp%
        NEXT count%

        FOR count% = 1 TO 60
        PRINT #2, do2%(count%); temp%(count%)

        dat2(count%) = do2%(count%) / 666   'Convert to DO2 Value

        NEXT count%

        CLOSE 2

        LOCATE 8, 1
        PRINT "                                          "



        RETURN
'----------------------------------------------------------------------------

SENTSTART:

        sentti = TIMER + 20
```

```
TRY:    CM$ = "STARTT"
        IF TIMER > sentti THEN
                        CLS
                        LOCATE 1, 1
                        PRINT "Communications Error!"
                        LOCATE 3, 1
                        PRINT "DO2 System NOT Responding"
                        LOCATE 5, 1
                        PRINT "Check Connections and Rerun Program"
                        END

        END IF

        FOR h% = 1 TO 6

        PRINT #1, MID$(CM$, h%, 1);

        GOSUB delay

        IF LOC(1) > 0 AND h% <> 6 THEN

                a$ = INPUT$(LOC(1), 1)

                'PRINT a$

                GOTO TRY
        END IF

        NEXT h%

                tout% = 0
        DO
                tout% = tout% + 1

                IF tout% > 30 THEN GOTO TRY

        LOOP UNTIL LOC(1) > 1

                a$ = INPUT$(LOC(1), 1)

                'PRINT a$
                IF LEFT$(a$, 2) = "ER" THEN GOTO TRY

        RETURN
'---------------------------------------------------------------------------

erlist:
        OPEN "A:ERROR.LST" FOR APPEND AS #4


            PRINT #4, "Error number "; ERR; " on line number "; ERL

        CLOSE 4


        RESUME NEXT

'---------------------------------------------------------------------------
```

```
Title:
        LOCATE 1, 25
        PRINT "DO2 Data System"
        LOCATE 3, 20
        PRINT "Version 4.6 Date Sept. 10 / 90"
        RETURN

'-------------------------------------------------------------------------------
```

Appendix B : DO2VER13.C program.

```
/*      Date Nov.17/89

        This program loops until the value of the A/D converter is greater
        than 1000 hex (1.000 volts). Once this value is => the program
        will drop out.

        ad(1) is a function that starts the A/D converter and returns the
        a/d value.
*/
#asm
        ORG $FFE4
        FDB timeirq
        ORG $FFFE
        FDB main

        ORG $0100
#endasm


int doarray[30];    /*      DO2 array                          */
int doaray[30];

int temparray[30];  /*      Temperature array                  */
int tmparay[30];

int rsarray[5];     /*      RS232 input array                  */
int *dopnt;         /*      DO2 array data pointer             */
int *dopnt1;

int *temppnt;       /*      tempurature array data pointer     */
int *tmppnt1;

int *cmpnt;         /*      command array buffer pointer       */
int *rspnt;         /*      RS232 array buffer pointer         */

int a2dtemp;        /*      temp loaction for DO2 reading      */
int a2dtemp1;       /*      temp location fo DO2 reading       */
int bufcount=125;   /*      data buffer size                   */

int sec;            /*      total second counter               */
int nib;            /*      nib = 25 m. sec.                   */
int min;            /*      one minuite counter                */
int tsec;           /*      one second counter                 */
int rscount;        /*      data buffer counter                */
int tempirqflag;    /*      temperature interrupt flag         */
int data;           /*      Command data OK or NOT
int ccount;         /*      Communications Counter             */
int comnum;         /*      Command Number                     */
int EOSpnt;         /*      End Of String pointer              */
int fillcount;      /*      cylinder level timeout conter      */
int x;

#asm
        ORG $E000
#endasm

char comarray[ ]="STARTTSTOPTNSENTDATESTSY##";    /*      command array buffe
*/ char EOS[ ]="##";

/*
```

```
#include icl7135b.lib          A/D converter (5 1/2 digs.) for the DO2 probe
#include setmotor.lib          Turn motors on and off
#include setac.lib             Turn solenoids on and off
#include 8bita2d.lib           A/D converter (8 bit) for the temp probe
#include readlev.lib           Read the  water level probes
#include delayc.lib            Delay by X second
#include timeirq.lib           Timer Interrupt (Every 25 m. sec.)
#include setport.lib           Set I/O ports
#include setirq.lib            Set interrupts
#include 8bita2d.lib           Internal 8 bit A/D routine
#include readrs23.lib          Check for start command from host
#include strngcom.lib          String compare
*/

#include timeirq.lib
#include setport.lib
#include setirq.lib
#include icl7135b.lib
#include delayc.lib
#include sentrs23.lib
#include 8bita2d.lib
#include setac.lib
#include setmotor.lib
#include readlev.lib
#include readrs23.lib
#include strngcom.lib

main()
{

#asm
        lds #$FF        Set stack pointer to HEX FF
#endasm

        setport(1);
        setirq(1);
        sampoff(1);
do
  {
  }while(a2d(1)!=0);
do
  {

dopnt=&doarray[0];
dopntl=&doaray[0];

temppnt=&temparray[0];
tmppntl=&tmparay[0];

cmpnt=&comarray[0];

        tempirqflag=0;
        rscount=0;
        motoron(2);
  do
    {
    }while(checkcom(1)!=1);       /* wait for STARTT command from host */

    acon(3);
    delay(10);
```

```
    acoff(3);
    acon(1);

    do
      {
      }while(readlev(1)==0);

    acoff(1);
    motoron(1);
    acon(4);
    delay(240);
    acoff(4);

    do
      {
        *dopnt=ad(1);
        dopnt++;
        *temppnt=a2d(1);
        temppnt++;
        rscount++;
        delay(20);
      }while(rscount<30);

    acon(2);
    sampon(1);                    /* sampler on and off */
    delay(1);
    sampoff(1);

    do
      {
       fillcount++;
       delay(1);

    /* if(fillcount>120) , program to be written yet  */

      }while(readlev(1)<=1);

    acoff(2);
    acon(4);
    delay(240);
    acoff(4);

    rscount=0;

    do
      {
       *dopntl=ad(1);
       dopntl++;
       *tmppntl=a2d(1);
       tmppntl++;
       rscount++;
       delay(10);

      }while(rscount<30);

        motoroff(1);
        acon(3);
        sent(1);
}while(x==x);
```

Appendix C

Procedure for Changing Auto-Sampler Sample Container

When the sampler has taken 24 samples (in about 10 hours) the auto-sampler will stop function until a new sample container is installed. The procedure for changing the sample container is listed as follows:

1. If a continuation of sampling is required -

   Press *off* when SpOUR unit is on RAS endogenous respiration testing. The full sample container is replaced with a new one. Then press *on* , *chang/halt* *start program* .

   Screen will ask *"Resume? or Start?"*

   Press *start*

   Screen will show *"Seeking bottle #1"* while sample spout looks for bottle number 1. When bottle number 1 is found the sampler will automatically resume the sampling as programmed.

2. A stop is required to do maintenance -

   When computer is still doing the SpOUR test, press *ESC* on the keyboard of computer and press *off* on the autosampler. To resume testing, type in *DO2CON46* and repeat the starting procedure.

Instruction on Programming the American Sigma Streamline

Auto-sampler

1. To enter new programme:

The command in bold should be keyed in, the sentences in italics are the responses from the auto-sampler on the 16 character alpha-numeric display.

	ON	Activate the auto-sampler
	NEW PROGRAM	Tells the sampler new programme is to be entered
Programme Delay?	**NO**	Do you want to delay start of the sampling
Timed Mode?	**NO**	Do you want to sample on a timed cycle
Flow Mode?	**YES**	Do you want to sample on a flow proportional basis
Total Count =	**1 ENTER**	Enter 1 contact closure for each sampling
Discrete Mode?	**YES**	Will deliver samples into 24 sequential (discrete) bottles
Samples / Bottle?	**YES**	Ask the total number of samples per bottle
Sample / Bottle=	**1 ENTER**	Will deposit 1 sample per bottle
Sample Volume=	**999 ENTER**	Indicate desire volume of sample maximum 999mL. The actual volume can be adjusted by calibration.
Calibrate Volume?	**YES**	Ask if a calibration of volume to be delivered is needed
Timed Calibrate?	**YES**	Use time calibrate for better accuracy

Ready to Start?	**YES**	Ask if ready to start time calibration
Pre-Purge		Pump starts to purge sample line
Stop at Mark		After purging, sampler pump start drawing sample and you are asked to press stop when desired quantity of sample is obtained
Post Purge		Purge line after finishes sampling
Do That Again?	**NO**	Ask if you want to calibrate again
Set up Complete, Ready to Start	**START PROGRAM**	Tell sampler to start the program
Seeking Bottle #1		The sampler is seeking for bottle #1 location
At bottle #1, Program Started		The sampler is activated and will start for the 1 pulse count signal from the computer to start sampling
2. To Review:		The 16-character Alpha-Numeric display will review the program

APPENDIX

SpOUR Apparatus and 68HC11F1 Micro-Controller Unit (MCU)Softwares Setup

1. Files needed to Assemble and Download Software:

a.	SMC11.EXE	Small C Compiler
b.	OPT11.EXE	HC11 Optimizer
c.	C11LIB.TXT	HC11 Library File
d.	C11.BAT	Batch file to compile software and create .S19 file to be sent to HC11
e.	EELOAD3.EXE	Download software to HC11
f.	E1PROGIX.BIN	HC11 downloading programme
g.	DO2VER13.S19	DO2 software to be loaded into HC11

2. Files required by 68HC11F1 MCU

Main C Programme

a.	DO2VER13.C	Main Control Programme

Library Files

a.	READLEV.LIB	Read Fluid Level and Return a value
b.	TIMEIRQ.LIB	Timer interrupt (every 25msec.)
c.	SETAC.LIB	Turn AC solenoids on and off
d.	SETIRQ.LIB	Set interrupts
e.	ICL7135B.LIB	A/D converter (5 1/2 digs.) DO2 reading
f.	DELAYC.LIB	Delay by X seconds
g.	READRS23.LIB	Check for command from host PC
h.	8BITA2D.LIB	Function to read HC11 internal 8 bit A/D
i.	SETMOTOR.LIB	Turns motors on or off
j.	STRNGCOM.LIB	String compare routine
k.	SETPORT.LIB	Set I/O port as in or out
l.	SENTRS23.LIB	Sent data to host PC

3. Example Procedure

<u>C:\HC11>C11 DO2VER13 [ENTER]</u>

```
C:\HC11>SMC11 <DO2VER13.C > DO2VER13.ASM

C:\HC11>OPT11 <DO2VER13 >DO2VER13.OPT

C:\HC11>TYPE C11LIB.TXT >>DO2VER13OPT

C:\HC11>AS11 DO2VER13.OPT -L >Do2VER13.LST

C:\HC11>FIND ":" DO2VER13.LST
```

All JMP and JSR labels will be listed on screen

APPENDIX

Down Loading Instructions

1. Unplug power from SpOUR apparatus system.
2. Disconnect RS232 cable from SpOUR apparatus system.
3. Connect down loading cable to end of RS232 cable.
4. Reconnect RS232 cable, now with down loading cable installed.
5. Plug power cord of apparatus back into AC outlet.
6. Type <u>EELOAD3 [ENTER]</u>

   Follow instructions of software. Data will be echoed back from HC11 to host PC to indicate that software is being loaded.
7. Once software has been loaded, unplug power from apparatus.
8. Disconnect RS232 cable from apparatus.
9. Disconnect down loading cable from end of RS232 cable.
10. Reconnect RS232 cable, now with down loading cable not installed.
11. Plug power of apparatus back into AC outlet.
12. Type <u>DO2CON46 [ENTER]</u>
    Follow instructions of software.

Appendix F. Example of Raw Data File for DO and Temperature

(a)	(b)
5960	112
5960	112
5907	111
5827	111
5741	112
5657	112
5571	112
5485	112
5390	112
5300	112
5217	112
5136	112
5057	112
4980	112
4899	112
4821	112
4750	112
4675	112
4604	112
4531	112
4460	112
4390	112
4320	112
4251	112
4188	112
4125	112
4066	112
4003	112
3937	112
3872	112

(a)	(b)
5492	112
5512	112
5503	111
5465	111
5409	111
5341	112
5269	111
5196	112
5122	112
5045	112
4965	111
4883	111
4802	112
4719	112
4643	111
4564	111
4488	111
4415	111
4341	111
4263	112
4182	112
4102	112
4027	112
3947	112
3864	112
3787	112
3714	112
3636	111
3561	111
3488	111

(a) = Raw DO readings as bits
(b) = Raw temperature readings as bits

Appendix G. Example of Daily Summary File.

OUR1 mg O2/sec	coef corr	OUR2 mg O2/sec	coef corr	SpOUR mg O2/(g.h)	Time
2.47203E-03	1.00011	6.524482E-03	.9997854	31.13814	120029 071490
7.981161E-03	.9806876	1.355798E-02	.9996579	58.30603	122443 071490
9.800267E-03	.9999862	1.161766E-02	.999869	43.29876	124852 071490
6.814533E-03	.99931	1.075887E-02	.9995423	45.18596	131303 071490
6.810882E-03	.9996933	5.405299E-03	.998959	15.08033	133716 071490
6.688052E-03	.9994209	1.471754E-02	.9997836	67.73805	140127 071490
6.645747E-03	.9997336	1.032719E-02	.9992605	43.13753	142539 071490
6.742637E-03	.9992051	1.051289E-02	.9990127	43.96407	144952 071490
6.863691E-03	.999436	1.967414E-02	.9992275	95.22375	151420 071490
7.026593E-03	.9996482	1.675521E-02	.9995108	78.43823	153833 071490
6.907824E-03	.9996939	1.113657E-02	.999029	47.1006	160316 071490
6.423689E-03	.9996299	1.154138E-02	.9995189	50.46695	162727 071490
6.636173E-03	.9995729	.0188244	.9995794	90.95586	165154 071490
6.585699E-03	.9997645	1.181716E-02	.9998962	51.65369	171607 071490
6.586153E-03	.999831	1.515248E-02	.999254	70.41383	174015 071490
7.19766E-03	.9997545	1.097871E-02	.9993596	45.5605	180428 071490
6.48011E-03	.9997144	1.048659E-02	.9993951	44.40684	212221 071490
8.577206E-03	.9999132	1.209863E-02	.9992802	48.75608	214647 071490
6.979696E-03	.9998776	1.189004E-02	.9994451	51.17715	221118 071490
6.611151E-03	.9999136	1.113837E-02	.9993692	47.77826	223531 071490
6.922834E-03	.9997998	1.126855E-02	.999137	47.8092	225945 071490
6.860025E-03	.9998245	1.120304E-02	.9992746	47.58205	232358 071490
7.092542E-03	.9996156	1.134378E-02	.9995661	47.85054	234811 071490
6.240312E-03	.9998176	1.149477E-02	.9993253	50.61737	001239 071590
7.137573E-03	.9997427	1.138918E-02	.9992692	48.00458	003652 071590
7.171728E-03	.9998317	1.990522E-02	.9996423	95.83044	010105 071590
7.072523E-03	.999618	2.114803E-02	.9993745	103.0445	012517 071590
7.109838E-03	.9999182	1.240702E-02	.9998521	53.79235	014930 071590
7.125773E-03	.9998146	.0117229	.9994834	49.90833	021343 071590
7.178996E-03	.9999238	1.135844E-02	.9992037	47.73848	023757 071590
7.05616E-03	1.000006	1.070521E-02	.9991485	44.34043	030212 071590
7.062525E-03	.999885	1.095833E-02	.999074	45.74993	032627 071590
6.981079E-03	.9998636	1.024812E-02	.9992367	41.93825	035043 071590
7.056138E-03	.9999381	1.055573E-02	.999099	43.49966	041459 071590
6.997894E-03	.9999341	1.013157E-02	.99878	41.24483	043916 071590
6.416861E-03	.99998	1.008573E-02	.9992093	42.29432	050334 071590
6.736738E-03	.9999966	1.003612E-02	.9990696	41.29552	052753 071590
6.717632E-03	.9999828	1.010557E-02	.9992425	41.72917	055211 071590
6.465106E-03	1.000002	9.794311E-03	.9991225	40.54651	061630 071590
6.486909E-03	.9999322	9.770817E-03	.9994349	40.3653	064049 071590
6.363175E-03	.9999745	9.784228E-03	.9994091	40.71914	070506 071590
6.188467E-03	.9999654	9.255498E-03	.9994735	38.13812	072925 071590

Appendix H. Raw Data for Monitoring Period Jun28 to Sept.1

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1	8.88E-03	0.793	1.06E-02	1.000	35.30	203004	62890
2	6.45E-03	1.000	1.16E-02	0.999	45.23	210252	62890
3	5.84E-03	1.000	1.12E-02	1.000	44.48	212738	62890
4	5.72E-03	1.000	9.08E-03	1.000	33.98	215429	62890
5	5.53E-03	1.000	9.35E-03	1.000	35.70	222011	62890
6	5.35E-03	1.000	9.29E-03	0.999	35.76	224423	62890
7	7.97E-03	1.000	1.18E-02	1.000	43.08	230841	62890
8	9.03E-03	1.000	1.30E-02	0.999	47.02	233300	62890
9	8.54E-03	1.000	1.19E-02	0.999	42.51	235718	62890
10	8.69E-03	1.000	1.14E-02	0.999	39.49	2133	62990
11	8.54E-03	1.000	1.19E-02	0.999	42.33	4551	62990
12	8.48E-03	1.000	1.46E-02	0.999	58.23	11017	62990
13	8.20E-03	1.000	1.22E-02	0.999	44.60	13429	62990
14	8.13E-03	1.000	1.33E-02	0.929	50.27	15848	62990
15	7.82E-03	1.000	1.16E-02	0.999	42.37	22300	62990
16	8.34E-03	1.000	1.37E-02	0.999	51.63	24709	62990
17	7.52E-03	1.000	1.23E-02	0.999	46.24	31131	62990
18	8.30E-03	1.000	1.29E-02	0.999	47.85	33542	62990
19	7.46E-03	1.000	1.12E-02	[illegible]	40.89	35951	62990
20	6.97E-03	[illegible]	[illegible]	[illegible]	[illegible]	42408	62990
21	7.09E-03	[illegible]	[illegible]	[illegible]	[illegible]	44819	62990
22	6.55E-03	1.000	[illegible]	[illegible]	[illegible]	51234	62990
23	6.64E-03	1.000	[illegible]	[illegible]	[illegible]	53656	62990
24	6.26E-03	1.000	[illegible]	[illegible]	[illegible]	60109	62990
25	6.18E-03	[illegible]	[illegible]	[illegible]	[illegible]	62529	62990
26							
27	6.13E-03	1.000	[illegible]	[illegible]	33.23	73459	62990
28	5.72E-03	1.000	[illegible]	0.999	42.96	75918	62990
29	7.77E-03	0.997	9.98E-03	1.000	34.38	82332	62990
30	5.45E-03	1.000	1.12E-02	0.999	45.03	84749	62990
31	5.69E-03	1.000	1.06E-02	0.999	41.75	91204	62990
32	5.45E-03	1.000	7.90E-03	1.000	29.08	93633	62990
33	5.52E-03	1.000	1.11E-02	0.999	44.36	100045	62990
34	5.57E-03	1.000	1.13E-02	0.999	45.16	102502	62990
35	5.45E-03	1.000	1.07E-02	0.999	42.79	104912	62990
36	5.29E-03	1.000	1.08E-02	0.999	43.22	111322	62990
37	5.40E-03	1.000	1.11E-02	0.999	44.81	113733	62990
38	7.72E-03	1.000	1.14E-02	0.999	41.77	120141	62990
39	2.78E-06	0.553	3.56E-06	0.889	0.12	122550	62990
40	5.69E-06	0.929	1.91E-06	0.798	-0.02	125018	62990
41	4.73E-05	0.910	8.07E-10	0.002	-0.09	131431	62990
42	2.32E-06	0.807	2.18E-06	0.853	0.06	133839	62990
43	7.35E-03	1.000	1.47E-02	0.999	58.79	140315	62990
44	7.77E-03	1.000	1.32E-02	0.999	50.42	142725	62990
45	7.98E-03	1.000	1.42E-02	0.999	54.90	145154	62990
46	8.02E-03	1.000	1.83E-02	0.999	86.28	151619	62990
47	7.87E-03	1.000	1.47E-02	0.999	57.88	154064	62990
48	8.14E-03	1.000	1.48E-02	0.999	57.98	160519	62990
49	7.82E-03	1.000	1.59E-02	0.999	63.90	162927	62990
50	7.72E-03	1.000	1.62E-02	0.999	65.60	165347	62990
51	7.71E-03	1.000	1.49E-02	0.999	58.92	171603	62990
52	7.89E-03	1.000	1.46E-02	0.999	57.81	174211	62990
53	7.75E-03	1.000	1.50E-02	0.999	59.69	180628	62990
54	7.42E-03	1.000	1.46E-02	0.999	58.11	183036	62990
55	7.19E-03	1.000	1.46E-02	0.999	58.56	185444	62990
56	9.61E-03	1.000	1.39E-02	0.999	50.23	191855	62990
57	8.62E-03	0.982	1.47E-02	0.999	56.41	194317	62990
58	8.64E-03	1.000	1.39E-02	0.999	56.28	200724	62990
59	6.33E-03	1.000	1.43E-02	0.999	58.63	203139	62990
60	6.32E-03	1.000	1.35E-02	0.999	54.70	205647	62990
61	6.38E-03	1.000	1.39E-02	0.999	56.56	211958	62990
62	6.43E-03	1.000	1.34E-02	0.999	54.22	214407	62990
63	6.24E-03	1.000	1.39E-02	0.999	56.81	220815	62990
64	6.26E-03	0.999	1.46E-02	0.999	58.41	223234	62990
65	6.19E-03	1.000	1.66E-02	0.999	66.97	225660	62990
66	7.93E-03	1.000	1.59E-02	0.999	63.78	232053	62990
67	8.03E-03	1.000	1.50E-02	0.999	59.89	234610	62990
68	7.86E-03	1.000	1.41E-02	0.999	54.99	828	63090
69	Note 1: Solenoid #3 leaked due to debris blocking valve						
70							
71							
72							
73							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
74							
75							
76							
77							
78							
79							
80							
81							
82							
83							
84							
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91							
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93							
94	1.91E-03	0.827	4.56E-03	0.999	21.34	101233	63090
95	3.42E-03	0.999	4.13E-03	0.998	15.54	103655	63090
96	3.49E-03	1.000	4.59E-03	0.998	17.98	110132	63090
97	3.38E-03	1.000	4.15E-03	0.998	15.76	112545	63090
98	3.52E-03	1.000	4.09E-03	0.998	15.08	114967	63090
99	3.22E-03	0.999	4.57E-03	0.999	18.48	121410	63090
100	3.28E-03	0.998	5.25E-03	0.999	22.14	123819	63090
101	3.40E-03	1.000	4.94E-03	0.998	20.13	130234	63090
102	3.45E-03	0.999	6.06E-03	0.993	26.30	132652	63090
103	3.58E-03	0.999	5.98E-03	0.998	25.56	135106	63090
104	3.57E-03	1.000	5.91E-03	0.998	25.20	141521	63090
105	3.61E-03	0.999	6.17E-03	0.997	26.14	143940	63090
106	3.56E-03	0.982	6.96E-03	0.998	31.14	150349	63090
107	3.07E-03	0.971	6.79E-03	0.999	31.29	152806	63090
108	3.83E-03	0.999	6.82E-03	0.999	29.72	155217	63090
109	2.67E-03	0.963	7.43E-03	0.998	35.78	161636	63090
110	3.52E-03	0.999	7.45E-03	1.000	34.01	164065	63090
111	7.73E-05	0.859	4.80E-03	0.998	26.82	170626	63090
112	7.90E-04	0.813	5.21E-03	0.998	27.50	172964	63090
113	3.56E-03	1.000	6.32E-03	0.999	27.54	175426	63090
114	3.47E-03	1.000	7.00E-03	0.999	31.56	181845	63090
115	4.22E-04	0.982	1.20E-03	0.942	5.78	184317	63090
116	3.62E-03	1.000	6.51E-03	0.999	28.45	190740	63090
117	Note 2: DO Probe calibration						
118							
119							
120							
121	4.01E-03	0.997	4.83E-03	0.999	18.12	211248	63090
122	6.60E-03	1.000	8.58E-03	0.999	33.38	213702	63090
123	6.49E-03	1.000	7.33E-03	0.999	26.66	220119	63090
124	5.43E-03	0.974	8.21E-03	0.998	33.96	222538	63090
125	6.22E-03	1.000	7.18E-03	0.999	26.40	224960	63090
126	5.50E-03	0.990	7.56E-03	0.999	30.10	231411	63090
127	5.88E-03	1.000	7.08E-03	0.999	26.59	233826	63090
128	5.84E-03	1.000	8.92E-03	0.999	37.02	301	70190
129	5.82E-03	1.000	8.88E-03	0.999	35.74	2718	70190
130	5.73E-03	1.000	8.83E-03	0.999	36.63	5129	70190
131	5.38E-03	1.000	6.30E-03	0.970	23.39	11543	70190
132	5.58E-03	1.000	8.72E-03	0.998	36.48	14003	70190
133	5.29E-03	1.000	8.92E-03	0.999	38.29	20432	70190
134	5.22E-03	1.000	8.66E-03	0.999	36.94	22868	70190
135	Note 3. Solenoid #3 leaked						
136							
137							
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144							
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146							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
147							
148							
149	3.61E-03	1.000	4.37E-03	0.998	14.61	81936	70190
150	3.33E-03	0.999	5.21E-03	0.987	19.40	84400	70190
151	5.27E-03	0.989	4.11E-03	0.992	10.01	90825	70190
152	Note Motor #1 fuse blown						
153							
154							
155							
156							
157	3.49E-03	1.000	4.34E-03	1.000	14.73	113636	70190
158	9.75E-04	0.980	1.48E-03	0.991	5.48	115950	70190
159	1.38E-03	0.954	4.51E-03	0.999	19.82	122404	70190
160	5.87E-03	1.000	5.82E-03	0.996	17.76	124825	70190
161	5.80E-03	1.000	5.87E-03	0.999	16.75	131240	70190
162	5.88E-03	1.000	5.42E-03	0.998	15.74	133703	70190
163	5.53E-03	1.000	5.57E-03	0.999	16.81	140122	70190
164	5.68E-03	1.000	8.28E-03	0.999	30.07	142537	70190
165	5.93E-03	1.000	7.92E-03	0.999	27.72	144958	70190
166	5.41E-03	1.000	6.71E-03	0.998	22.74	151410	70190
167	9.92E-05	0.938	6.66E-03	0.999	33.11	153830	70190
168	Note 4 DC Motor #3 overheated						
169							
170							
171							
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177							
178							
179							
180							
181	3.20E-04	1.000	5.27E-04	0.987	1.99	210853	70190
182	4.57E-03	0.994	6.70E-03	0.999	24.38	213317	70190
183	3.70E-03	1.000	6.42E-03	0.999	24.69	215741	70190
184	3.48E-03	1.000	6.41E-03	0.998	25.08	222158	70190
185	4.27E-03	0.996	7.08E-03	0.999	26.74	224812	70190
186	4.02E-03	1.000	6.03E-03	0.999	22.10	231025	70190
187	3.58E-03	1.000	5.63E-03	0.999	20.97	233439	70190
188	3.89E-03	1.000	5.14E-03	0.998	17.90	235847	70190
189	Note 5 Unit sent to U of A for motor repair						
190	(July 2-4)						
191							
192							
193	1.19E-02	1.000	1.73E-02	1.000	40.36	102412	70590
194	1.05E-02	0.999	1.50E-02	0.999	34.84	104820	70590
195	7.30E-03	1.000	1.29E-02	0.999	32.00	111228	70590
196	6.69E-03	1.000	1.62E-02	0.999	43.41	113633	70590
197	6.57E-03	1.000	1.71E-02	1.000	46.43	120039	70590
198	6.69E-03	1.000	1.22E-02	1.000	30.51	122447	70590
199	6.76E-03	1.000	2.20E-02	0.999	61.86	124907	70590
200	6.77E-03	1.000	1.99E-02	0.999	56.32	131314	70590
201	Note 6:No test due to low Raw Influent level						
202							
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212							
213	6.70E-03	1.000	1.38E-02	0.999	35.86	185606	70590
214	1.15E-02	1.000	1.32E-02	1.000	27.58	192012	70590
215	7.23E-03	1.000	9.74E-03	1.000	22.00	194418	70590
216	6.59E-03	0.999	9.30E-03	1.000	21.42	200823	70590
217	6.53E-03	1.000	8.31E-03	0.999	18.32	203227	70590
218	6.22E-03	0.999	7.60E-03	1.000	16.42	205630	70590
219	6.31E-03	1.000	7.73E-03	1.000	16.75	212036	70590

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
220	6.12E-03	1.000	7.43E-03	1.000	16.01	214441	70590
221	6.05E-03	1.000	7.83E-03	1.000	17.40	220845	70590
222	6.18E-03	0.999	8.21E-03	1.000	18.46	223308	70590
223	6.13E-03	1.000	9.15E-03	0.999	21.53	225729	70590
224	5.97E-03	1.000	9.18E-03	1.000	18.62	232134	70590
225	5.86E-03	1.000	8.14E-03	1.000	18.89	234541	70590
226	6.01E-03	1.000	8.56E-03	0.997	19.80	947	70690
227	5.82E-03	1.000	8.76E-03	0.997	20.66	3353	70690
228	Note 7:Solenoid #3 leaked						
229							
230							
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259							
260	6.29E-03	0.999	9.96E-03	0.999	27.92	134613	70690
261	6.08E-03	1.000	9.80E-03	1.000	27.64	141018	70690
262	6.11E-03	0.999	1.03E-02	1.000	29.54	143423	70690
263	6.23E-03	1.000	1.01E-02	1.000	28.70	145829	70690
264	6.36E-03	1.000	1.05E-02	1.000	29.73	152234	70690
265	6.22E-03	1.000	1.66E-02	1.000	53.06	154640	70690
266	6.35E-03	1.000	1.07E-02	0.999	30.68	161047	70690
267	6.23E-03	1.000	1.12E-02	0.999	32.69	163453	70690
268	6.28E-03	0.996	1.09E-02	0.999	31.57	165900	70690
269	6.28E-03	1.000	1.06E-02	1.000	30.47	172308	70690
270	6.21E-03	1.000	1.12E-02	1.000	32.52	174713	70690
271	6.09E-03	1.000	1.13E-02	1.000	33.12	181120	70690
272	6.20E-03	0.997	1.07E-02	0.999	30.88	183526	70690
273	6.11E-03	1.000	1.15E-02	1.000	33.66	185934	70690
274	5.46E-03	0.983	1.17E-02	0.999	35.64	192342	70690
275	6.21E-03	1.000	1.77E-02	1.000	57.16	194750	70690
276	6.34E-03	0.996	1.15E-02	0.998	33.66	201158	70690
277	6.09E-03	1.000	1.11E-02	0.999	32.41	203607	70690
278	6.43E-03	1.000	1.79E-02	1.000	57.59	210016	70690
279	6.60E-03	0.999	1.09E-02	0.997	31.03	212424	70690
280	5.61E-03	0.990	1.80E-02	1.000	58.96	214834	70690
281	7.66E-03	0.998	1.88E-02	1.000	58.40	221243	70690
282	6.23E-03	1.000	1.25E-02	0.997	37.61	223655	70690
283	5.96E-03	0.999	1.09E-02	1.000	32.07	230108	70690
284	Note 8:Auto-Sampler not calibrated						
285							
286							
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291							
292							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 26 to Sept 1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
293							
294							
295							
296							
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301							
302							
303							
304							
305							
306							
307	6.68E-03	1.000	8.03E-03	1.000	16.98	90346	70790
308	Note 9 DO Probe calibration						
309							
310							
311							
312	1.16E-02	1.000	8.91E-03	1.000	13.34	110733	70790
313	4.96E-05	1.211	9.10E-03	0.999	28.76	113149	70790
314	6.27E-03	1.000	8.66E-03	0.999	19.49	122224	70790
315	6.63E-03	1.000	1.75E-02	1.000	47.08	124636	70790
316	6.20E-03	1.000	1.03E-02	1.000	24.85	131107	70790
317	6.60E-03	1.000	1.12E-02	0.999	27.27	133640	70790
318	6.38E-03	1.000	1.02E-02	1.000	24.33	135953	70790
319	6.56E-03	1.000	1.07E-02	0.999	25.74	142430	70790
320	6.01E-03	1.000	1.08E-02	1.000	26.78	144859	70790
321	6.02E-03	1.000	1.13E-02	1.000	28.30	151337	70790
322	6.20E-03	1.000	1.11E-02	1.000	27.36	153807	70790
323	6.43E-03	1.000	1.12E-02	0.999	27.27	160238	70790
324	6.51E-03	1.000	1.61E-02	0.999	42.80	162708	70790
325	5.86E-03	1.000	1.53E-02	1.000	41.20	165124	70790
326	6.03E-03	1.000	1.11E-02	1.000	27.66	171604	70790
327	6.28E-03	1.000	1.05E-02	1.000	25.37	174040	70790
328	6.44E-03	1.000	1.04E-02	0.999	24.80	180513	70790
329	5.53E-03	1.000	1.04E-02	1.000	25.90	182943	70790
330	5.08E-03	1.000	1.31E-02	0.999	34.28	185421	70790
331	5.74E-03	1.000	1.00E-02	1.000	24.54	191903	70790
332	5.54E-03	0.999	1.00E-02	0.999	24.68	194343	70790
333	5.39E-03	0.999	1.11E-02	1.000	28.32	200870	70790
334	6.89E-03	0.969	1.14E-02	0.999	27.32	203258	70790
335	6.94E-03	1.000	1.16E-02	1.000	28.08	206727	70790
336	7.10E-03	1.000	1.16E-02	1.000	27.66	212200	70790
337	7.07E-03	1.000	1.78E-02	1.000	47.50	214836	70790
338							
339	6.95E-03	0.999	1.19E-02	0.999	28.06	224444	70790
340	7.25E-03	1.000	1.22E-02	1.000	29.59	230914	70790
341	7.00E-03	0.994	1.21E-02	1.000	29.59	233340	70790
342	6.54E-03	1.000	1.20E-02	0.999	29.86	235812	70790
343	7.08E-03	1.000	1.24E-02	0.998	30.23	2249	70890
344	6.80E-03	0.999	1.23E-02	0.999	30.47	4721	70890
345	6.43E-03	0.996	1.21E-02	0.999	30.16	11203	70890
346	6.61E-03	0.999	1.24E-02	1.000	30.50	13633	70890
347	7.08E-03	0.999	1.98E-02	0.999	53.76	20109	70890
348	6.66E-03	1.000	1.25E-02	0.998	31.09	22546	70890
349	6.82E-03	1.000	1.15E-02	1.000	28.16	25021	70890
350	6.53E-03	0.999	1.13E-02	1.000	27.68	31463	70890
351	6.53E-03	1.000	1.14E-02	0.998	27.82	33933	70890
352	6.54E-03	1.000	1.12E-02	1.000	27.29	40411	70890
353	6.34E-03	1.000	1.08E-02	0.999	26.35	42861	70890
354	6.06E-03	0.999	1.07E-02	1.000	26.14	45323	70890
355	6.14E-03	1.000	1.04E-02	0.999	25.29	51809	70890
356	6.34E-03	1.000	1.02E-02	0.999	24.17	54246	70890
357	6.72E-03	1.000	1.09E-02	1.000	25.91	60722	70890
358	6.46E-03	1.000	1.03E-02	1.000	24.30	63200	70890
359	6.62E-03	1.000	9.93E-03	1.000	23.07	65641	70890
360	7.01E-03	0.998	9.53E-03	1.000	21.31	72118	70890
361	6.43E-03	1.000	9.64E-03	1.000	22.40	74568	70890
362	6.26E-03	1.000	9.20E-03	1.000	21.23	81036	70890
363	Note 10:Maintenance (Cleanup etc.)						
364							
365							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 26 to Sept 1,1990)

Test No.	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
366							
367	6.50E-03	1.000	9.10E-03	1.000	20.88	101526	70890
368	6.42E-03	1.000	9.88E-03	1.000	23.43	104008	70890
369	6.29E-03	1.000	9.89E-03	1.000	23.71	110431	70890
370	6.98E-03	0.997	1.02E-02	1.000	23.88	112846	70890
371	6.77E-03	1.000	1.01E-02	1.000	23.82	115321	70890
372	7.40E-03	1.000	1.07E-02	0.999	24.86	121746	70890
373	6.97E-03	1.000	1.10E-02	1.000	26.43	124210	70890
374	6.85E-03	1.000	1.08E-02	1.000	26.00	130634	70890
375	7.18E-03	1.000	1.07E-02	0.999	25.01	133058	70890
376	7.03E-03	1.000	1.06E-02	1.000	25.03	135518	70890
377	7.08E-03	1.000	1.13E-02	0.999	27.30	141939	70890
378	7.15E-03	1.000	1.11E-02	1.000	26.52	144359	70890
379	7.08E-03	1.000	1.18E-02	0.999	28.67	150817	70890
380	7.17E-03	1.000	1.13E-02	0.999	27.10	153230	70890
381	7.29E-03	1.000	1.11E-02	0.999	26.29	155657	70890
382	7.10E-03	1.000	1.10E-02	1.000	26.31	162117	70890
383	7.00E-03	0.999	1.12E-02	1.000	27.06	164538	70890
384	6.59E-03	0.997	1.14E-02	1.000	28.10	171000	70890
385	6.99E-03	0.997	1.14E-02	1.000	27.68	173423	70890
386	6.99E-03	0.998	1.21E-02	1.000	29.75	175846	70890
387	6.71E-03	0.999	1.18E-02	1.000	29.30	182306	70890
388	6.58E-03	1.000	1.21E-02	1.000	30.29	184730	70890
389	6.46E-03	0.998	1.14E-02	1.000	28.43	191151	70890
390	6.62E-03	0.998	1.14E-02	1.000	28.01	193612	70890
391	6.56E-03	1.000	1.12E-02	1.000	27.53	200036	70890
392	6.77E-03	1.000	1.16E-02	1.000	28.50	202458	70890
393	6.06E-03	0.998	1.13E-02	0.999	28.43	204921	70890
394	5.43E-03	0.982	1.14E-02	1.000	29.59	211348	70890
395	5.77E-03	0.989	1.09E-02	0.998	27.58	213812	70890
396	5.60E-03	0.961	1.06E-02	1.000	26.44	220244	70890
397	5.81E-03	1.000	1.10E-02	1.000	27.75	222717	70890
398	5.49E-03	1.000	1.12E-02	0.999	28.90	225150	70890
399	5.72E-03	0.999	1.16E-02	1.000	29.92	231612	70890
400	4.30E-03	0.941	1.15E-02	0.999	31.48	234020	70890
401	5.63E-03	1.000	1.16E-02	0.999	29.92	437	70990
402	5.84E-03	1.000	1.23E-02	0.999	31.98	2852	70990
403	5.54E-03	1.000	1.20E-02	0.999	31.46	5315	70990
404	5.02E-03	1.000	1.20E-02	1.000	30.00	11733	70990
405	5.74E-03	0.998	1.15E-02	1.000	29.46	14154	70990
406	5.80E-03	0.999	1.21E-02	0.999	31.31	20601	70990
407	5.64E-03	1.000	1.13E-02	0.991	28.11	23025	70990
408	5.74E-03	1.000	1.13E-02	0.999	28.94	25446	70990
409	5.78E-03	1.000	1.11E-02	0.999	28.32	31913	70990
410	5.68E-03	1.000	1.15E-02	0.999	29.70	34336	70990
411	5.81E-03	1.000	1.08E-02	1.000	27.40	40756	70990
412	5.46E-03	0.999	1.00E-02	0.998	27.89	43228	70990
413	5.61E-03	1.000	1.12E-02	1.000	28.65	45653	70990
414	5.75E-03	0.997	1.06E-02	1.000	26.38	52120	70990
415	5.75E-03	0.987	8.04E-03	0.998	18.47	54546	70990
416	5.89E-03	0.991	1.06E-02	1.000	28.25	60957	70990
417	5.32E-03	1.000	1.03E-02	0.999	26.13	63410	70990
418	5.38E-03	1.000	1.06E-02	1.000	26.87	65822	70990
419	5.07E-03	1.000	8.84E-03	1.000	22.22	72242	70990
420							
421							
422	5.58E-03	0.999	1.49E-02	1.000	56.92	84628	70990
423	5.52E-03	1.000	1.19E-02	1.000	43.54	91002	70990
424	5.44E-03	1.000	1.00E-02	1.000	35.19	93411	70990
425	5.27E-03	1.000	1.12E-02	1.000	40.83	95827	70990
426	5.44E-03	1.000	1.19E-02	1.000	39.53	102251	70990
427	5.54E-03	1.000	1.13E-02	0.998	40.88	104716	70990
428	5.04E-03	0.998	1.11E-02	0.999	40.72	111153	70990
429	5.84E-03	1.000	1.38E-02	1.000	50.80	113616	70990
430	5.93E-03	1.000	1.26E-02	1.000	46.47	120033	70990
431	5.87E-03	1.000	1.72E-02	1.000	66.67	122509	70990
432	6.02E-03	1.000	1.91E-02	1.000	75.20	124926	70990
433	6.05E-03	1.000	1.59E-02	1.000	60.64	131353	70990
434	6.12E-03	1.000	1.29E-02	1.000	47.20	133819	70990
435	6.29E-03	1.000	1.48E-02	1.000	54.56	140243	70990
436	Note 11:Computer disk memory full						
437							
438							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar Wastewater Treatment Plant (June 28 to Sept 1,1990)

Test No	OUR 1 mg/L sec	Coef Corr	OUR 2 mg/L sec	Coef. Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
439							
440							
441							
442							
443							
444							
445							
446							
447							
448							
449							
450							
451	5.98E-03	0.990	1.68E-02	0.998	64.65	202042	70990
452	4.83E-03	1.000	1.73E-02	1.000	69.32	204509	70990
453	5.25E-03	1.000	1.69E-02	1.000	66.76	210933	70990
454	4.54E-03	1.000	1.54E-02	1.000	61.10	213406	70990
455	4.68E-03	1.000	1.42E-02	0.999	55.27	223003	70990
456	5.61E-03	1.000	1.68E-02	1.000	66.36	225429	70990
457	5.21E-03	1.000	1.57E-02	1.000	61.12	231861	70990
458	5.18E-03	1.000	1.53E-02	1.000	59.58	234313	70990
459	5.20E-03	0.999	1.37E-02	1.000	52.38	725	71090
460	5.44E-03	1.000	1.45E-02	0.999	55.32	3151	71090
461	5.36E-03	0.999	1.64E-02	1.000	64.31	5602	71090
462	5.43E-03	1.000	1.71E-02	0.968	67.38	12025	71090
463	5.26E-03	1.000	1.61E-02	0.999	63.04	14451	71090
464	5.52E-03	1.000	1.48E-02	1.000	56.54	20922	71090
465	5.28E-03	1.000	1.58E-02	1.000	61.71	23348	71090
466	5.38E-03	1.000	1.62E-02	0.999	63.40	25819	71090
467	5.34E-03	1.000	1.46E-02	1.000	58.06	32243	71089
468	5.37E-03	0.999	1.18E-02	1.000	43.53	34706	71090
469	5.21E-03	1.000	1.22E-02	0.999	45.37	41120	71090
470	5.09E-03	1.000	1.59E-02	0.999	62.31	43634	71090
471	5.14E-03	1.000	1.39E-02	0.999	53.52	45958	71090
472	4.39E-03	0.999	1.01E-02	1.000	36.87	52411	71090
473	4.68E-03	1.000	1.08E-02	0.999	39.48	54840	71090
474	5.20E-03	1.000	1.30E-02	1.000	49.26	61259	71090
475	4.59E-03	1.000	1.29E-02	1.000	49.73	63717	71090
476	5.01E-03	1.000	1.28E-02	1.000	48.56	70157	71090
477	4.71E-03	1.000	1.26E-02	1.000	48.37	72623	71090
478							
479	4.57E-03	1.000	8.58E-03	1.000	37.03	82123	71090
480	4.89E-03	1.000	1.10E-02	1.000	49.40	84632	71090
481	4.76E-03	1.000	9.58E-03	0.999	42.03	91060	71090
482	4.97E-03	1.000	1.25E-02	0.999	57.68	93509	71090
483	5.02E-03	1.000	1.13E-02	1.000	50.86	95932	71090
484	5.12E-03	0.999	1.34E-02	0.999	62.51	102410	71090
485	5.03E-03	1.000	1.43E-02	1.000	67.56	104840	71090
486	5.01E-03	1.000	1.40E-02	1.000	66.99	111308	71090
487	7.28E-03	0.988	1.38E-02	0.999	58.76	113741	71090
488	5.11E-03	1.000	1.34E-02	0.998	62.24	120156	71090
489	4.83E-03	1.000	1.29E-02	0.999	60.17	122611	71090
490	5.36E-03	1.000	1.32E-02	0.999	60.51	125028	71090
491	5.32E-03	1.000	1.38E-02	0.999	64.02	131509	71090
492	5.44E-03	1.000	1.43E-02	1.000	66.46	133922	71090
493	5.51E-03	1.000	1.27E-02	1.000	57.71	140339	71090
494	5.50E-03	0.999	1.43E-02	1.000	66.17	142752	71090
495	4.98E-03	1.000	1.38E-02	1.000	63.71	145209	71090
496	5.12E-03	0.991	1.29E-02	1.000	50.79	151628	71090
497	5.28E-03	0.999	1.32E-02	1.000	60.67	154108	71090
498	5.09E-03	0.999	1.37E-02	0.999	63.81	160522	71090
499	5.24E-03	0.999	1.36E-02	1.000	62.42	162941	71090
500	6.18E-03	0.999	1.65E-02	0.999	77.12	165403	71090
501	6.01E-03	1.000	1.59E-02	0.999	73.99	171834	71090
502	6.01E-03	1.000	1.60E-02	1.000	74.46	174250	71090
503	5.96E-03	1.000	1.55E-02	1.000	71.92	180709	71090
504	5.76E-03	0.999	1.79E-02	1.000	86.39	183125	71090
505	6.73E-03	0.993	1.86E-02	1.000	86.97	185541	71090
506	6.09E-03	0.999	1.77E-02	1.000	83.76	191954	71090
507	5.71E-03	1.000	1.69E-02	1.000	79.75	194411	71090
508	6.09E-03	1.000	1.75E-02	0.999	82.44	200832	71090
509	5.79E-03	1.000	1.43E-02	1.000	65.76	203340	71090
510	5.52E-03	1.000	1.58E-02	1.000	74.78	205816	71090
511	5.69E-03	1.000	1.69E-02	1.000	80.38	212231	71090
512	5.79E-03	1.000	1.84E-02	1.000	88.21	214658	71090
513	5.86E-03	1.000	1.80E-02	1.000	85.93	221108	71090
514	5.89E-03	1.000	1.48E-02	1.000	68.51	223524	71090
515	5.54E-03	1.000	1.73E-02	1.000	83.03	230013	71090
516	5.75E-03	1.000	1.66E-02	1.000	78.25	232532	71090
517							
518	5.35E-03	1.000	1.56E-02	1.000	67.95	2046	71190
519	5.65E-03	1.000	1.68E-02	0.999	73.22	4500	71190
520	5.67E-03	1.000	1.62E-02	0.999	70.61	10914	71190
521	5.59E-03	0.999	1.62E-02	1.000	70.39	13340	71190
522	5.73E-03	1.000	1.50E-02	1.000	66.64	15820	71190
523	5.74E-03	1.000	1.41E-02	1.000	59.44	22250	71190
524	5.79E-03	1.000	1.38E-02	1.000	58.05	24711	71190
525	5.54E-03	1.000	1.65E-02	1.000	72.44	31144	71190
526	5.75E-03	1.000	1.63E-02	1.000	70.98	33623	71190
527	5.66E-03	1.000	1.30E-02	1.000	54.25	40103	71190
528	5.66E-03	1.000	1.49E-02	1.000	63.84	42536	71190
529	5.56E-03	1.000	1.20E-02	1.000	49.63	45004	71190
530	5.41E-03	1.000	1.54E-02	1.000	67.14	51431	71190
531	5.30E-03	1.000	1.04E-02	1.000	41.67	53600	71190
532	5.06E-03	1.000	1.01E-02	0.999	40.98	60343	71190
533	5.08E-03	1.000	1.13E-02	1.000	46.84	62758	71190
534	5.16E-03	1.000	1.10E-02	1.000	45.33	65237	71190
535	4.98E-03	1.000	9.80E-03	1.000	39.48	71707	71190
536	4.96E-03	1.000	1.41E-02	1.000	61.30	74128	71190
537	5.01E-03	1.000	9.23E-03	0.999	36.52	80605	71190
538	5.47E-03	1.000	1.56E-02	0.999	67.87	83015	71190
539	5.29E-03	1.000	1.45E-02	1.000	62.69	85439	71190
540	5.57E-03	1.000	1.67E-02	1.000	73.06	91904	71190
541	5.38E-03	1.000	1.16E-02	0.999	47.08	94329	71190
542	5.40E-03	1.000	1.08E-02	0.988	42.81	100749	71190
543	5.16E-03	1.000	1.45E-02	0.999	62.64	103209	71190
544	5.60E-03	1.000	1.50E-02	1.000	64.66	105636	71190
545	5.75E-03	1.000	1.04E-02	1.000	61.28	112059	71190
546	5.62E-03	1.000	1.66E-02	0.999	72.79	114521	71190
547	5.82E-03	1.000	1.18E-02	1.000	47.67	120929	71190
548	5.31E-03	1.000	1.15E-02	1.000	47.58	123351	71190
549	5.66E-03	0.996	1.23E-02	1.000	50.66	125820	71190
550	5.98E-03	1.000	1.67E-02	1.000	72.36	132229	71190
551	Note 12: Solenoid #3 not functioning						
552							
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571	6.04E-03	0.999	1.86E-02	1.000	92.96	214422	71190
572	5.60E-03	1.000	1.68E-02	1.000	82.77	220851	71190
573	5.22E-03	1.000	1.74E-02	1.000	88.59	223307	71190
574	5.29E-03	1.000	1.84E-02	0.999	94.13	225718	71190
575	5.50E-03	1.000	1.86E-02	1.000	93.67	232139	71190
576	5.62E-03	1.000	1.52E-02	1.000	74.27	234554	71190
577	6.03E-03	1.000	1.45E-02	1.000	69.96	1019	71290
578	5.93E-03	1.000	1.23E-02	1.000	57.57	3426	71290
579	5.42E-03	1.000	1.53E-02	1.000	75.48	5857	71290
580	5.66E-03	1.000	1.79E-02	1.000	90.20	12330	71290
581	5.72E-03	1.000	1.42E-02	1.000	68.73	14801	71290
582	5.94E-03	1.000	1.32E-02	1.000	62.68	21207	71290
583	5.44E-03	1.000	1.98E-02	1.000	101.82	23616	71290
584	6.37E-03	1.000	1.56E-02	1.000	77.36	30027	71290

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
585	5.17E-03	1.000	1.21E-02	1.000	57.99	32440	71290
586	5.24E-03	1.000	1.11E-02	1.000	52.04	34852	71290
587	5.41E-03	1.000	1.16E-02	0.999	54.24	41303	71290
588	5.27E-03	1.000	1.14E-02	0.999	53.71	43712	71290
589	5.40E-03	1.000	1.18E-02	0.999	55.36	50120	71290
590	5.24E-03	1.000	1.57E-02	0.999	78.68	52527	71290
591	5.13E-03	1.000	1.12E-02	0.999	52.92	54933	71290
592	4.87E-03	1.000	1.13E-02	1.000	53.85	61341	71290
593	4.90E-03	1.000	1.23E-02	1.000	59.52	63745	71290
594	4.60E-03	1.000	1.13E-02	0.999	54.48	70154	71290
595	4.68E-03	1.000	9.06E-03	0.999	41.45	75128	71290
596	4.80E-03	0.999	1.14E-02	1.000	54.42	81541	71290
597	4.86E-03	1.000	1.09E-02	1.000	51.92	83945	71290
598	4.61E-03	1.000	1.19E-02	1.000	58.26	90349	71290
599	4.78E-03	1.000	7.89E-03	1.000	34.47	92745	71290
600	2.89E-04	0.987	9.82E-03	1.000	56.00	95152	71290
601	5.38E-03	1.000	1.73E-02	1.000	87.18	101558	71290
602	4.93E-03	1.000	4.08E-03	1.000	12.19	103940	71290
603	2.78E-04	0.974	1.65E-02	1.000	94.28	110341	71290
604	3.08E-04	0.989	1.13E-02	1.000	64.56	112741	71290
[illegible]	[illegible]58E-04	0.998	1.30E-02	0.999	74.28	115142	71290
[illegible]	[illegible]	0.998	1.02E-02	1.000	58.20	121602	71290
[illegible]	[illegible]	1.002	1.00E-02	1.000	56.73	124016	71290
608	[illegible]	1.000	1.57E-02	1.000	75.32	130339	71290
609	[illegible]	1.000	1.50E-02	0.999	70.76	132726	71290
610	[illegible]	1.000	1.56E-02	0.999	76.53	135129	71290
611	6.27E-03	1.000	1.59E-02	0.999	77.25	141531	71290
612	6.11E-03	1.000	1.52E-02	1.000	73.47	143936	71290
613							
614	Note 13:No SpOUR work during 12-13,July						
615							
616	2.47E-03	1.000	6.52E-03	1.000	31.14	120029	71490
617	7.98E-03	0.981	1.36E-02	1.000	58.31	122443	71490
618	9.80E-03	1.000	1.16E-02	1.000	43.30	124852	71490
619	6.81E-03	0.999	1.08E-02	1.000	45.19	131303	71490
620	3.81E-03	1.000	5.41E-03	0.999	15.09	133716	71490
621	6.89E-03	0.899	1.47E-02	1.000	67.74	140127	71490
622	6.95E-03	1.000	1.03E-02	0.999	43.14	142539	71490
623	6.74E-03	0.999	1.05E-02	0.999	43.96	144952	71490
624	6.86E-03	0.969	1.97E-02	0.999	95.22	151420	71490
625	7.03E-03	1.000	1.68E-02	1.000	78.44	153833	71490
626	6.91E-03	1.000	1.11E-02	0.999	47.10	160316	71490
627	6.42E-03	1.000	1.15E-02	1.000	50.47	162727	71490
628	6.64E-03	1.000	1.88E-02	1.000	90.96	165154	71490
629	6.59E-03	1.000	1.18E-02	1.000	51.66	171607	71490
630	6.59E-03	1.000	1.52E-02	0.999	70.41	174015	71490
631	7.20E-03	1.000	1.10E-02	0.999	45.56	180428	71490
632	Note 14: No test due to low Raw Influent flow						
633							
634							
635							
636							
637							
638							
639	6.48E-03	1.000	1.06E-02	0.999	44.41	212221	71490
640	6.58E-03	1.000	1.21E-02	0.999	48.76	214647	71490
641	6.98E-03	1.000	1.19E-02	0.999	51.18	221118	71490
642	6.81E-03	1.000	1.11E-02	0.999	47.78	223531	71490
643	6.92E-03	1.000	1.13E-02	0.999	47.81	225945	71490
644	6.86E-03	1.000	1.12E-02	0.999	47.58	232358	71490
645	7.09E-03	1.000	1.13E-02	1.000	47.86	234811	71490
646	6.24E-03	1.000	1.15E-02	0.999	50.62	1239	71590
647	7.14E-03	1.000	1.14E-02	0.999	48.00	3652	71590
648	7.17E-03	1.000	1.99E-02	1.000	95.83	10105	71590
649	7.07E-03	1.000	2.11E-02	0.999	103.04	12517	71590
650	7.11E-03	1.000	1.24E-02	1.000	53.79	14930	71590
651	7.13E-03	1.000	1.17E-02	0.999	49.91	21343	71590
652	7.18E-03	1.000	1.14E-02	0.999	47.74	23757	71590
653	7.06E-03	1.000	1.07E-02	0.999	44.34	30212	71590
654	7.06E-03	1.000	1.10E-02	0.999	46.75	32627	71590
655	6.98E-03	1.000	1.02E-02	0.999	41.94	35043	71590
656	7.06E-03	1.000	1.06E-02	0.999	43.50	41459	71590
657	7.00E-03	1.000	1.01E-02	0.999	41.24	43916	71590

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
658	6.42E-03	1.000	1.01E-02	0.999	42.29	50334	71590
659	6.74E-03	1.000	1.00E-02	0.999	41.30	52753	71590
660	6.72E-03	1.000	1.01E-02	0.999	41.73	55211	71590
661	6.47E-03	1.000	9.79E-03	0.999	40.56	61630	71590
662	6.49E-03	1.000	9.77E-03	0.999	40.37	64046	71590
663	6.36E-03	1.000	9.78E-03	0.999	40.72	70506	71590
664	6.19E-03	1.000	9.28E-03	0.999	38.14	72925	71590
665							
666	5.86E-03	1.000	8.57E-03	0.999	28.02	82325	71590
667	6.85E-03	1.000	8.98E-03	0.999	28.13	84745	71590
668	6.73E-03	1.000	9.20E-03	0.999	29.29	91203	71590
669	6.62E-03	1.000	9.73E-03	0.999	31.66	93618	71590
670	6.48E-03	1.000	8.78E-03	0.999	27.88	100036	71590
671	6.83E-03	1.000	9.27E-03	0.999	29.46	102453	71590
672	6.82E-03	1.000	8.68E-03	0.999	26.90	104909	71590
673	7.01E-03	1.000	9.53E-03	0.999	30.26	111324	71590
674	7.09E-03	1.000	2.83E-02	0.289	106.50	113741	71590
675	4.26E-03	1.000	4.54E-03	0.998	12.77	120239	71590
676	6.05E-03	1.000	4.83E-03	0.998	10.83	122711	71590
677	6.18E-03	1.000	4.75E-03	0.997	10.23	125141	71590
678	6.23E-03	1.000	5.13E-03	0.998	11.87	131609	71590
679	6.20E-03	1.000	5.07E-03	0.982	11.86	134038	71590
680	6.27E-03	1.000	5.08E-03	0.997	11.48	140503	71590
681	6.28E-03	1.000	5.13E-03	0.997	11.77	142928	71590
682	6.21E-03	1.000	5.18E-03	0.998	12.14	145353	71590
683	6.43E-03	0.999	5.34E-03	0.997	12.47	151821	71590
684	6.30E-03	0.999	5.67E-03	0.998	14.18	154246	71590
685	6.63E-03	0.999	5.64E-03	0.998	13.45	160710	71590
686	6.29E-03	0.999	5.60E-03	0.986	13.91	163142	71590
687	6.26E-03	0.999	5.37E-03	0.998	12.91	165613	71590
688	6.53E-03	0.999	5.37E-03	0.999	12.40	172044	71590
689	6.46E-03	1.000	5.77E-03	0.999	14.32	174509	71590
690	6.19E-03	1.000	5.90E-03	0.999	15.44	180942	71590
691	6.45E-03	1.000	6.28E-03	0.997	16.67	183415	71590
692	6.41E-03	1.000	6.04E-03	0.997	15.62	185847	71590
693	6.36E-03	0.999	6.59E-03	0.990	18.23	192316	71590
694	6.50E-03	1.000	6.44E-03	0.994	17.27	194749	71590
695	6.16E-03	0.999	6.06E-03	0.992	16.14	201219	71590
696	6.12E-03	0.999	5.54E-03	0.991	13.90	203648	71590
697	6.20E-03	1.000	5.57E-03	0.998	13.90	210100	71590
698	6.70E-03	0.999	6.14E-03	0.994	15.56	1641	71690
699	6.72E-03	1.000	5.90E-03	0.997	14.43	4104	71690
700	6.67E-03	1.000	5.97E-03	0.995	14.87	10626	71690
701	6.43E-03	1.000	6.20E-03	0.994	16.33	12957	71690
702	6.52E-03	1.000	6.07E-03	0.994	15.56	15426	71690
703	6.75E-03	1.000	5.00E-03	0.998	14.40	21848	71690
704	7.18E-03	1.000	5.89E-03	0.996	13.60	24310	71690
705	6.72E-03	0.999	5.94E-03	0.995	14.86	30744	71690
706	6.74E-03	0.998	5.97E-03	0.997	14.30	33218	71690
707	6.71E-03	1.000	6.10E-03	0.998	15.39	35649	71690
708	6.69E-03	0.999	5.82E-03	0.993	14.17	42116	71690
709	6.75E-03	0.999	5.06E-03	0.900	10.71	44641	71690
710	6.59E-03	1.000	5.83E-03	0.994	14.40	51014	71690
711	6.40E-03	1.000	5.87E-03	0.996	14.80	53450	71690
712	6.41E-03	1.000	5.66E-03	0.997	13.90	55922	71690
713	6.38E-03	1.000	5.56E-03	0.997	13.53	62400	71690
714	6.12E-03	1.000	5.36E-03	0.998	13.03	64828	71690
715	6.02E-03	1.000	5.48E-03	0.998	13.82	71304	71690
716	5.98E-03	1.000	5.32E-03	0.994	13.21	73738	71690
717	5.89E-03	0.999	4.46E-03	0.998	9.40	80212	71690
718	5.89E-03	0.999	4.46E-03	0.998	9.40	80212	71690
719							
720	7.17E-03	1.000	6.79E-03	0.970	22.09	84832	71690
721	4.76E-03	1.000	9.21E-03	0.999	41.12	91258	71690
722	4.71E-03	1.000	9.20E-03	0.999	41.14	93721	71690
723	4.81E-03	1.000	8.77E-03	0.999	38.53	100149	71690
724	4.74E-03	1.000	1.08E-02	1.000	50.21	102812	71690
725	4.70E-03	1.000	9.92E-03	0.999	45.23	106029	71690
726	4.80E-03	1.000	8.76E-03	0.999	38.81	111446	71690
727	4.40E-03	1.000	9.13E-03	0.999	41.40	113858	71690
728	4.29E-03	1.000	8.62E-03	0.999	38.30	120313	71690
729	4.25E-03	1.000	7.70E-03	0.999	33.74	122728	71690
730	4.14E-03	1.000	7.28E-03	0.999	31.62	125130	71690

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1, 1990)

Test No	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
731	4.03E-03	1.000	1.16E-02	0.999	57.21	131351	71690
732	4.06E-03	1.000	7.41E-03	0.999	32.54	134001	71690
733	3.91E-03	1.000	7.30E-03	0.999	32.29	140412	71690
734	3.91E-03	1.000	7.44E-03	0.999	33.04	142826	71690
735	3.88E-03	1.000	7.83E-03	0.998	36.30	145240	71690
736	3.91E-03	1.000	9.66E-03	0.999	45.66	151655	71690
737	3.69E-03	1.000	1.06E-02	0.999	50.12	154110	71690
738	3.90E-03	1.000	1.01E-02	1.000	48.02	160525	71690
739	3.95E-03	1.000	9.76E-03	1.000	46.03	162939	71690
740	4.04E-03	1.000	1.06E-02	1.000	50.17	165354	71690
741	3.91E-03	1.000	1.21E-02	1.000	59.34	171809	71690
742	4.15E-03	1.000	1.12E-02	0.999	53.66	174222	71690
743	4.38E-03	1.000	1.24E-02	0.999	59.74	180637	71690
744	4.57E-03	1.000	1.17E-02	0.999	55.44	183049	71690
745	4.50E-03	1.000	1.08E-02	0.999	50.69	185503	71690
746	4.28E-03	1.000	1.09E-02	0.999	51.57	191916	71690
747	4.22E-03	1.000	1.12E-02	0.999	53.79	194331	71690
748	4.36E-03	1.000	1.15E-02	0.999	56.03	200747	71690
749	4.29E-03	1.000	1.20E-02	1.000	58.06	203203	71690
750	4.28E-03	1.000	1.10E-02	0.999	52.31	205620	71690
751	4.27E-03	1.000	1.20E-02	1.000	57.84	212036	71690
752	4.37E-03	1.000	9.06E-03	0.999	41.06	214452	71690
753	4.08E-03	1.000	1.02E-02	0.999	48.17	220906	71690
754							
755							
756	5.93E-03	1.000	6.06E-03	0.998	20.73	232627	71690
757	6.41E-03	1.000	5.48E-03	0.998	16.40	235044	71690
758	6.44E-03	1.000	5.71E-03	0.992	17.64	1510	71790
759	6.54E-03	0.998	5.83E-03	0.993	18.07	3934	71790
760	6.52E-03	0.999	5.51E-03	0.994	16.34	10357	71790
761	6.01E-03	1.000	6.39E-03	0.999	22.43	12826	71790
762	3.03E-03	0.997	6.46E-03	0.998	29.53	15310	71790
763	6.33E-03	1.000	6.37E-03	0.998	21.60	21727	71790
764	6.00E-03	1.000	6.40E-03	0.994	22.48	24158	71790
765	5.99E-03	1.000	6.13E-03	0.997	21.00	30624	71790
766	5.88E-03	1.000	5.92E-03	0.996	20.04	33045	71790
767	5.66E-03	1.000	5.81E-03	0.999	19.96	35515	71790
768	5.56E-03	1.000	5.39E-03	0.996	17.83	41949	71790
769	5.41E-03	0.999	4.67E-03	0.998	14.12	44409	71790
770	5.32E-03	1.000	5.78E-03	0.996	20.58	50841	71790
771	5.18E-03	1.000	5.18E-03	0.996	17.38	53314	71790
772	5.14E-03	1.000	5.15E-03	0.995	17.38	55741	71790
773	4.90E-03	0.999	5.39E-03	0.995	19.26	62216	71790
774	4.69E-03	1.000	5.22E-03	0.995	18.38	64652	71790
775	4.74E-03	0.999	5.31E-03	0.997	18.21	71122	71790
776	4.58E-03	0.999	5.29E-03	0.998	19.48	73600	71790
777	4.41E-03	0.999	5.01E-03	0.997	18.27	80038	71790
778	6.32E-03	1.000	7.77E-03	0.999	29.50	82143	71790
779	6.22E-03	1.000	6.52E-03	0.999	22.68	84613	71790
780	5.63E-03	1.000	1.10E-02	0.999	49.40	93202	71790
781	5.24E-03	1.000	8.29E-03	0.999	34.82	95623	71790
782	4.85E-03	1.000	1.20E-02	0.999	56.55	102047	71790
783	4.52E-03	0.999	9.30E-03	1.000	42.62	104516	71790
784	5.06E-03	1.000	9.30E-03	1.000	40.94	110936	71790
785	4.91E-03	1.000	8.75E-03	0.999	38.16	113363	71790
786	4.84E-03	1.000	9.70E-03	0.999	43.67	115811	71790
787	4.67E-03	1.000	9.06E-03	0.999	40.39	122232	71790
788	4.74E-03	1.000	9.84E-03	1.000	44.66	124651	71790
789	4.72E-03	1.000	9.24E-03	1.000	41.37	131111	71790
790	5.29E-03	0.991	1.02E-02	1.000	45.51	133531	71790
791	4.91E-03	1.000	1.08E-02	1.000	49.63	135957	71790
792	4.76E-03	1.000	1.23E-02	1.000	58.56	142416	71790
793	4.94E-03	1.000	1.24E-02	0.998	58.50	144837	71790
794	5.19E-03	1.000	1.15E-02	1.000	52.82	151302	71790
795	5.15E-03	1.000	1.18E-02	0.999	54.87	153720	71790
796	5.03E-03	1.000	1.10E-02	0.999	50.74	160136	71790
797	1.21E-02	0.998	1.16E-02	0.994	39.29	162559	71790
798	5.14E-03	1.000	1.15E-02	0.999	53.39	165023	71790
799	4.77E-03	1.000	1.16E-02	0.999	56.43	171453	71790
800	4.56E-03	0.999	1.11E-02	1.000	52.27	173922	71790
801	4.74E-03	1.000	1.20E-02	1.000	57.06	180350	71790
802	4.94E-03	0.996	1.12E-02	0.994	52.15	182816	71790
803	7.32E-03	0.994	3.72E-02	0.996	136	185236	71790

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1, 1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
804	1.16E-02	0.998	1.16E-02	1.000	38.55	191700	71790
805	1.38E-02	0.994	9.78E-03	0.999	23.92	194126	71790
806	4.93E-03	1.000	8.29E-03	0.996	36.51	200552	71790
807	1.20E-02	0.976	9.81E-03	0.999	28.28	203016	71790
808							
809							
810							
811							
812							
813	6.56E-03	1.000	1.25E-02	0.999	55.70	231053	71790
814	6.58E-03	1.000	1.18E-02	0.999	51.74	233511	71790
815	6.18E-03	1.000	9.73E-03	0.999	40.83	235937	71790
816	7.08E-03	1.000	1.25E-02	0.994	54.11	2356	71890
817	6.50E-03	1.000	9.77E-03	0.999	40.34	4819	71890
818	6.56E-03	1.000	1.38E-02	1.000	61.96	11242	71890
819	6.58E-03	1.000	9.90E-03	0.998	40.90	13703	71890
820	5.09E-03	0.998	1.03E-02	0.999	46.27	20132	71890
821	6.13E-03	1.000	8.06E-03	0.998	34.95	22556	71890
822	6.19E-03	1.000	9.46E-03	0.998	39.42	25025	71890
823	6.22E-03	1.000	8.65E-03	0.999	34.68	31502	71890
824	6.17E-03	1.000	6.66E-03	0.991	23.56	33941	71890
825	5.88E-03	1.000	7.67E-03	0.996	29.92	40425	71890
826	5.53E-03	0.999	7.11E-03	0.998	27.56	42902	71890
827	5.36E-03	0.998	1.18E-02	1.000	54.58	45337	71890
828	5.69E-03	1.000	9.73E-03	0.996	41.94	51806	71890
829							
830							
831							
832							
833							
834							
835	7.08E-03	1.000	8.42E-03	0.997	20.88	82342	71890
836	5.81E-03	0.999	9.79E-03	0.994	43.32	84812	71890
837	5.69E-03	0.999	6.31E-03	0.996	22.99	91239	71890
838	5.69E-03	0.999	1.17E-02	0.999	54.60	93704	71890
839	5.73E-03	1.000	6.25E-03	0.992	22.97	100123	71890
840	5.93E-03	0.999	5.50E-03	0.994	18.14	102540	71890
841	5.89E-03	0.999	5.60E-03	0.994	20.00	104958	71890
842	5.92E-03	1.000	6.19E-03	0.992	22.17	111418	71890
843	5.85E-03	0.999	6.99E-03	0.991	27.01	113832	71890
844	6.16E-03	0.998	6.98E-03	0.994	26.19	120249	71890
845	6.25E-03	1.000	6.28E-03	0.996	21.92	122701	71890
846	5.90E-03	1.000	6.47E-03	0.994	23.87	125110	71860
847	5.69E-03	0.999	8.30E-03	0.996	34.97	131524	71890
848	4.80E-03	0.998	1.06E-02	0.984	50.44	133933	71890
849	5.63E-03	0.997	8.04E-03	0.997	33.60	140344	71890
850	5.77E-03	0.999	8.60E-03	0.993	37.68	142758	71890
851							
852							
853							
854							
855	5.49E-03	1.000	9.58E-03	0.999	42.84	165326	71890
856	5.63E-03	0.999	8.81E-03	0.995	38.07	171755	71890
857	5.84E-03	1.000	9.96E-03	0.999	38.41	174206	71890
858	6.41E-03	0.999	1.15E-02	0.998	51.86	180621	71890
859	6.31E-03	0.999	7.64E-03	0.999	29.68	183038	71890
860	6.46E-03	0.999	1.09E-02	0.992	48.22	185450	71890
861	6.59E-03	0.999	7.39E-03	0.987	27.61	191902	71890
862	5.58E-03	0.990	7.56E-03	0.987	30.91	194318	71890
863	5.32E-03	0.990	7.86E-03	0.994	33.12	200733	71890
864	6.01E-03	0.998	8.63E-03	0.994	36.15	203142	71890
865	6.14E-03	0.998	7.74E-03	0.993	30.71	205653	71890
866	6.15E-03	0.999	6.86E-03	0.991	26.11	212007	71890
867	5.34E-03	0.995	9.20E-03	0.997	41.02	214418	71890
868	5.67E-03	0.998	7.40E-03	0.998	29.77	220631	71890
869	5.72E-03	0.999	6.64E-03	0.990	25.25	223244	71890
870	5.56E-03	0.999	7.47E-03	0.995	30.46	225657	71890
871							
872	6.38E-03	0.998	6.71E-03	0.991	22.68	235814	71890
873	6.66E-03	0.999	7.50E-03	0.978	26.36	2229	71990
874	6.32E-03	0.998	6.06E-03	0.990	19.22	4641	71990
875	5.83E-03	0.998	6.86E-03	0.993	25.26	11100	71990
876	5.23E-03	0.999	7.04E-03	0.991	27.01	13617	71990

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
877	6.48E-03	1.000	9.05E-03	0.994	35.19	15937	71990
878	6.48E-03	0.998	8.45E-03	0.987	31.94	22354	71990
879	6.52E-03	0.999	6.60E-03	0.998	21.78	24814	71990
880	6.02E-03	0.999	6.86E-03	0.988	24.26	31230	71990
881	6.19E-03	0.999	6.74E-03	0.992	23.29	33644	71990
882	6.28E-03	1.000	6.21E-03	0.983	20.17	40101	71990
883	5.71E-03	0.999	6.43E-03	0.992	22.61	42515	71990
884	5.90E-03	0.999	6.59E-03	0.993	23.10	44926	71990
885	5.18E-03	0.999	6.10E-03	0.995	21.97	51344	71990
886	5.53E-03	0.999	6.34E-03	0.990	22.52	53758	71990
887	5.48E-03	0.999	6.66E-03	0.994	24.40	60213	71990
888	5.50E-03	0.999	6.34E-03	0.994	22.60	62631	71990
889	5.41E-03	0.999	7.22E-03	0.991	27.59	65044	71990
890	5.15E-03	0.998	1.04E-02	0.996	45.41	71450	71990
891	4.78E-03	0.999	5.17E-03	0.984	17.79	73902	71990
892							
893							
894	5.47E-03	0.999	6.41E-03	0.993	21.69	[illegible]	[illegible]
895	4.75E-03	0.999	3.83E-03	0.994	9.93	[illegible]	[illegible]
896	4.50E-03	1.000	5.87E-03	0.992	20.96	[illegible]	71990
897	4.99E-03	0.998	4.74E-03	0.998	14.11	[illegible]	71990
898	4.61E-03	0.999	4.14E-03	0.991	11.41	101[illegible]	71990
899	4.69E-03	0.999	6.01E-03	0.987	21.27	104050	71990
900	5.18E-03	0.999	6.52E-03	0.992	22.86	110451	71990
901	3.62E-03	1.000	6.92E-03	0.994	28.15	112847	71990
902	4.89E-03	0.999	6.81E-03	0.990	24.98	115247	71990
903	4.37E-03	0.998	6.28E-03	0.986	23.30	121651	71990
904	5.24E-03	0.999	5.74E-03	0.988	18.73	124053	71990
905	4.30E-03	0.998	8.64E-03	0.998	36.64	130456	71990
906	4.98E-03	0.999	4.71E-03	0.992	13.99	132829	71990
907	4.48E-03	0.998	9.77E-03	0.988	41.01	135229	71990
908	3.67E-03	0.986	8.25E-03	0.995	34.69	141632	71990
909	5.32E-03	0.999	7.07E-03	0.991	25.40	144036	71990
910	4.74E-03	0.998	6.49E-03	0.989	23.00	150437	71990
911	4.88E-03	0.996	7.72E-03	0.993	29.65	152838	71990
912	5.05E-03	0.999	8.71E-03	0.993	34.42	155239	71990
913	2.65E-03	0.998	8.49E-03	0.986	27.93	161653	71990
914	5.12E-03	0.997	9.17E-03	0.998	31.62	164100	71990
915	5.29E-03	0.998	7.49E-03	0.983	27.62	170615	71990
916	5.24E-03	0.999	5.22E-03	0.979	16.05	172822	71990
917	4.67E-03	0.993	5.69E-03	0.983	19.63	175325	71990
918	4.58E-03	0.997	5.25E-03	0.988	17.50	181724	71990
919	4.19E-03	0.997	4.92E-03	0.992	16.68	184126	71990
920	4.23E-03	0.998	4.33E-03	0.989	13.56	190529	71990
921	4.39E-03	0.999	5.88E-03	0.993	21.11	192931	71990
922	4.09E-03	0.997	4.60E-03	0.992	15.23	195334	71990
923	4.22E-03	0.998	5.00E-03	0.988	17.01	201741	71990
924	4.06E-03	0.998	5.14E-03	0.994	18.06	204148	71990
925	6.60E-03	0.999	6.12E-03	0.988	17.46	210549	71990
926	5.34E-03	0.996	6.32E-03	0.994	21.50	212950	71990
927							
928	5.92E-03	0.999	6.17E-03	0.987	18.02	222709	71990
929	5.36E-03	0.999	5.71E-03	0.981	16.88	225114	71990
930	6.13E-03	0.999	5.46E-03	0.982	14.25	231517	71990
931	1.10E-03	0.983	6.94E-03	0.991	30.68	233916	71990
932	5.54E-03	0.993	5.98E-03	0.994	17.82	322	72090
933	5.81E-03	0.998	6.18E-03	0.992	18.27	2724	72090
934	1.48E-03	0.992	6.57E-03	0.990	28.36	5102	72090
935	5.58E-03	0.998	5.90E-03	0.991	17.36	11502	72090
936	4.03E-03	0.998	6.99E-03	0.993	26.49	13858	72090
937	1.03E-04	0.629	8.38E-03	0.994	39.48	20303	72090
938	3.88E-03	0.999	5.58E-03	0.998	16.97	22657	72090
939	4.69E-03	0.999	3.84E-03	0.990	9.31	25026	72090
940	2.99E-03	0.999	6.10E-03	0.992	23.22	31433	72090
941	4.51E-03	0.999	4.17E-03	0.990	11.23	33801	72090
942	3.64E-03	0.999	4.17E-03	0.995	12.88	40129	72090
943	4.74E-03	0.999	3.00E-03	0.985	5.23	42456	72090
944	1.43E-03	0.998	2.31E-03	0.987	8.24	44824	72090
945	7.79E-04	0.993	2.01E-03	0.998	8.03	51158	72090
946	8.36E-04	0.984	9.56E-04	0.986	2.94	53624	72090
947	1.12E-03	0.993	1.67E-03	0.993	5.80	55851	72090
948	6.78E-06	1.193	2.92E-03	0.993	13.71	62248	72090
949	4.52E-04	1.006	1.85E-03	1.000	7.92	64646	72090

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
950	2.56E-04	0.904	1.69E-03	0.998	7.54	71012	72090
951	2.69E-06	0.300	3.56E-03	0.789	16.74	73413	72090
952							
953	2.46E-03	0.998	2.59E-03	1.000	7.62	83631	72090
954	1.04E-03	0.986	1.42E-03	0.994	4.73	85904	72090
955	9.83E-06	0.843	2.70E-03	0.998	12.60	92303	72090
956	5.39E-04	0.986	4.34E-03	0.994	16.54	94704	72090
957	6.18E-04	1.001	1.26E-03	0.892	4.81	101059	72090
958	1.20E-03	0.994	2.70E-03	0.999	10.51	103425	72090
959	3.57E-04	0.984	1.37E-03	0.962	5.82	105825	72090
960	1.06E-03	0.976	3.39E-03	0.994	14.08	112152	72090
961	1.09E-03	0.999	4.27E-03	0.982	16.16	114555	72090
962	3.82E-04	0.986	1.84E-03	0.962	7.98	120952	72090
963	3.75E-04	1.000	2.82E-04	0.543	0.62	123344	72090
964	9.84E-04	0.999	2.22E-03	0.968	8.63	125746	72090
965							
966	4.18E-03	0.999	1.53E-02	1.000	64.44	135436	72090
967	5.37E-03	1.000	1.45E-02	1.000	58.71	141904	72090
968	5.06E-03	1.000	1.42E-02	1.000	57.98	144323	72090
969	5.57E-03	1.000	1.54E-02	1.000	62.24	150753	72090
970	5.45E-03	1.000	1.47E-02	1.000	59.17	153226	72090
971	5.27E-03	1.000	1.50E-02	0.999	61.24	155659	72090
972	5.81E-03	1.000	1.44E-02	0.999	57.32	162134	72090
973	5.40E-03	1.000	1.48E-02	1.000	59.87	164606	72090
974	5.71E-03	1.000	1.53E-02	0.999	61.64	171038	72090
975	5.57E-03	1.000	1.42E-02	0.999	56.72	173609	72090
976	5.77E-03	1.000	1.36E-02	1.000	53.06	175933	72090
977	5.56E-03	1.000	1.41E-02	0.999	56.24	182364	72090
978	5.58E-03	1.000	1.48E-02	0.999	59.53	184815	72090
979	5.52E-03	1.000	1.42E-02	1.000	56.68	191239	72090
980	5.58E-03	1.000	1.37E-02	0.999	54.30	193659	72090
981	6.52E-03	1.000	1.42E-02	0.999	55.07	200119	72090
982	5.83E-03	1.000	1.44E-02	0.999	57.00	202540	72090
983	5.80E-03	1.000	1.36E-02	0.999	52.89	205001	72090
984	5.71E-03	1.000	1.47E-02	0.999	58.72	211420	72090
985	5.76E-03	1.000	1.33E-02	0.999	52.12	213840	72090
986	5.66E-03	1.000	1.26E-02	0.999	48.59	220258	72090
987	7.61E-03	1.000	1.58E-02	1.000	60.40	222718	72090
988	7.78E-03	1.000	1.58E-02	0.999	59.97	225137	72090
989	7.67E-03	1.000	1.77E-02	1.000	69.67	231567	72090
990	7.40E-03	1.000	1.88E-02	1.000	75.27	234018	72090
991	7.13E-03	1.000	1.73E-02	0.998	69.53	443	72190
992	7.22E-03	1.000	1.48E-02	1.000	56.36	2811	72190
993	6.81E-03	1.000	1.44E-02	1.000	55.39	5338	72190
994	6.61E-03	1.000	1.69E-02	0.999	67.43	11806	72190
995	6.60E-03	1.000	1.70E-02	1.000	67.86	14232	72190
996	6.70E-03	1.000	1.63E-02	0.999	64.37	20658	72190
997	6.57E-03	1.000	1.58E-02	1.000	62.32	23124	72190
998	5.93E-03	1.000	1.38E-02	0.999	54.28	25560	72190
999	6.48E-03	1.000	1.38E-02	1.000	52.33	32015	72190
1000	6.02E-03	1.000	1.32E-02	0.999	51.34	34464	72190
1001	5.94E-03	1.000	1.28E-02	0.999	49.20	40931	72190
1002	6.02E-03	1.000	1.19E-02	0.999	46.08	43400	72190
1003	5.82E-03	1.000	1.23E-02	0.999	47.39	45839	72190
1004	5.63E-03	1.000	1.16E-02	0.999	44.19	52314	72190
1005	5.42E-03	1.000	1.11E-02	0.999	42.12	54768	72190
1006	5.41E-03	1.000	1.07E-02	0.999	40.63	61236	72190
1007	5.[illegible]E-03	1.000	8.74E-03	1.000	30.98	63713	72190
1008	5.38E-03	1.000	9.51E-03	1.000	34.84	70153	72190
1009							
1010							
1011							
1012	5.40E-03	1.000	9.08E-03	0.999	32.69	83736	72190
1013	5.23E-03	1.000	7.88E-03	0.999	27.33	90211	72190
1014	4.67E-03	1.000	1.06E-02	1.000	41.12	92644	72190
1015	5.52E-03	1.000	8.09E-03	0.999	27.86	95120	72190
1016	5.29E-03	1.000	7.[illegible]E-03	0.999	28.10	101548	72190
1017	5.13E-03	1.000	7.62E-03	0.999	26.36	104008	72190
1018	4.11E-03	0.999	7.46E-03	0.999	27.51	110434	72190
1019	4.78E-03	1.000	8.71E-03	1.000	32.18	112854	72190
1020	4.81E-03	1.000	8.27E-03	0.999	30.64	115312	72190
1021	4.75E-03	1.000	7.34E-03	0.999	26.74	121728	72190
1022	4.91E-03	1.000	7.62E-03	0.999	26.79	124144	72190

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1023	4.90E-03	1.000	7.48E-03	0.999	26.14	130559	72190
1024	3.82E-03	0.999	7.57E-03	1.000	29.00	133016	72190
1025	4.52E-03	1.000	1.13E-02	0.999	45.07	136429	72190
1026	7.09E-03	0.998	1.03E-02	1.000	35.46	141844	72190
1027	7.59E-03	1.000	9.63E-03	1.000	31.24	144259	72190
1028	5.98E-03	1.000	8.75E-03	0.999	30.11	150716	72190
1029	7.04E-03	1.000	8.33E-03	0.999	26.10	153129	72190
1030	7.28E-03	1.000	1.12E-02	0.999	39.32	155544	72190
1031	6.59E-03	1.000	1.10E-02	1.000	39.81	161959	72190
1032	6.32E-03	1.000	1.09E-02	1.000	39.82	164414	72190
1033	Note 15 Solenoid #3 leaked						
1034							
1035							
1036							
1037							
1038							
1039							
1040							
1041							
1042							
1043							
1044							
1045							
1046							
1047	7.72E-03	1.000	9.98E-03	1.000	32.66	221717	72190
1048	7.30E-03	0.999	8.96E-03	1.000	28.81	224131	72190
1049	6.24E-03	1.000	1.05E-02	1.000	38.04	230545	72190
1050	6.49E-03	1.000	9.99E-03	1.000	35.00	232959	72190
1051	6.04E-03	1.000	1.07E-02	1.000	39.26	235413	72190
1052	5.65E-03	0.999	1.09E-02	0.999	40.60	1827	72290
1053	5.33E-03	1.000	1.04E-02	1.000	38.98	4241	72290
1054	5.85E-03	1.000	1.06E-02	1.000	38.74	10654	72290
1055	5.95E-03	1.000	1.07E-02	0.999	39.56	13109	72290
1056	5.84E-03	1.000	1.07E-02	0.999	39.57	15526	72290
1057	5.91E-03	1.000	1.03E-02	0.999	37.71	21941	72290
1058	5.76E-03	1.000	1.03E-02	1.000	37.77	24356	72290
1059	5.83E-03	1.000	1.04E-02	1.000	38.25	30813	72290
1060	5.66E-03	1.000	1.03E-02	0.999	38.24	33230	72290
1061	5.95E-03	1.000	1.03E-02	0.999	37.53	35646	72290
1062	5.33E-03	1.000	9.74E-03	1.000	36.05	42108	72290
1063	6.48E-03	1.000	9.67E-03	0.999	33.54	44523	72290
1064	5.61E-03	1.000	8.13E-03	0.999	27.86	50949	72290
1065	5.67E-03	1.000	8.09E-03	1.000	27.60	53414	72290
1066	5.41E-03	1.000	7.91E-03	1.000	27.20	55834	72290
1067	4.90E-03	0.999	7.34E-03	0.999	25.50	62301	72290
1068	5.41E-03	1.000	7.54E-03	0.999	25.44	64727	72290
1069	5.13E-03	1.000	7.57E-03	1.000	26.14	71154	72290
1070	5.20E-03	1.000	7.49E-03	0.999	25.64	73620	72290
1071							
1072							
1073	5.64E-03	1.000	8.20E-03	0.999	28.15	85028	72290
1074	4.49E-03	0.994	7.25E-03	0.999	25.86	91447	72290
1075	5.22E-03	0.999	6.99E-03	0.999	23.21	93909	72290
1076	5.98E-03	1.000	6.97E-03	0.999	21.75	100311	72290
1077	6.82E-03	1.000	9.10E-03	0.999	23.64	102739	72290
1078	7.86E-03	1.000	7.63E-03	0.999	21.07	105158	72290
1079	7.49E-03	1.000	7.49E-03	0.999	21.36	111620	72290
1080	8.78E-03	1.000	7.83E-03	0.999	24.24	114038	72290
1081	6.60E-03	1.000	7.92E-03	0.999	24.99	120454	72290
1082	6.49E-03	1.000	7.89E-03	0.999	25.08	122909	72290
1083	6.54E-03	1.000	8.02E-03	0.999	25.58	125324	72290
1084	6.33E-03	1.000	7.93E-03	0.999	25.58	131739	72290
1085	6.05E-03	1.000	8.23E-03	0.999	27.54	134150	72290
1086	6.13E-03	1.000	8.33E-03	0.999	27.88	140602	72290
1087	6.09E-03	1.000	8.16E-03	0.999	27.11	143013	72290
1088	6.23E-03	1.000	8.49E-03	1.000	28.39	145424	72290
1089	6.20E-03	1.000	9.30E-03	1.000	32.30	151834	72290
1090	6.19E-03	1.000	9.76E-03	0.999	34.50	154245	72290
1091	6.14E-03	1.000	9.81E-03	0.999	34.84	160658	72290
1092	6.29E-03	1.000	9.94E-03	0.999	35.20	163110	72290
1093	6.18E-03	1.000	9.94E-03	0.999	36.38	165522	72290
1094	6.11E-03	1.000	9.32E-03	0.999	32.58	171936	72290
1095	5.45E-03	0.999	9.80E-03	0.999	39.11	174347	72290

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1096	5.90E-03	1.000	1.01E-02	0.999	36.59	180759	72290
1097	5.96E-03	1.000	9.68E-03	0.999	34.56	183212	72290
1098	5.55E-03	1.000	9.65E-03	0.999	35.20	185625	72290
1099	5.83E-03	1.000	9.22E-03	0.999	32.44	192039	72290
1100							
1101							
1102							
1103							
1104	7.52E-03	1.000	8.40E-03	0.999	25.56	213311	72290
1105	7.33E-03	1.000	1.01E-02	0.999	34.00	215722	72290
1106	2.26E-04	0.961	8.48E-04	0.953	3.58	222159	72290
1107	1.56E-04	0.843	3.84E-03	0.993	17.90	224631	72290
1108	2.59E-04	0.901	3.98E-03	0.996	18.38	231106	72290
1109	9.15E-06	0.777	5.03E-03	0.998	23.66	233632	72290
1110	1.84E-04	1.034	3.99E-03	0.999	18.56	3	72390
1111	3.59E-06	0.412	5.29E-03	0.998	24.99	2428	72390
1112	3.53E-03	0.997	9.42E-03	0.999	37.94	4838	72390
1113	1.70E-04	0.544	8.03E-03	0.999	37.71	11259	72390
1114	2.19E-06	0.359	5.31E-03	0.997	25.11	13722	72390
1115	6.32E-06	1.069	4.76E-03	0.999	22.44	20149	72390
1116	6.23E-06	0.803	5.38E-03	0.997	25.36	22614	72390
1117	3.06E-06	0.616	4.86E-03	0.990	22.96	25041	72390
1118	2.23E-06	0.268	4.58E-03	0.997	21.64	31510	72390
1119	1.90E-04	1.039	4.49E-03	0.999	20.89	33950	72390
1120	1.38E-04	0.907	4.70E-03	0.999	22.02	40428	72390
1121	1.48E-04	1.027	4.37E-03	0.996	20.40	42909	72390
1122	8.19E-06	0.792	5.06E-03	0.999	23.83	45361	72390
1123	5.59E-03	1.000	1.03E-02	0.996	38.40	51809	72390
1124	5.57E-03	1.000	8.48E-03	0.999	29.60	54224	72390
1125	5.42E-03	1.000	8.36E-03	0.999	29.27	60641	72390
1126	5.21E-03	1.000	8.74E-03	0.999	31.53	63057	72390
1127	5.31E-03	1.000	7.26E-03	0.999	24.30	65517	72390
1128	4.66E-03	0.999	6.72E-03	0.999	22.97	71935	72390
1129							
1130	7.66E-03	0.999	7.71E-03	0.999	27.34	81421	72390
1131	8.81E-03	1.000	7.46E-03	0.999	23.64	83838	72390
1132	8.16E-03	1.000	7.68E-03	0.999	26.49	90252	72390
1133	7.80E-03	1.000	8.66E-03	0.999	34.93	92706	72390
1134	6.17E-03	1.000	9.98E-03	1.000	44.51	95120	72390
1135	6.32E-03	1.000	1.07E-02	0.999	49.05	101534	72390
1136	6.72E-03	1.000	8.83E-03	0.999	36.87	103946	72390
1137	6.37E-03	1.000	1.31E-02	0.999	63.19	110359	72390
1138	6.54E-03	1.000	1.43E-02	1.000	70.34	112811	72390
1139	6.79E-03	1.000	1.30E-02	1.000	61.48	115222	72390
1140	6.77E-03	1.000	1.24E-02	0.999	57.93	121634	72390
1141	6.80E-03	1.000	1.26E-02	1.000	58.98	124044	72390
1142	6.89E-03	1.000	1.41E-02	0.999	68.30	130454	72390
1143	6.99E-03	1.000	1.26E-02	1.000	59.07	132304	72390
1144	6.82E-03	1.000	1.42E-02	0.999	68.61	135313	72390
1145	6.61E-03	1.000	1.27E-02	0.999	60.15	141723	72390
1146	6.71E-03	1.000	1.43E-02	1.000	69.81	144135	72390
1147	6.32E-03	1.000	1.34E-02	1.000	66.50	150546	72390
1148	5.71E-03	1.000	1.30E-02	1.000	64.19	152958	72390
1149	6.98E-03	1.000	1.31E-02	0.998	61.91	155407	72390
1150	7.08E-03	1.000	1.32E-02	1.000	62.46	161818	72390
1151	6.99E-03	1.000	1.33E-02	0.999	62.74	164228	72390
1152	9.50E-03	1.000	1.37E-02	1.000	59.43	170640	72390
1153	9.60E-03	1.000	1.40E-02	0.999	60.76	173052	72390
1154	8.90E-03	1.000	1.39E-02	0.999	61.15	175503	72390
1155	9.22E-03	1.000	1.39E-02	0.998	61.32	181915	72390
1156	8.30E-03	1.000	1.37E-02	1.000	62.34	184328	72390
1157	8.33E-03	1.000	1.39E-02	1.000	63.57	190740	72390
1158	8.70E-03	1.000	1.48E-02	1.000	67.66	193150	72390
1159	6.07E-03	1.000	1.36E-02	0.999	62.15	195601	72390
1160	8.16E-03	1.000	1.23E-02	0.999	54.36	202014	72390
1161	8.02E-03	1.000	1.31E-02	0.999	59.20	204425	72390
1162	9.01E-03	1.000	1.31E-02	1.000	59.54	210837	72390
1163	7.96E-03	1.000	1.27E-02	1.000	57.37	213248	72390
1164	8.06E-03	1.000	1.22E-02	1.000	54.06	215701	72390
1165							
1166	8.26E-03	1.000	1.33E-02	0.999	64.56	225215	72390
1167	8.61E-03	1.000	1.28E-02	1.000	60.34	231627	72390
1168	8.95E-03	1.000	1.38E-02	0.999	65.42	234037	72390

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar Wastewater Treatment Plant (June 28 to Sept 1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1169	8.61E-03	1.000	1.29E-02	1.000	60.73	440	72490
1170	7.98E-03	1.000	1.35E-02	0.999	66.01	2901	72490
1171	8.33E-03	0.998	1.25E-02	0.999	63.97	5317	72490
1172	8.89E-03	1.000	1.26E-02	0.999	57.89	11729	72490
1173	8.40E-03	1.000	1.27E-02	0.999	59.83	14141	72490
1174	8.33E-03	1.000	1.29E-02	0.999	61.23	20556	72490
1175	7.98E-03	1.000	1.25E-02	1.000	59.58	23007	72490
1176	8.80E-03	1.000	1.26E-02	0.999	58.57	25421	72490
1177	8.26E-03	1.000	1.17E-02	0.999	54.10	31839	72490
1178	8.27E-03	1.000	1.22E-02	0.999	57.43	34254	72490
1179	7.96E-03	1.000	1.16E-02	0.997	54.40	40711	72490
1180	7.78E-03	1.000	1.08E-02	0.998	49.31	43127	72490
1181	7.11E-03	1.000	1.08E-02	0.999	50.15	45548	72490
1182	7.13E-03	1.000	1.01E-02	0.999	46.78	52010	72490
1183	7.00E-03	1.000	1.25E-02	0.999	62.14	54428	72490
1184	6.87E-03	1.000	9.47E-03	0.998	43.19	60848	72490
1185	6.89E-03	1.000	1.11E-02	0.999	54.22	63309	72490
1186	7.00E-03	1.000	1.10E-02	0.999	52.67	65728	72490
1187	6.97E-03	1.000	1.01E-02	0.998	47.25	72148	72490
1188	Note 16.DO Probe coated with grease						
1189							
1190							
1191							
1192							
1193							
1194							
1195							
1196							
1197							
1198							
1199							
1200							
1201							
1202	3.86E-03	0.998	9.14E-03	0.998	48.83	130916	72490
1203	5.52E-03	0.999	8.22E-03	0.997	38.68	133330	72490
1204	6.18E-03	1.000	8.15E-03	0.995	36.52	135745	72490
1205	4.16E-03	0.998	7.74E-03	0.998	39.07	142200	72490
1206	6.16E-03	0.998	7.45E-03	0.999	32.03	144616	72490
1207	6.50E-03	0.999	7.91E-03	0.998	34.15	151031	72490
1208	6.55E-03	1.000	7.21E-03	0.997	29.51	153447	72490
1209	9.89E-04	0.985	2.41E-03	0.962	13.02	155924	72490
1210	7.39E-03	0.999	7.16E-03	1.000	27.00	162339	72490
1211	6.67E-03	0.999	8.03E-03	0.995	34.50	164753	72490
1212	6.14E-03	0.998	8.06E-03	1.000	36.94	171209	72490
1213	7.10E-03	0.999	8.48E-03	0.997	36.18	173621	72490
1214	7.08E-03	1.000	7.82E-03	0.999	32.14	180036	72490
1215	6.96E-03	0.999	8.19E-03	0.999	34.78	182449	72490
1216	7.18E-03	1.000	7.36E-03	0.997	28.77	184903	72490
1217	7.08E-03	0.999	8.31E-03	0.995	36.25	191324	72490
1218	5.29E-03	0.998	6.37E-03	0.995	27.33	193739	72490
1219	4.53E-03	0.999	7.09E-03	0.998	33.98	200153	72490
1220	6.69E-03	1.000	7.78E-03	1.000	32.31	202608	72490
1221	7.08E-03	1.000	7.12E-03	0.995	27.54	205022	72490
1222	7.39E-03	0.995	8.02E-03	0.995	18.72	211436	72490
1223							
1224	9.83E-03	1.000	8.93E-03	0.998	29.98	220816	72490
1225	9.69E-03	1.000	9.44E-03	0.999	33.40	223230	72490
1226	8.89E-03	1.000	1.01E-02	0.996	39.44	225644	72490
1227	8.04E-03	1.000	1.00E-02	0.999	40.93	232058	72490
1228	8.76E-03	1.000	9.18E-03	0.998	34.04	234611	72490
1229	8.73E-03	0.999	8.88E-03	0.997	32.22	927	72590
1230	8.59E-03	0.999	9.23E-03	0.993	34.76	3339	72590
1231	8.41E-03	1.000	8.89E-03	0.997	33.15	5751	72590
1232	8.21E-03	0.998	7.82E-03	0.999	27.18	12204	72590
1233	7.89E-03	0.997	8.24E-03	0.999	30.53	14619	72590
1234	8.11E-03	0.999	6.93E-03	0.998	21.54	21034	72590
1235	8.61E-03	0.998	7.37E-03	1.000	23.53	23449	72590
1236	8.27E-03	1.000	7.48E-03	1.000	24.89	25906	72590
1237	7.93E-03	0.999	6.94E-03	0.997	22.61	32326	72590
1238	7.85E-03	0.998	7.61E-03	1.000	26.81	34743	72590
1239	7.78E-03	1.000	6.01E-03	0.989	17.46	41201	72590
1240	8.01E-03	0.998	8.03E-03	0.998	28.97	43625	72590
1241	6.46E-03	0.995	6.83E-03	0.998	25.44	50061	72590

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar Wastewater Treatment Plant (June 28 to Sept 1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1242	7.22E-03	0.999	6.84E-03	0.999	23.71	52512	72590
1243	7.18E-03	0.999	7.36E-03	0.999	26.88	54935	72590
1244	7.06E-03	0.999	6.26E-03	0.998	20.76	61350	72590
1245	6.86E-03	0.999	5.45E-03	0.999	16.22	63827	72590
1246	6.57E-03	0.997	5.71E-03	0.998	16.50	70253	72590
1247	6.61E-03	0.999	5.47E-03	0.992	16.94	72715	72590
1248							
1249	7.43E-03	0.998	7.12E-03	0.999	23.34	82128	72590
1250	6.98E-03	1.000	5.16E-03	0.998	13.31	84546	72590
1251	4.50E-03	0.987	5.27E-03	0.994	19.52	91004	72590
1252	5.96E-03	0.999	1.99E-02	0.991	96.42	93420	72590
1253	6.30E-03	0.999	6.11E-03	0.998	20.17	95834	72590
1254	5.77E-03	0.995	5.88E-03	1.000	20.09	102248	72590
1255	6.04E-03	0.998	6.38E-03	0.997	22.32	104702	72590
1256	5.90E-03	0.998	5.84E-03	1.000	19.60	111117	72590
1257	6.02E-03	1.000	5.82E-03	0.999	18.08	113531	72590
1258	6.02E-03	0.999	6.12E-03	0.999	20.86	115945	72590
1259	5.33E-03	0.998	4.81E-03	0.993	15.08	122359	72590
1260	6.08E-03	0.995	4.65E-03	0.994	12.50	124809	72590
1261	5.90E-03	0.997	3.13E-03	0.992	4.31	131220	72590
1262	6.33E-03	0.997	4.67E-03	0.999	12.01	133634	72590
1263	5.39E-03	1.000	4.08E-03	0.995	10.84	140046	72590
1264	5.27E-03	0.998	4.64E-03	0.998	14.25	142458	72590
1265	6.10E-03	0.999	5.30E-03	1.000	16.09	144911	72590
1266	5.07E-03	0.999	4.23E-03	0.999	12.38	151325	72590
1267	4.52E-03	0.997	4.00E-03	1.000	12.39	153737	72590
1268	5.07E-03	0.999	2.69E-03	0.995	3.72	160152	72590
1269	5.80E-03	0.998	4.32E-03	0.999	11.65	162603	72590
1270	5.76E-03	0.999	4.42E-03	1.000	11.92	165015	72590
1271	5.87E-03	0.999	4.04E-03	0.998	9.50	171429	72590
1272	4.71E-03	0.999	3.58E-03	0.998	9.54	173841	72590
1273	Note 17.Sampler not functioning						
1274							
1275							
1276							
1277							
1278							
1279							
1280							
1281							
1282							
1283							
1284							
1285							
1286							
1287							
1288	5.52E-03	0.999	3.30E-03	0.995	4.93	233014	72590
1289	5.44E-03	0.994	4.75E-03	0.995	11.60	235426	72590
1290	5.37E-03	0.997	4.57E-03	0.998	10.83	1837	72690
1291	5.29E-03	0.998	4.43E-03	0.998	10.41	4300	72690
1292	5.43E-03	0.999	4.75E-03	0.998	11.82	10710	72690
1293	5.20E-03	0.999	4.20E-03	0.997	9.54	13121	72690
1294	5.25E-03	0.996	4.13E-03	0.998	9.14	15534	72690
1295	3.98E-03	0.995	3.33E-03	0.999	7.87	21947	72690
1296	4.72E-03	1.000	2.78E-03	0.999	3.92	24401	72690
1297	4.56E-03	0.999	4.58E-03	0.998	12.38	30818	72690
1298	4.78E-03	0.999	4.47E-03	0.998	11.40	33233	72690
1299	4.88E-03	1.000	4.31E-03	0.996	10.68	35648	72690
1300	4.92E-03	0.995	4.84E-03	1.000	12.06	42103	72690
1301	4.31E-03	0.998	2.14E-03	0.997	1.87	44520	72690
1302	4.36E-03	0.999	2.03E-03	0.998	1.31	50938	72690
1303	4.00E-03	0.998	1.98E-03	1.000	1.84	53400	72690
1304	4.04E-03	1.000	4.27E-03	1.000	11.92	55817	72690
1305	4.34E-03	1.000	4.83E-03	1.000	14.37	62236	72690
1306	4.38E-03	0.999	3.46E-03	0.999	7.65	64858	72690
1307	6.66E-03	1.000	3.33E-03	0.980	2.97	71116	72690
1308	6.36E-03	0.999	3.83E-03	0.997	8.26	73640	72690
1309	6.17E-03	0.995	3.86E-03	0.997	6.68	75854	72690
1310	6.68E-03	0.999	3.84E-03	0.980	4.38	82414	72690
1311	6.39E-03	0.997	4.17E-03	0.990	7.32	84831	72690
1312	5.71E-03	0.997	3.90E-03	1.000	7.28	91250	72690
1313	5.86E-03	0.999	3.86E-03	0.997	7.23	93715	72690
1314	6.44E-03	0.999	4.51E-03	0.999	8.88	100130	72690

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef. Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1315	5 37E-03	0 998	3 45E-03	0 993	5.88	102546	72690
1316	5 97E-03	0.990	4.38E-03	0 997	8 98	105004	72690
1317	5 00E-03	0 998	3 57E-03	0 999	7.06	111417	72690
1318	5 06E-03	0 997	4 58E-03	0 999	11 58	113829	72690
1319	4 65E-03	0 997	4 14E-03	0 994	10 28	120242	72690
1320	4 49E-03	0 998	3.59E-03	0 908	8 08	122653	72690
1321	4 65E-03	0 997	3 34E-03	0 998	8.67	125106	72690
1322	4 55E-03	0 994	1 97E-03	0.994	0.67	131518	72690
1323	5 28E-03	0 999	2 71E-03	0.998	2.69	133929	72690
1324	4 52E-03	0 993	2.33E-03	0 986	2.35	140341	72690
1325	4 10E-03	0 999	2 87E-03	0 997	5.56	142752	72690
1326	2 99E-03	0 998	1.78E-03	0 999	2 61	145204	72690
1327							
1328	6 42E-03	0 999	1 88E-03	0 998	-2 55	155012	72690
1329	5 53E-03	1 000	2 32E-03	0 999	0.38	161422	72690
1330							
1331							
1332	1 45E-02	0 979	2 35E-02	1 000	63 65	172522	72690
1333	9 96E-03	0.999	1 81E-02	1 000	52.23	174940	72690
1334	8 27E-03	0.998	1.89E-02	1.000	58.17	181404	72690
1335	1 14E-02	1 000	1.64E-02	1 000	42 67	183824	72690
1336	1 10E-02	1.000	1 54E-02	1.000	39 43	190243	72690
1337	1 13E-02	1.000	1.54E-02	1.000	39.09	192701	72690
1338	1 04E-02	1 000	1 48E-02	1 000	38.38	195119	72690
1339	1 10E-02	1 000	1.49E-02	1 000	37 66	201540	72690
1340	1 03E-02	1.000	1.57E-02	1 000	41.47	204000	72690
1341	9 97E-03	1 000	1 67E-02	1.000	45.62	210414	72690
1342	8 93E-03	1 000	1.59E-02	1.000	44 22	212830	72690
1343							
1344	1 18E-02	0 999	1 88E-02	1.000	50 87	222018	72690
1345	1 40E-02	1 000	1.96E-02	1 000	50 39	224429	72690
1346	1 28E-02	1 000	1 89E-02	1.000	49.73	230843	72690
1347	1 34E-02	0 999	1.91E-02	1 000	49.31	233258	72690
1348	1 29E-02	1 000	1.8?E-02	1 000	47.06	235713	72690
1349	1 28E-02	1.000	[illegible]	1.000	50.69	2127	72790
1350	1 29E-02	1.000	1 97E-02	1 000	48.80	4543	72790
1351	1 27E-02	1 000	1 97E-02	1.000	52.46	10958	72790
1352	1 18E-02	0.999	1 76E-02	1.000	48.44	13412	72790
1353	1 24E-02	1.000	1 80E-02	1.000	47.10	15828	72790
1354	1 17E-02	1.000	1 77E-02	1.000	48.99	22244	72790
1355	1.14E-02	1.000	1 83E-02	1 000	49.86	24702	72790
1356	1.18E-02	1.000	1 88E-02	1.000	49 87	31119	72790
1357	9 89E-03	1.000	1 58E-02	1.000	42.86	33539	72790
1358	1.06E-02	1 000	1.58E-02	1 000	40.94	40003	72790
1359	9 48E-03	1.000	1 49E-02	1.000	40.06	42430	72790
1360	9 56E-03	1.000	1 53E-02	1 000	41 43	44853	72790
1361	8 64E-03	1 000	1.69E-02	1 000	48.19	51315	72790
1362	8 80E-03	1 000	1.57E-02	1 000	43.83	53737	72790
1363	9.17E-03	1 000	1 53E-02	1.000	41 78	60200	72790
1364	9 02E-03	1 000	1 68E-02	1.000	46 69	62620	72790
1365	7 86E-03	0 999	1.53E-02	1 000	43.96	65049	72790
1366	9 13E-03	1.000	1.20E-02	1.000	30.19	71512	72790
1367							
1368	1 73E-02	0.983	1 98E-02	1.000	46.31	80622	72790
1369	1.49E-02	1.000	1.99E-02	1.000	50.34	82941	72790
1370	1 39E-02	1.000	1 98E-02	1.000	50.62	86401	72790
1371	1 41E-02	1.000	1 73E-02	1.000	41 83	91820	72790
1372	1 41E-02	1 000	2.07E-02	1 000	54.44	94236	72790
1373	1 37E-02	1.000	2.08E-02	1 000	54.41	100649	72790
1374	1 31E-02	1.000	1.78E-02	1.000	46.29	103106	72790
1375							
1376							
1377							
1378							
1379	1 26E-02	1 000	1 97E-02	1 000	52.73	130358	72790
1380	3 37E-03	0.976	2.00E-02	1.000	67.27	132813	72790
1381	1 25E-03	0 873	1.80E-02	1.000	63 01	135230	72790
1382	1.50E-02	1.000	2.28E-02	1 000	60.40	141643	72790
1383	1 48E-02	1.000	2.32E-02	1.000	62.48	144056	72790
1384	1 36E-02	0.999	2.10E-02	1.000	58.29	150510	72790
1385	1.53E-02	1.000	2.28E-02	1.000	58.42	152923	72790
1386	1 52E-02	1 000	2.11E-02	1.000	54.03	155337	72790
1387	1 53E-02	1.000	2.18E-02	1.000	56.50	161748	72790

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1388	1.43E-02	1.000	2.03E-02	1.000	52.70	164202	72790
1389	1.52E-02	1.000	2.07E-02	1.000	52.83	170615	72790
1390	1.38E-02	1.000	2.05E-02	1.000	53.87	173030	72790
1391	1.43E-02	0.999	1.99E-02	1.000	51.00	175444	72790
1392	1.48E-02	1.000	2.08E-02	1.000	53.66	181857	72790
1393	1 43E-02	1.000	2.00E-02	1.000	51.41	184312	72790
1394	1.47E-02	1.000	2 04E-02	1 000	52.47	190725	72790
1395	1 45E-02	1.000	1.89E-02	1.000	47.19	193139	72790
1396	1.39E-02	1.000	1.97E-02	1.000	51.08	195553	72790
1397	1.38E-02	1.000	1.93E-02	1.000	49.56	202008	72790
1398	1.39E-02	1.000	1.86E-02	1.000	46.83	204423	72790
1399	1.13E-02	1.000	1 78E-02	1.000	47.01	210837	72790
1400	1.22E-02	0.999	1.79E-02	1.000	46.83	213251	72790
1401							
1402	1.51E-02	1.000	2.10E-02	1.000	53.90	223514	72790
1403	1 56E-02	1.000	2.11E-02	1.000	53.83	225927	72790
1404	1.62E-02	1.009	1.73E-02	1.000	40.31	232338	72790
1405	1.55E-02	1.000	[illegible]	1.000	45.61	234750	72790
1406	1.49E-02	[illegible]	[illegible]	1.000	45.53	1205	72890
1407	[illegible]	[illegible]	[illegible]	1.000	45.97	3617	72890
1408	1.44E-02	[illegible]	[illegible]	1.000	50.73	10030	72890
1409	1.47E-02	[illegible]	[illegible]	1.000	45.66	12444	72890
1410	1.49E-02	[illegible]	[illegible]	1.000	47.83	14858	72890
1411	1.49E-02	[illegible]	[illegible]	1.000	56.73	21307	72890
1412	1.48E-02	[illegible]	[illegible]	1.000	47.74	23721	72890
1413	1.48E-02	[illegible]	[illegible]	1.000	49 54	30137	72890
1414	1.48E-02	[illegible]	[illegible]	1.000	50.62	32618	72890
1415	1.41E-02	1 000	1.98E-02	1.000	50.10	35033	72890
1416	1.42E-02	1.000	1.87E-02	1.000	46.69	41449	72890
1417	1.40E-02	1.000	1.98E-02	1.000	51.07	43908	72890
1418	1.36E-02	1.000	1 68E-02	1.000	40.84	50321	72890
1419	1.16E-02	1.000	1.87E-02	1.000	50.53	52740	72890
1420	1.27E-02	1.000	1.58E-02	1.000	38.63	56158	72890
1421	1.15E-02	1.000	1.41E-02	1.000	34.28	61617	72890
1422	1.09E-02	1.000	1.63E-02	1.000	43.16	64036	72890
1423	1.08E-02	1.000	1.38E-02	1.000	34.16	70455	72890
1424	1.00E-02	1.000	1.31E-02	1.000	32.79	72915	72890
1425	9.64E-03	1.000	1.65E-02	1.000	45.63	75333	72890
1426							
1427							
1428	1 20E-02	0.999	1.27E-02	1.000	28.38	90621	72890
1429	1.44E-02	1.000	1.18E-02	1.000	21.82	92939	72890
1430	1.19E-02	1.000	1.24E-02	1.000	27.51	96357	72890
1431	1.22E-02	0.999	1.25E-02	1.000	27.47	101813	72890
1432	1.41E-02	1.000	1.31E-02	1.000	26 84	104226	72890
1433	1.48E-02	1.000	1.32E-02	1.000	26.58	110639	72890
1434	1.36E-02	0.999	1.34E-02	1.000	28.79	113052	72890
1435	6.51E-03	0.999	1.38E-02	1.000	40.48	115604	72890
1436	1.58E-02	1.000	1.48E-02	1.000	30 67	121913	72890
1437	1.48E-02	1.000	1.45E-02	1.000	31.41	124321	72890
1438	1.36E-02	0.998	1 45E-02	1.000	32.81	130730	72890
1439	1.50E-02	1.000	1.44E-02	1.000	30.32	133139	72890
1440	1.59E-02	1.000	1.56E-02	1.000	32 08	135644	72890
1441	1.53E-02	1.000	1.50E-02	1.000	32.08	141951	72890
1442	1.29E-02	0.999	1.50E-02	1.000	36.49	144358	72890
1443	1.23E-02	0.998	1.42E-02	1.000	33.46	150806	72890
1444	7.40E-03	0.999	1.24E-02	1.000	33.86	153212	72890
1445	1.39E-02	0.999	1.36E-02	1.000	28.98	155618	72890
1446	1.32E-02	1.000	1.35E-02	1.000	29.78	162025	72890
1447	1.43E-02	1.000	1.38E-02	1.000	29.28	164432	72890
1448	5.24E-03	0.974	1.51E-02	1.000	48.75	170843	72890
1449	1.52E-02	1.000	1.48E-02	1.000	30.66	173419	72890
1450	2.57E-03	0.974	1.78E-02	1.000	60.41	175832	72890
1451	1.40E-02	0.999	1.48E-02	1.000	32.37	182242	72890
1452	1.58E-02	1.000	1.48E-02	1.000	30.66	184651	72890
1453	1.50E-02	1.000	1.49E-02	1.000	32.01	191059	72890
1454	1.49E-02	1.000	1.57E-02	1.000	36.00	193507	72890
1455	1.39E-02	0.999	1.48E-02	1.000	32.61	195916	72890
1456	1.53E-02	1.000	1.44E-02	1.000	29.79	202323	72890
1457	2.69E-04	0.959	7.32E-03	1.000	25.98	204756	72890
1458							
1459							
1460							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1461							
1462	3.85E-03	0.999	7.88E-03	0.988	22.82	230415	72890
1463	1.15E-02	0.998	1.40E-02	1.000	33.82	232828	72890
1464	1.22E-02	0.999	1.41E-02	1.000	33.28	235242	72890
1465	1.18E-02	1.000	1.40E-02	1.000	33.28	1655	72990
1466	1.25E-02	0.999	1.40E-02	1.000	32.26	4109	72990
1467	1.10E-02	0.999	1.38E-02	1.000	33.74	10523	72990
1468	1.33E-02	1.000	1.40E-02	1.000	31.07	12938	72990
1469	1.21E-02	1.000	1.41E-02	1.000	33.33	15353	72990
1470	1.23E-02	0.999	1.37E-02	1.000	31.72	21809	72990
1471	1.32E-02	1.000	1.37E-02	1.000	30.13	24226	72990
1472	1.19E-02	1.000	1.35E-02	1.000	31.47	30642	72990
1473	1.19E-02	0.999	1.34E-02	1.000	31.20	33058	72990
1474	1.14E-02	0.999	1.34E-02	0.998	31.72	35515	72990
1475	1.18E-02	1.000	1.29E-02	1.000	29.73	41934	72990
1476	1.12E-02	1.000	1.26E-02	1.000	29.41	44352	72990
1477	1.09E-02	1.000	1.23E-02	1.000	28.70	50810	72990
1478	1.03E-02	0.999	1.20E-02	1.000	28.43	53229	72990
1479	1.00E-02	1.000	1.18E-02	1.000	28.00	55653	72990
1480	9.83E-03	1.000	1.18E-02	1.000	27.59	62115	72990
1481	9.39E-03	1.000	1.11E-02	1.000	26.82	64539	72990
1482	9.02E-03	1.000	9.14E-03	1.000	19.90	71002	72990
1483	8.79E-03	1.000	8.49E-03	1.000	17.92	73426	72990
1484							
1485	1.22E-02	1.000	9.38E-03	1.000	16.28	82826	72890
1486	1.07E-02	1.000	1.01E-04	0.966	-15.03	85254	72890
1487	9.48E-05	0.955	1.48E-05	0.898	-0.06	91723	72890
1488	5.12E-04	0.903	1.55E-04	0.907	-0.18	94150	72890
1489	4.32E-03	0.990	9.19E-03	1.000	26.88	100617	72890
1490	1.34E-02	0.999	9.78E-03	1.000	15.92	103036	72890
1491	1.33E-02	1.000	9.64E-03	1.000	15.60	105455	72890
1492	1.33E-02	1.000	9.99E-03	1.000	16.85	111914	72890
1493	1.33E-02	1.000	1.06E-02	1.000	19.66	114329	72890
1494	1.28E-02	1.000	1.08E-02	1.000	20.33	120746	72890
1495	1.32E-02	1.000	1.11E-02	1.000	20.97	123157	72890
1496	1.35E-02	0.999	1.14E-02	1.000	21.79	125609	72890
1497	1.32E-02	1.000	1.13E-02	1.000	21.73	132019	72890
1498	1.33E-02	1.000	1.15E-02	1.000	22.21	134431	72890
1499	1.33E-02	1.000	1.85E-02	1.000	47.48	140842	72890
1500	1.36E-02	1.000	1.25E-02	1.000	25.56	143251	72890
1501	1.31E-02	1.000	1.22E-02	1.000	25.01	145700	72890
1502	Note 18:RAS seed tank empty						
1503							
1504							
1505							
1506							
1507							
1508							
1509							
1510							
1511							
1512							
1513							
1514							
1515							
1516							
1517	1.32E-02	1.000	1.40E-02	1.000	31.30	210857	72890
1518							
1519	1.23E-02	1.000	1.52E-02	1.000	37.12	220417	72890
1520	1.22E-02	1.000	1.47E-02	1.000	35.35	222832	72990
1521	1.22E-02	1.000	1.51E-02	1.000	36.84	225248	72990
1522	1.20E-02	1.000	1.71E-02	1.000	44.22	231703	72990
1523	1.10E-02	1.000	1.20E-02	1.000	27.53	234115	72990
1524	Note 19:Sampler tubing blocked						
1525							
1526							
1527							
1528							
1529							
1530							
1531							
1532							
1533							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No	OUR 1 mg/L.sec	Coef. Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1534							
1535							
1536							
1537							
1538							
1539							
1540							
1541							
1542							
1543							
1544	1.19E-02	1.000	9.06E-03	0.998	16.76	80125	73090
1545	1.01E-02	1.000	8.53E-03	1.000	17.60	82547	73090
1546	9.59E-03	1.000	1.23E-02	1.000	32.98	85006	73090
1547	8.44E-03	1.000	1.34E-02	1.000	39.04	91424	73090
1548	1.15E-02	0.998	1.45E-02	1.000	38.72	93841	73090
1549	9.00E-03	0.998	1.30E-02	1.000	36.93	100300	73090
1550	7.82E-03	0.999	1.37E-02	1.000	41.06	102714	73090
1551	9.75E-03	1.000	1.41E-02	1.000	38.92	105126	73090
1552	8.82E-03	1.000	1.39E-02	1.000	39.34	111538	73090
1553	9.75E-03	1.000	1.45E-02	1.000	41.42	113950	73090
1554	9.20E-03	0.999	1.29E-02	1.000	36.07	120407	73090
1555	9.29E-03	1.000	1.33E-02	1.000	37.33	122819	73090
1556	9.26E-03	1.000	1.44E-02	1.000	42.04	125229	73090
1557	9.58E-03	1.000	1.45E-02	1.000	41.77	131641	73090
1558	8.93E-03	1.000	1.33E-02	0.998	38.15	134053	73090
1559	8.51E-03	1.000	1.40E-02	1.000	41.34	140506	73090
1560	7.83E-03	1.000	1.36E-02	1.000	40.86	142917	73090
1561	8.02E-03	1.000	1.36E-02	1.000	40.66	145344	73090
1562	7.88E-03	0.998	1.38E-02	1.000	41.81	151757	73090
1563	7.67E-03	0.998	1.26E-02	1.000	37.11	154214	73090
1564	8.19E-03	1.000	1.30E-02	1.000	37.98	160628	73090
1565	7.38E-03	0.997	1.29E-02	0.998	39.09	163042	73090
1566	1.07E-02	1.000	1.39E-02	1.000	37.57	165455	73090
1567	1.07E-02	0.999	1.39E-02	1.000	37.56	171906	73090
1568	1.06E-02	1.000	1.38E-02	1.000	37.38	174319	73090
1569	1.02E-02	0.999	1.36E-02	1.000	36.73	180731	73090
1570	1.00E-02	1.000	1.32E-02	1.000	36.12	183145	73090
1571	9.92E-03	1.000	1.37E-02	1.000	38.01	185600	73090
1572	1.01E-02	1.000	1.32E-02	1.000	36.97	192013	73090
1573	9.41E-03	0.999	1.36E-02	1.000	37.94	194425	73090
1574	9.43E-03	1.000	1.25E-02	1.000	34.03	200840	73090
1575	9.21E-03	1.000	1.25E-02	1.000	34.32	203256	73090
1576	6.84E-03	0.999	1.27E-02	1.000	36.03	206709	73090
1577							
1578	9.22E-03	0.999	1.33E-02	1.000	57.57	215215	73090
1579	1.04E-02	1.000	1.30E-02	1.000	53.07	221627	73090
1580	9.72E-03	1.000	1.38E-02	0.999	59.36	224038	73090
1581	6.66E-03	0.999	1.28E-02	1.000	60.78	230453	73090
1582	8.52E-03	0.992	1.32E-02	1.000	58.79	232904	73090
1583	9.61E-03	1.000	1.28E-02	1.000	53.89	235315	73090
1584	6.05E-03	0.998	1.24E-02	1.000	59.64	1730	73190
1585	8.27E-03	0.999	1.33E-02	1.000	60.10	4131	73190
1586	8.40E-03	0.999	1.36E-02	1.000	60.61	10566	73190
1587	6.34E-03	1.000	1.27E-02	1.000	61.07	13009	73190
1588	5.69E-03	0.999	1.33E-02	0.999	66.91	15423	73190
1589	8.10E-03	0.999	1.38E-02	1.000	63.18	21836	73190
1590	7.82E-03	0.998	1.27E-02	1.000	57.89	24250	73190
1591	7.23E-03	0.998	1.27E-02	1.000	58.78	30703	73190
1592	7.54E-03	0.996	1.23E-02	1.000	56.42	33122	73190
1593	7.38E-03	0.998	1.19E-02	1.000	53.72	35641	73190
1594	6.93E-03	1.000	1.27E-02	1.000	59.56	42002	73190
1595	7.26E-03	1.000	1.29E-02	1.000	59.95	44428	73190
1596	6.98E-03	0.998	1.20E-02	0.999	56.03	50849	73190
1597	3.19E-03	0.995	1.24E-02	1.000	67.06	53309	73190
1598	6.31E-03	0.999	1.18E-02	1.000	55.98	55730	73190
1599	4.82E-03	0.998	9.66E-03	0.999	46.85	62153	73190
1600	5.87E-03	0.998	9.69E-03	0.994	44.04	64615	73190
1601	4.58E-03	0.999	1.23E-02	0.989	62.86	71043	73190
1602							
1603	3.67E-03	0.993	9.71E-03	1.000	49.45	81228	73190
1604	3.69E-03	0.997	1.03E-02	0.998	52.92	83649	73190
1605	4.28E-03	0.998	9.88E-03	1.000	49.96	90108	73190
1606	5.50E-03	1.000	9.98E-03	0.998	40.67	92538	73190

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 26 to Sept.1,1990)

Test No	OUR 1 mg/L sec	Coef. Corr	OUR 2 mg/L sec	Coef. Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1607	3 46E-03	0 996	8 27E-03	1 000	41 33	94957	73190
1608	5 13E-03	1 000	9 27E-03	0 999	43.31	101411	73190
1609							
1610							
1611	4 66E-03	1 000	9 87E-03	0 998	46 38	114111	73190
1612	4 85E-03	1 000	1.03E-02	0 998	50 21	120624	73190
1613	5 26E-03	1 000	9 13E-03	1 000	42 14	122934	73190
1614	4 79E-03	1 000	8 97E-03	0 999	42.36	125347	73190
1615	5 06E-03	1.000	9.94E-03	0.999	47 51	131759	73190
1616	5 31E-03	1 000	9.15E-03	0.999	42 19	134211	73190
1617	5 16E-03	1 000	1 04E-02	1 000	50 29	140624	73190
1618	4 83E-03	0.999	9 84E-03	0 999	47 44	143037	73190
1619	4 91E-03	0 993	9.10E-03	0.999	42.81	145449	73190
1620	8 57E-03	1 000	9 88E-03	0.999	38.70	151859	73190
1621	8 86E-03	1 000	1 09E-02	1 000	44 34	154310	73190
1622	8 95E-03	1 000	1.13E-02	1.000	46.09	160721	73190
1623	9 51E-03	1 000	1 12E-02	1 000	44.59	163130	73190
1624	9 05E-03	1 000	1.07E-02	0 999	42.37	165538	73190
1625	8 72E-03	1.000	1 04E-02	1.000	41 76	171949	73190
1626	8.16E-03	1.000	1.05E-02	1.000	43 24	174359	73190
1627	8 95E-03	0.999	1 02E-02	0.999	44 59	180808	73190
1628	7 60E-03	1.000	1 06E-02	1.000	44 50	183217	73190
1629	8 33E-03	1 000	1.03E-02	0.999	41.77	185627	73190
1630	8 04E-03	0.984	1.04E-02	0 998	48.10	192035	73190
1631	8 08E-03	1 000	9 83E-03	1.000	39.57	194442	73190
1632	8 00E-03	1 000	8.80E-03	1.000	33.58	200851	73190
1633	8 30E-03	0 998	8.55E-03	1.000	38 20	203300	73190
1634	7 72E-03	1 000	9.61E-03	1.000	39.14	205707	73190
1635	6 36E-03	1.000	9.86E-03	0.999	44.41	212117	73190
1636							
1637	7 83E-03	1.000	1 09E-02	1.000	46.40	221508	73190
1638	5.98E-03	1.000	1 02E-02	1 000	47.13	223913	73190
1639	7 64E-03	0 999	7 92E-03	0.990	29 15	230318	73190
1640	8.43E-03	0.998	1.04E-02	1.000	46.66	232724	73190
1641	8 94E-03	0 996	8.29E-03	1.000	33.08	235131	73190
1642	7 12E-03	1.000	9 86E-03	1.000	42.80	1539	80190
1643	7.16E-03	0 998	1.00E-02	1.000	43.04	3944	80190
1644	8 07E-03	1.000	8.23E-03	1.000	30.03	10349	80190
1645	7.01E-03	0 999	8.63E-03	0.998	34.98	12756	80190
1646	8.12E-03	0.999	9 42E-03	1.000	41.86	15203	80190
1647	6 78E-03	0 999	9.09E-03	1.000	38.24	21610	80190
1648	5.40E-03	0.999	9.39E-03	0.999	43.40	24017	80190
1649	2.04E-03	0 974	1.02E-02	1.000	58.41	30428	80190
1650	4.89E-03	0.999	8.90E-03	0.998	42.17	32836	80190
1651	6.59E-03	1 000	9 24E-03	1.000	39.60	35242	80190
1652	4 86E-03	1.000	9.10E-03	0 999	42.92	41649	80190
1653	4 32E-03	0.992	8.92E-03	0.999	43 12	44057	80190
1654	3.68E-04	0.858	8.79E-03	1.000	51.87	50506	80190
1655	2 64E-03	0.983	9.19E-03	1.000	48.31	52912	80190
1656	8 94E-04	0 991	8.08E-03	0.999	46.23	55323	80190
1657	7 46E-04	0 990	7.34E-03	1.000	42.23	61734	80190
1658	1 57E-03	0.994	8.88E-03	0.999	49.41	64143	80190
1659	9.94E-04	0 984	8.00E-03	1.000	46.63	70552	80190
1660	5 29E-04	0.995	8.18E-03	1.000	47.81	73001	80190
1661	6.66E-04	0.998	8.92E-03	0.999	51.89	75408	80190
1662	8.65E-04	0.991	7.69E-03	0.999	44.02	81811	80190
1663	3.78E-04	0.966	7.57E-03	0.999	44.51	84216	80190
1664	Note 20: Solenoid #3 blocked						
1665							
1666							
1667							
1668	3 32E-03	1 000	4.20E-03	0 999	15.18	105127	80190
1669	3 44E-03	1.000	4.72E-03	0.999	17 87	111539	80190
1670	3 39E-03	1 000	4 74E-03	1.000	17.90	113953	80190
1671							
1672							
1673							
1674	3 38E-03	0 992	4.70E-03	0.999	17.69	131453	80190
1675	3 69E-03	1.000	5.74E-03	1.000	22.58	133902	80190
1676	6.51E-03	0 999	4.98E-03	0.999	12.58	140310	80190
1677	3 03E-03	0.999	5.00E-03	0 999	20.03	142720	80190
1678	3.01E-03	0.998	5.20E-03	0.999	21.18	145127	80190
1679	3.15E-03	1.000	3.48E-03	0.999	11.7?	151537	80190

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 26 to Sept.1,1990)

Test No.	OUR 1 mg/L sec	Coef. Corr	OUR 2 mg/L sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1680	3.26E-03	1.000	4.82E-03	1.000	18.62	153946	80190
1681	3.43E-04	0.747	2.66E-03	1.000	13.38	160445	80190
1682	8.03E-04	0.979	3.17E-03	0.999	15.08	162912	80190
1683	2.86E-04	0.963	2.70E-03	0.999	13.69	165412	80190
1684	6 60E-03	1.000	7.67E-03	1.000	26 62	171826	80190
1685	6.82E-03	1.000	6.99E-03	1.000	22.54	174240	80190
1686	6.84E-03	1.000	8.18E-03	1.000	26.79	180656	80190
1687	6.71E-03	1 000	8.20E-03	1.000	29.21	183110	80190
1688	Note 21: Solenoid #3 blocked						
1689							
1690							
1691							
1692							
1693							
1694	2.70E-04	0.948	4.57E-03	0.995	23.61	212035	80190
1695							
1696	6.84E-03	0 996	7.81E-03	1.000	25.38	222120	80190
1697	6.54E-03	1 000	7.37E-03	1.000	23.77	224533	80190
1698	6.24E-03	0.999	7.87E-03	0.999	26.98	230947	80190
1699	6.37E-03	1.000	7.86E-03	1.000	26.55	233359	80190
1700	6.14E-03	1.000	7.18E-03	1.000	23.64	235813	80190
1701	6.10E-03	1.000	6.93E-03	1.000	22.44	2227	80290
1702	5.74E-03	1 000	7.16E-03	1.000	24.33	4645	80290
1703	5.60E-03	1.000	7.38E-03	1.000	25.72	11059	80290
1704	5.64E-03	1.000	7.06E-03	1.000	24.02	13514	80290
1705	5.33E-03	1.000	6.97E-03	0.999	24.17	15930	80290
1706	5.29E-03	0.998	6.51E-03	0.999	21.97	22346	80290
1707	6.22E-03	1.000	6.76E-03	0.999	21.34	24802	80290
1708	4.97E-03	0.998	7.10E-03	1.000	25.58	31217	80290
1709	4.87E-03	1.000	6.06E-03	0.998	20.53	33634	80290
1710	4.76E-03	0.996	6.01E-03	1.000	20.54	40049	80290
1711	4.84E-03	0.997	6.94E-03	1.000	25.05	42502	80290
1712	4.52E-03	1.000	6.68E-03	1.000	24.37	44917	80290
1713	Note 22: Solenoid #3 blocked						
1714							
1715							
1716							
1717							
1718							
1719	4.63E-03	1.000	6.26E-03	1.000	24.77	81921	80290
1720	3.96E-03	1.000	5.58E-03	1.000	22.44	84339	80290
1721	4.09E-03	1.000	5.69E-03	0.998	22.82	90758	80290
1722	3.80E-03	1.000	5.48E-03	1.000	22.25	93214	80290
1723	3.66E-03	0.997	5.76E-03	0.999	24.15	95629	80290
1724	3.72E-03	1.000	6.35E-03	0.999	27.36	102043	80290
1725	3.53E-03	0.998	6.06E-03	1.000	26.15	104458	80290
1726	3.75E-03	1.000	5.94E-03	1.000	24.98	110911	80290
1727	3.73E-03	1.000	5.88E-03	1.000	24.70	113323	80290
1728	3.71E-03	1.000	5.78E-03	1.000	24.16	115736	80290
1729	3.36E-03	1.000	5.82E-03	0.999	25.10	122148	80290
1730	3.48E-03	1.000	5 78E-03	0.999	24.88	124600	80290
1731	3.88E-03	0.999	6.36E-03	0.999	27.13	131011	80290
1732	3.26E-03	0.999	4.97E-03	0.994	20.81	133424	80290
1733	3.62E-03	1.000	5.45E-03	0.999	22.50	135837	80290
1734	1.33E-03	0.998	5.57E-03	0.982	28.31	142327	80290
1735	4.10E-03	0.999	4.40E-03	1.000	15.56	144740	80290
1736	1.71E-03	0.989	2.86E-03	0.998	12.25	151219	80290
1737	4.17E-03	0.997	4.82E-03	0.998	17.74	153632	80290
1738	3.61E-03	0.992	4.64E-03	1.000	17.99	160044	80290
1739	Note 23: DO Probe coated with grease						
1740							
1741							
1742							
1743							
1744							
1745							
1746							
1747							
1748							
1749							
1750							
1751							
1752							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L sec	Coef. Corr	OUR 2 mg/L sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1753							
1754	4.49E-03	1.000	6.46E-03	0.999	23.30	221332	80290
1755	4.85E-03	1.000	6.25E-03	0.999	21.57	223746	80290
1756	4.88E-03	1.000	6.40E-03	0.999	22.23	230157	80290
1757	5.04E-03	1.000	4.86E-03	0.999	14.22	232609	80290
1758	4.82E-03	1.000	4.64E-03	0.997	13.56	235020	80290
1759	4.94E-03	0.999	6.11E-03	0.999	20.69	1433	80390
1760	5.15E-03	0.999	4.25E-03	0.995	10.97	3646	80390
1761	5.14E-03	1.000	4.86E-03	0.997	14.02	10300	80390
1762	5.11E-03	1.000	6.24E-03	0.993	20.97	12714	80390
1763	4.96E-03	1.000	5.06E-03	0.997	15.38	15129	80390
1764	4.42E-03	0.998	5.16E-03	0.999	16.94	21544	80390
1765	4.98E-03	0.997	5.17E-03	0.999	15.92	24000	80390
1766	5.05E-03	0.999	4.60E-03	0.997	12.93	30416	80390
1767	4.47E-03	1.000	4.89E-03	0.994	15.50	32835	80390
1768	4.52E-03	1.000	3.94E-03	0.997	10.66	35254	80390
1769	4.35E-03	1.000	5.20E-03	0.999	17.32	41715	80390
1770	4.21E-03	1.000	5.54E-03	0.999	19.29	44138	80390
1771	4.31E-03	1.000	5.48E-03	0.997	18.76	50558	80390
1772	4.03E-03	1.000	5.24E-03	0.999	18.14	53021	80390
1773	3.80E-03	1.000	5.42E-03	0.999	19.53	55440	80390
1774	3.79E-03	1.000	5.81E-03	0.999	21.46	61900	80390
1775	3.44E-03	0.998	5.61E-03	0.998	21.17	64320	80390
1776	3.59E-03	1.000	6.00E-03	0.999	22.61	70743	80390
1777							
1778	4.68E-03	1.000	4.86E-03	1.000	14.87	80929	80390
1779	4.61E-03	0.999	5.26E-03	1.000	17.10	83355	80390
1780	4.31E-03	0.999	4.57E-03	1.000	14.22	85823	80390
1781	4.41E-03	0.999	4.58E-03	1.000	14.07	92248	80390
1782	4.66E-03	1.000	6.56E-03	0.999	23.47	94712	80390
1783	4.39E-03	1.000	5.57E-03	0.999	19.06	101138	80390
1784	4.15E-03	0.999	6.01E-03	1.000	21.76	103603	80390
1785	4.32E-03	0.999	4.89E-03	1.000	15.83	110029	80390
1786	4.30E-03	0.999	6.36E-03	0.998	23.15	112453	80390
1787	4.25E-03	0.999	3.45E-03	0.999	8.72	114921	80390
1788	4.08E-03	1.000	3.28E-03	0.998	8.25	121347	80390
1789	3.76E-03	0.999	4.76E-03	0.999	16.27	123814	80390
1790	4.36E-03	0.999	4.74E-03	0.999	14.96	130245	80390
1791	4.34E-03	1.000	3.71E-03	1.000	9.87	132710	80390
1792	4.40E-03	0.999	3.09E-03	0.999	6.64	136138	80390
1793	4.15E-03	0.999	2.64E-03	0.998	4.69	141606	80390
1794	4.41E-03	1.000	2.39E-03	1.000	3.13	144036	80390
1795	3.97E-03	1.000	3.20E-03	0.998	8.07	150507	80390
1796	4.04E-03	0.999	2.18E-03	0.998	2.72	152937	80390
1797	1.71E-02	0.728	1.27E-02	1.000	29.40	155403	80390
1798	7.94E-03	1.000	1.27E-02	0.999	47.46	161822	80390
1799	7.73E-03	1.000	1.26E-02	0.999	47.34	164248	80390
1800	8.11E-03	0.999	1.10E-02	1.000	39.01	170708	80390
1801	8.10E-03	0.999	1.09E-02	0.999	38.22	173133	80390
1802	8.18E-03	1.000	1.14E-02	1.000	40.44	175562	80390
1803	8.19E-03	1.000	1.17E-02	1.000	42.23	182012	80390
1804	8.19E-03	1.000	1.16E-02	0.999	41.46	184430	80390
1805	8.63E-03	1.000	1.17E-02	1.000	41.18	190862	80390
1806	8.32E-03	1.000	1.47E-02	0.999	56.63	193316	80390
1807	8.31E-03	1.000	1.25E-02	1.000	45.97	195738	80390
1808	8.39E-03	1.000	1.24E-02	1.000	45.32	202158	80390
1809	9.16E-03	0.999	1.20E-02	1.000	41.80	204621	80390
1810	8.28E-03	1.000	1.21E-02	1.000	44.07	211044	80390
1811	8.26E-03	1.000	1.17E-02	1.000	42.04	213604	80390
1812	8.02E-03	1.000	1.19E-02	0.999	43.27	215927	80390
1813							
1814	9.03E-03	1.000	1.12E-02	0.999	37.94	225222	80390
1815	8.30E-03	1.000	1.09E-02	1.000	37.91	231644	80390
1816	9.20E-03	0.846	1.16E-02	1.000	39.66	234105	80390
1817	8.68E-03	0.811	1.25E-02	1.000	45.34	530	80490
1818	9.41E-03	1.000	1.13E-02	1.000	37.48	2958	80490
1819	8.81E-03	1.000	1.06E-02	1.000	36.25	5422	80490
1820	8.36E-03	1.000	1.12E-02	1.000	39.44	11848	80490
1821	8.81E-03	1.000	1.08E-02	0.999	36.63	14315	80490
1822	9.06E-03	1.000	1.12E-02	0.999	38.13	20741	80490
1823	8.65E-03	1.000	1.16E-02	1.000	40.46	23210	80490
1824	8.86E-03	1.000	1.01E-02	0.999	32.77	25636	80490
1825	1.51E-02	0.829	1.17E-02	0.999	28.26	32106	80490

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No.	OUR 1 mg/L sec	Coef. Corr	OUR 2 mg/L sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1826	8.57E-03	1.000	1.00E-02	0.999	33.06	34537	80490
1827	8.27E-03	1.000	1.11E-02	0.999	38.98	41010	80490
1828	8.30E-03	1.000	1.07E-02	0.994	36.71	43443	80490
1829	1.83E-02	0.998	2.99E-03	0.307	-21.56	45918	80490
1830	8.47E-03	1.000	9.70E-03	1.000	31.56	52364	80490
1831	7.82E-03	1.000	8.54E-03	0.998	27.08	54829	80490
1832	7.55E-03	1.000	8.18E-03	0.998	25.79	61306	80490
1833	1.40E-02	0.999	6.82E-03	0.994	6.21	63742	80490
1834	1.22E-02	0.999	6.48E-03	1.000	17.66	70220	80490
1835	6.41E-03	1.000	6.73E-03	0.998	20.81	72657	80490
1836	1.03E-02	0.999	7.34E-03	1.000	18.02	75137	80490
1837	5.74E-03	1.000	5.86E-03	0.999	17.76	81616	80490
1838							
1839	6.94E-03	1.000	5.73E-03	0.999	16.63	91034	80490
1840	6.99E-03	0.998	5.16E-03	0.998	13.31	93506	80490
1841	7.24E-03	1.000	4.76E-03	0.998	10.50	95937	80490
1842	7.33E-03	1.000	7.52E-03	1.000	25.77	102409	80490
1843	7.75E-03	1.000	1.64E-02	0.990	74.57	104841	80490
1844	7.91E-03	1.000	1.12E-02	0.982	45.06	111314	80490
1845	9.63E-03	1.000	1.38E-02	0.995	55.75	113744	80490
1846	9.40E-03	1.000	1.57E-02	1.000	66.97	120213	80490
1847	7.69E-03	1.000	6.40E-03	0.999	18.69	122642	80490
1848	7.23E-03	1.000	6.67E-03	1.000	21.25	125110	80490
1849	7.06E-03	0.999	6.20E-03	0.995	19.01	131537	80490
1850	6.67E-03	0.998	6.25E-03	0.999	19.70	134006	80490
1851	1.06E-02	1.000	6.94E-03	0.999	15.46	140433	80490
1852	9.45E-03	0.997	7.56E-03	1.000	21.21	142900	80490
1853	1.10E-02	1.000	5.96E-03	0.998	8.69	145326	80490
1854	6.02E-03	1.000	6.66E-03	0.998	24.06	151757	80490
1855	4.42E-03	0.982	6.43E-03	0.999	26.23	154226	80490
1856	1.21E-02	1.000	2.20E-02	0.999	96.43	160655	80490
1857	1.19E-02	0.999	2.17E-02	0.999	94.96	163124	80490
1858	1.15E-02	0.999	2.22E-02	0.999	98.81	165554	80490
1859	1.15E-02	0.999	2.18E-02	0.998	96.92	172028	80490
1860	1.16E-02	0.999	2.17E-02	0.999	96.11	174500	80490
1861	1.12E-02	0.999	2.17E-02	0.999	96.89	180930	80490
1862	1.12E-02	0.999	2.18E-02	0.998	97.31	183403	80490
1863	1.12E-02	0.999	2.18E-02	0.999	97.76	185838	80490
1864	1.08E-02	0.999	2.18E-02	0.999	98.19	192313	80490
1865	1.10E-02	0.999	2.17E-02	0.999	97.46	194747	80490
1866	5.25E-03	0.999	2.06E-02	0.999	103.58	201226	80490
1867	1.83E-03	0.986	2.30E-02	0.999	125.14	203703	80490
1868	1.62E-03	0.987	2.36E-02	0.998	128.42	210142	80490
1869	1.86E-03	0.987	6.01E-03	0.995	29.64	212624	80490
1870	1.23E-03	0.986	6.57E-03	0.998	34.22	215101	80490
1871							
1872	8.04E-03	1.000	5.81E-03	0.998	14.53	224516	80490
1873	7.41E-03	0.999	5.08E-03	0.997	16.35	230932	80490
1874	6.92E-03	0.999	6.41E-03	0.995	20.39	233352	80490
1875	7.27E-03	0.999	6.45E-03	0.998	19.69	235813	80490
1876	7.26E-03	1.000	6.11E-03	0.998	17.98	2236	80590
1877	6.60E-03	0.999	6.08E-03	0.839	22.72	4701	80590
1878	7.31E-03	0.999	6.23E-03	0.997	18.52	11124	80590
1879	6.87E-03	0.999	6.62E-03	0.999	21.70	13550	80590
1880	7.66E-03	1.000	8.39E-03	0.995	29.81	20015	80590
1881	7.36E-03	1.000	6.74E-03	1.000	21.30	22442	80590
1882	6.89E-03	0.999	6.54E-03	0.999	21.22	24910	80590
1883	7.84E-03	0.998	8.06E-03	1.000	27.53	31339	80590
1884	1.47E-03	0.981	7.42E-03	0.999	38.29	33809	80590
1885	1.70E-03	0.997	7.02E-03	1.000	35.53	40238	80590
1886	4.03E-03	0.993	7.97E-03	0.994	35.83	42706	80590
1887	3.98E-03	0.998	6.28E-03	1.000	28.33	46139	80590
1888	5.57E-03	0.999	5.67E-03	0.999	19.28	51614	80590
1889	6.41E-03	0.999	9.72E-03	1.000	40.12	54047	80590
1890	6.31E-03	0.998	5.69E-03	1.000	17.90	60522	80590
1891	6.08E-03	0.998	5.02E-03	1.000	14.53	62954	80590
1892	1.76E-03	0.997	6.20E-03	0.998	30.81	65433	80590
1893	8.34E-04	0.964	5.98E-03	1.000	31.63	71807	80590
1894	3.90E-03	0.998	5.84E-03	0.999	23.99	74340	80590
1895							
1896							
1897	6.50E-03	0.998	4.62E-03	0.999	9.09	85032	80590
1898	6.26E-03	0.998	4.70E-03	0.998	9.87	91501	80590

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No	OUR 1 mg/L.sec	Coef. Corr	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1899	2.46E-03	0.987	5.17E-03	1.000	18.82	93830	80590
1900	1.53E-03	0.999	5.57E-03	1.000	22.34	100358	80590
1901	1.18E-03	0.998	5.85E-03	1.000	23.32	102825	80590
1902	4.37E-03	0.998	4.97E-03	1.000	14.51	105248	80590
1903	1.10E-03	1.000	5.91E-03	0.999	24.63	111710	80590
1904	1.13E-03	0.999	5.51E-03	0.999	22.77	114129	80590
1905	9.78E-04	1.000	5.13E-03	0.999	21.32	120548	80590
1906	1.10E-03	0.999	5.29E-03	1.000	21.83	123004	80590
1907	3.32E-04	0.900	4.59E-03	1.000	20.07	125421	80590
1908	1.47E-03	0.998	6.16E-03	0.993	25.08	131837	80590
1909	1.32E-03	0.994	5.53E-03	0.998	22.53	134256	80590
1910	1.98E-03	0.977	6.20E-03	1.000	24.37	140708	80590
1911	1.02E-03	0.971	7.77E-03	0.999	33.13	143127	80590
1912	1.38E-03	0.998	6.11E-03	1.000	25.02	145543	80590
1913	1.59E-03	0.998	5.83E-03	0.998	23.38	152001	80590
1914	4.14E-03	0.999	8.03E-03	0.999	26.68	154414	80590
1915	1.64E-03	0.998	7.07E-03	1.000	28.86	160835	80590
1916	3.16E-03	1.000	6.12E-03	0.999	21.85	163250	80590
1917	6.25E-04	0.986	6.34E-03	1.000	27.42	165712	80590
1918	1.19E-03	0.999	7.29E-03	1.000	30.64	172138	80590
1919	1.62E-03	0.998	7.60E-03	0.999	31.28	174558	80590
1920	1.59E-03	0.999	8.08E-03	1.000	33.53	181036	80590
1921	9.07E-04	0.983	6.53E-03	1.000	27.76	183518	80590
1922	1.74E-03	0.999	6.99E-03	1.000	28.32	185955	80590
1923	1.48E-03	0.998	7.37E-03	0.999	30.48	192436	80590
1924	1.61E-03	1.000	6.97E-03	1.000	28.12	194915	80590
1925	1.41E-03	0.998	6.87E-03	1.000	28.36	201354	80590
1926	1.54E-03	0.998	7.55E-03	1.000	31.10	203835	80590
1927	1.23E-03	0.993	9.64E-03	0.999	41.19	210311	8059:
1928							
1929	6.76E-03	0.999	7.29E-03	0.998	20.62	221701	80590
1930	6.37E-03	0.999	6.34E-03	0.998	17.06	224129	80590
1931	6.91E-03	0.999	7.07E-03	0.999	19.38	230544	80590
1932	7.43E-03	1.000	7.33E-03	0.999	19.60	233001	80590
1933	7.78E-03	1.000	7.02E-03	0.998	17.59	235421	80590
1934	7.15E-03	0.999	6.97E-03	0.998	18.51	1843	80690
1935	7.21E-03	0.999	6.72E-03	0.997	17.27	4306	80690
1936	7.31E-03	1.000	7.23E-03	0.997	19.39	10731	80690
1937	7.39E-03	1.000	7.42E-03	1.000	20.07	13156	80690
1938	7.76E-03	1.000	7.75E-03	0.999	20.92	15620	80690
1939	7.62E-03	1.000	7.17E-03	0.998	18.54	22046	80690
1940	7.42E-03	1.000	7.38E-03	0.999	19.88	24511	80690
1941	7.44E-03	0.999	7.27E-03	0.999	19.31	30939	80690
1942	6.07E-03	0.999	7.03E-03	1.000	20.72	33412	80690
1943	7.05E-03	0.999	7.38E-03	1.000	20.45	35840	80690
1944	6.69E-03	1.000	7.11E-03	0.999	19.95	42313	80690
1945	6.91E-03	1.000	6.51E-03	0.999	18.66	44744	80690
1946	Note 24:No test due to low Raw influent flow						
1947							
1948							
1949							
1950							
1951							
1952							
1953							
1954							
1955							
1956	7.80E-03	1.000	5.41E-03	0.999	10.87	84144	80690
1957	3.29E-03	0.979	4.65E-03	0.999	15.93	90701	80690
1958	6.34E-03	1.000	5.81E-03	0.998	11.73	93628	80690
1959	7.66E-03	1.000	5.24E-03	0.999	10.35	95958	80690
1960	7.62E-03	1.000	5.39E-03	0.999	11.04	102427	80690
1961	7.54E-03	1.000	5.40E-03	0.999	11.29	104859	80690
1962	6.84E-03	1.000	5.17E-03	0.999	11.52	111342	80690
1963	7.66E-03	1.000	5.47E-03	0.999	11.41	113821	80690
1964	6.79E-03	1.000	5.63E-03	0.999	13.80	120312	80690
1965	5.72E-03	0.998	6.48E-03	0.999	19.85	122800	80690
1966	6.21E-03	1.000	6.22E-03	0.999	17.69	125250	80690
1967	7.67E-03	1.000	6.99E-03	0.999	18.54	131735	80690
1968	6.98E-03	1.000	7.23E-03	0.999	21.06	134237	80690
1969	6.56E-03	0.999	8.92E-03	0.999	20.35	140737	80690
1970	4.19E-03	0.988	7.07E-03	1.000	25.56	143238	80690
1971	7.54E-03	1.000	7.28E-03	0.998	20.18	145739	80690

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
1972	7.10E-03	1.000	1.00E-02	0.999	34.12	152238	80690
1973	7.64E-03	1.000	7.19E-03	0.995	19.59	154738	80690
1974	7.48E-03	1.000	7.69E-03	0.998	22.26	161241	80690
1975	7.94E-03	1.000	7.78E-03	0.999	21.79	163748	80690
1976	7.02E-03	1.000	7.91E-03	0.999	24.15	170303	80690
1977	6.39E-03	0.997	7.64E-03	0.999	24.09	172827	80690
1978	6.79E-03	1.000	7.77E-03	0.998	23.94	175347	80690
1979	7.08E-03	1.000	7.04E-03	0.999	19.91	181908	80690
1980	5.40E-03	0.992	7.39E-03	0.998	24.77	184429	80690
1981	6.86E-03	0.999	7.45E-03	0.998	22.31	190956	80690
1982	8.64E-03	0.981	7.27E-03	0.998	18.07	193458	80690
1983	7.64E-03	0.998	7.65E-03	0.999	21.77	200010	80690
1984	4.14E-04	0.931	7.66E-03	1.000	36.86	202604	80690
1985	8.10E-03	1.000	7.50E-03	0.998	20.20	205312	80690
1986							
1987	1.02E-02	1.000	8.56E-03	0.998	21.25	214949	80690
1988	8.31E-03	1.000	1.04E-02	0.999	33.73	221402	80690
1989	8.41E-03	1.000	8.46E-03	0.998	24.14	223818	80690
1990	8.21E-03	1.000	7.85E-03	0.999	21.63	230236	80690
1991	8.56E-03	1.000	1.10E-02	1.000	36.11	232656	80690
1992	8.82E-03	1.000	7.32E-03	0.999	17.94	235118	80690
1993	8.91E-03	1.000	7.24E-03	0.997	17.41	1549	80790
1994	8.90E-03	1.000	7.98E-03	0.998	20.65	4026	80790
1995	4.70E-04	0.995	1.24E-02	0.994	57.94	10521	80790
1996	9.16E-03	1.000	7.45E-03	0.998	17.93	12958	80790
1997	9.42E-03	1.000	8.21E-03	0.999	21.06	15436	80790
1998	9.08E-03	1.000	7.58E-03	0.997	18.72	21914	80790
1999	8.80E-03	1.000	1.09E-02	0.999	34.75	24353	80790
2000	8.63E-03	1.000	1.00E-02	0.999	31.02	30836	80790
2001	8.92E-03	1.000	7.47E-03	0.999	18.49	33316	80790
2002	8.43E-03	1.000	6.41E-03	1.000	14.38	35811	80790
2003	8.23E-03	1.000	7.30E-03	0.998	18.99	42310	80790
2004	8.72E-03	1.000	6.46E-03	1.000	14.09	44811	80790
2005	7.51E-03	1.000	7.27E-03	0.999	20.18	51329	80790
2006	7.53E-03	1.000	5.86E-03	0.999	13.46	53842	80790
2007	7.21E-03	1.000	5.84E-03	0.993	14.01	60357	80790
2008	6.96E-03	1.000	5.62E-03	0.999	13.48	62916	80790
2009	6.65E-03	1.000	4.86E-03	0.999	10.36	65438	80790
2010	6.54E-03	1.000	6.48E-03	1.000	18.31	72000	80790
2011							
2012	6.56E-03	0.999	4.86E-03	0.998	11.21	81945	80790
2013	6.21E-03	0.998	4.94E-03	0.998	12.28	84418	80790
2014	6.59E-03	1.000	4.74E-03	0.999	10.53	90902	80790
2015	6.31E-03	1.000	5.31E-03	0.998	13.92	93343	30790
2016	6.39E-03	0.999	7.86E-03	0.998	25.48	95825	80790
2017	6.89E-03	0.999	1.12E-02	0.999	42.25	102307	80790
2018	7.02E-03	0.999	6.18E-03	1.000	16.84	104751	80790
2019	6.98E-03	0.999	7.52E-03	0.998	23.62	111237	80790
2020	7.22E-03	1.000	7.25E-03	1.000	21.84	113727	80790
2021	7.70E-03	0.999	7.61E-03	1.000	22.88	120214	80790
2022	7.71E-03	1.000	6.08E-03	0.994	14.88	122706	80790
2023	7.07E-03	1.000	9.03E-03	0.799	31.00	125203	80790
2024	6.92E-03	1.000	5.79E-03	0.995	15.12	131658	80790
2025	7.68E-03	1.000	3.97E-03	0.995	4.52	134154	80790
2026	6.42E-03	1.000	4.22E-03	0.997	8.25	140702	80790
2027	7.27E-03	1.000	6.65E-03	0.991	19.70	143210	80790
2028	9.95E-03	0.998	5.19E-03	0.998	6.02	145719	80790
2029	7.90E-03	0.997	4.22E-03	0.990	5.32	152307	80790
2030	9.33E-03	0.995	4.12E-03	0.995	1.94	154852	80790
2031	9.26E-03	1.000	2.87E-03	0.997	-4.14	161438	80790
2032	1.00E-02	1.000	1.25E-02	1.000	40.21	170915	80790
2033	8.93E-03	0.997	1.16E-02	1.000	38.17	173331	80790
2034	5.37E-03	1.000	1.05E-02	0.998	39.32	175749	80790
2035	9.65E-03	1.000	1.17E-02	1.000	37.35	182209	80790
2036	9.61E-03	1.000	1.19E-02	1.000	37.93	184632	80790
2037	9.77E-03	0.999	1.29E-02	0.998	42.78	191055	80790
2038	9.99E-03	1.000	1.16E-02	1.000	36.89	193517	80790
2039	9.07E-03	0.999	1.18E-02	1.000	37.77	195954	80790
2040	1.82E-04	0.616	1.09E-02	1.000	51.00	202452	80790
2041	8.57E-03	0.999	1.13E-02	0.999	37.22	204939	80790
2042	9.24E-05	0.584	1.09E-02	1.000	51.60	211459	80790
2043	7.19E-03	0.998	1.15E-02	1.000	40.82	214016	80790
2044	6.99E-03	0.999	1.14E-02	1.000	41.06	220543	80790

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 26 to Sept.1,1990)

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 26 to Sept.1,1990)

Test No	OUR 1 mg/L sec	Coef. Corr.	OUR 2 mg/L sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2045	7.69E-03	0.996	1.17E-02	1.000	41.07	223103	80790
2046	8.77E-03	1.000	1.15E-02	1.000	38.04	225837	80790
2047	8.6?E-03	1.000	1.11E-02	1.000	36.28	232221	80790
2048							
2049	9.04E-03	0.999	1.34E-02	1.000	46.56	1736	80890
2050	9.51E-03	1.000	1.23E-02	1.000	40.39	[illegible]	80890
2051	8.65E-03	1.000	1.32E-02	0.999	46.07	10606	80890
2052	8.67E-03	1.000	1.17E-02	1.000	39.11	13027	80890
2053	8.53E-03	1.000	1.11E-02	1.000	36.65	15453	80890
2054	1.30E-04	0.740	1.12E-02	0.999	52.93	22003	80890
2055	Note 25:Solenoid #3 blocked						
2056							
2057							
2058							
2059							
2060							
2061							
2062							
2063							
2064							
2065							
2066							
2067							
2068							
2069							
2070							
2071							
2072	7.01E-05	0.779	6.85E-03	0.999	32.32	91215	80890
2073	9.15E-03	1.000	1.35E-02	0.999	46.60	93658	80890
2074	1.15E-02	1.000	1.24E-02	0.999	37.16	100135	80890
2075	9.35E-03	1.000	1.27E-02	1.000	42.47	102612	80890
2076	8.60E-03	1.000	1.04E-02	0.999	33.09	105042	80890
2077	8.30E-03	1.000	1.14E-02	0.999	38.10	111518	80890
2078	6.11E-03	0.998	1.24E-02	0.999	49.66	120844	80890
2079	8.48E-03	1.000	1.10E-02	0.999	37.91	123302	80890
2080	6.33E-03	0.998	1.13E-02	1.000	43.60	125725	80890
2081	5.46E-04	0.685	1.10E-02	1.000	53.87	132156	80890
2082	8.72E-03	1.000	1.21E-02	1.000	42.82	134623	80890
2083	9.21E-03	1.000	1.20E-02	0.999	41.67	141049	80890
2084	8.38E-03	1.000	1.19E-02	1.000	42.56	143517	80890
2085	8.01E-03	1.000	1.27E-02	0.999	47.28	145944	80890
2086	9.16E-03	1.000	1.22E-02	1.000	42.56	152413	80890
2087	9.83E-03	1.000	1.17E-02	1.000	36.93	154841	80890
2088	8.71E-03	1.000	1.46E-02	0.996	55.76	161309	80890
2089	7.91E-03	0.997	1.01E-02	0.997	34.66	163740	80890
2090	9.06E-03	1.000	1.14E-02	0.999	39.10	170211	80890
2091	9.63E-03	0.998	1.23E-02	1.000	42.42	172646	80890
2092	8.86E-03	1.000	1.18E-02	1.000	41.38	175120	80890
2093	1.17E-03	0.971	1.10E-02	0.962	52.46	182022	80890
2094	Note 26:SpOUR Apparatus down for maintenance						
2095							
2096							
2097							
2098							
2099							
2100							
2101							
2102							
2103							
2104	1.03E-02	1.000	1.32E-02	1.000	45.42	224144	80890
2105	1.08E-02	1.000	1.52E-02	1.000	54.33	230613	80890
2106	9.23E-03	1.000	1.36E-02	0.999	49.62	233044	80890
2107	8.50E-03	1.000	1.34E-02	0.999	49.90	235520	80890
2108	8.54E-03	1.000	1.47E-02	0.999	56.53	2007	80990
2109	8.60E-03	1.000	1.32E-02	0.999	46.61	4453	80990
2110	8.23E-03	1.000	1.42E-02	1.000	54.69	10943	80990
2111	8.97E-03	1.000	1.19E-02	1.000	41.60	13419	80990
2112	9.37E-03	1.000	1.29E-02	1.000	45.92	15869	80990
2113	9.12E-03	1.000	1.34E-02	0.999	48.54	22338	80990
2114	8.56E-03	1.000	1.51E-02	1.000	58.34	24818	80990
2115	6.97E-03	0.993	1.47E-02	1.000	59.56	31303	80990
2116	3.01E-03	0.996	1.32E-02	1.000	60.03	33757	80990
2117	8.61E-03	0.999	1.34E-02	1.000	49.67	40254	80990
2118	6.61E-03	1.000	1.07E-02	0.999	36.23	42754	80990
2119	7.01E-03	0.999	1.09E-02	0.999	40.70	45253	80990
2120	6.70E-03	0.999	9.74E-03	0.999	36.32	51749	80990
2121	7.23E-03	0.999	1.24E-02	0.999	47.61	54248	80990
2122	8.08E-03	1.000	1.33E-02	1.000	50.51	60747	80990
2123	5.77E-03	0.996	1.17E-02	1.000	46.79	63248	80990
2124	4.76E-03	0.997	8.11E-03	0.999	31.03	65750	80990
2125	2.76E-03	0.994	7.63E-03	0.999	32.48	72248	80990
2126							
2127	6.73E-03	1.000	8.25E-03	0.998	23.77	82638	80990
2128	3.91E-03	0.998	7.89E-03	0.999	31.61	86256	80990
2129	4.28E-03	0.997	1.02E-02	1.000	42.20	91707	80990
2130	3.73E-03	0.993	1.06E-02	0.998	44.61	94126	80990
2131	8.00E-03	1.000	9.49E-03	0.999	31.44	100643	80990
2132	8.70E-04	0.988	8.61E-03	0.999	41.31	102959	80990
2133	5.26E-03	0.998	8.76E-03	0.999	33.32	105416	80990
2134	6.01E-03	0.999	1.03E-02	0.999	41.56	111636	80990
2135	4.91E-03	0.997	8.64E-03	0.998	33.38	114257	80990
2136	6.70E-03	1.000	9.53E-03	0.998	34.24	120722	80990
2137	8.06E-03	1.000	8.12E-03	0.998	24.49	123141	80990
2138	7.78E-03	1.000	8.56E-03	0.998	27.19	125601	80990
2139	7.07E-03	1.000	6.08E-03	0.999	16.25	131962	80990
2140	7.23E-04	0.996	7.82E-04	0.991	2.46	134361	80990
2141	1.58E-04	0.927	3.13E-04	0.987	1.25	140736	80990
2142	6.75E-03	1.000	5.90E-03	0.999	16.01	143153	80990
2143	5.91E-04	0.999	1.03E-02	0.998	50.44	145619	80990
2144	2.46E-04	0.624	4.16E-03	0.992	20.33	152012	80990
2145	5.91E-05	0.698	8.66E-04	0.943	4.31	154406	80990
2146	5.68E-04	0.998	3.20E-04	0.993	0.43	160804	80990
2147	3.16E-04	0.997	9.69E-04	0.992	3.81	163202	80990
2148	1.12E-04	0.436	1.01E-03	0.984	4.81	165600	80990
2149	7.60E-05	0.835	2.21E-04	0.856	0.95	171966	80990
2150	4.62E-04	0.982	6.38E-04	0.963	2.27	174362	80990
2151	2.64E-05	1.147	5.36E-04	0.998	2.62	180748	80990
2152	1.70E-04	0.918	1.23E-04	0.794	0.27	183144	80990
2153	2.36E-04	0.973	7.93E-05	0.848	-0.07	185641	80990
2154	3.03E-04	0.992	5.47E-04	0.985	2.13	191937	80990
2155	3.49E-04	0.980	1.16E-03	0.993	5.21	194336	80990
2156	1.70E-04	0.872	7.11E-04	0.995	3.22	200734	80990
2157	4.93E-04	0.980	9.29E-04	1.002	3.66	203131	80990
2158	3.11E-04	1.004	5.21E-04	0.764	1.98	205530	80990
2159	Note 27:DO Probe coated with grease						
2160	4.46E-03	0.993	1.22E-02	0.999	52.25	220649	80990
2161	3.77E-03	0.998	1.06E-02	0.999	44.93	223111	80990
2162	5.51E-03	0.999	1.09E-02	0.999	43.37	225634	80990
2163	4.45E-03	0.992	1.09E-02	0.999	45.67	231959	80990
2164	5.73E-03	1.000	1.06E-02	0.999	41.23	234423	80990
2165	6.58E-03	1.000	1.08E-02	0.998	40.67	847	81090
2166	6.47E-03	1.000	1.12E-02	0.999	43.06	3316	81090
2167	6.24E-03	0.999	1.02E-02	0.999	38.41	5746	81090
2168	7.09E-03	1.000	1.07E-02	1.000	39.14	12220	81090
2169	1.20E-02	0.998	1.03E-02	0.999	27.61	14660	81090
2170	6.89E-03	1.000	1.06E-02	0.999	38.58	21121	81090
2171	6.92E-03	1.000	1.01E-02	0.999	36.89	23661	81090
2172	6.54E-03	1.000	9.09E-03	0.999	32.36	30036	81090
2173	7.00E-03	1.000	1.02E-02	0.999	36.90	32507	81090
2174	6.15E-03	0.999	1.05E-02	0.999	40.19	34958	81090
2175	5.42E-03	0.994	9.58E-03	0.999	37.08	41434	81090
2176	6.30E-03	0.999	8.46E-03	0.999	29.80	43908	81090
2177	6.38E-03	0.999	1.00E-02	0.994	37.46	50347	81090
2178	6.94E-03	1.000	8.15E-03	0.999	28.98	52823	81090
2179	5.99E-03	0.999	7.79E-03	0.999	28.90	55320	81090
2180	5.92E-03	0.998	8.95E-03	0.997	32.92	61815	81090
2181	6.10E-03	1.000	7.76E-03	0.997	28.58	64310	81090
2182	5.93E-03	0.998	7.50E-03	0.999	25.63	70830	81090
2183	4.94E-03	0.997	6.29E-03	0.999	21.58	73347	81090
2184							
2185	6.65E-03	0.999	8.72E-03	0.999	26.27	82529	81090
2186	9.65E-03	1.000	8.88E-03	0.999	24.98	84848	81090
2187	9.22E-03	1.000	1.12E-02	0.999	37.42	91408	81090
2188	8.88E-03	0.999	9.02E-03	0.999	27.74	93827	81090
2189	9.33E-03	1.000	1.27E-02	0.999	44.98	100242	81090
2190	8.89E-03	1.000	1.56E-02	1.000	50.67	102859	81090

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2191	9.20E-03	0.999	1.70E-02	0.999	66.53	105115	81090
2192	9.17E-03	1.000	1.45E-02	1.000	54.37	111529	81090
2193	1.22E-02	0.997	1.27E-02	1.000	39.38	113943	81090
2194	9.66E-03	1.000	1.68E-02	0.999	64.69	120356	81090
2195	9.72E-03	1.000	1.29E-02	0.999	45.19	122810	81090
2196	9.72E-03	1.000	1.57E-02	0.999	59.90	125225	81090
2197	9.59E-03	1.000	1.78E-02	0.996	69.94	131638	81090
2198	1.08E-02	1.000	1.82E-02	0.969	69.66	134048	81090
2199	1.01E-02	1.000	1.27E-02	0.997	43.15	140459	81090
2200	1.02E-02	1.000	1.10E-02	0.997	34.42	142909	81090
2201	9.03E-03	0.998	1.71E-02	0.999	67.66	145323	81090
2202	9.82E-03	1.000	1.12E-02	0.998	36.25	151734	81090
2203	1.03E-02	1.000	1.12E-02	0.997	35.39	154144	81090
2204	1.00E-02	1.000	1.48E-02	0.999	52.99	160557	81090
2205	9.97E-03	1.000	1.75E-02	1.000	67.49	163010	81090
2206	1.00E-02	0.999	1.31E-02	0.999	45.69	165424	81090
2207	1.26E-02	0.997	1.24E-02	1.000	36.60	171838	81090
2208	9.37E-03	1.000	1.76E-02	0.999	69.06	174252	81090
2209	9.80E-03	1.000	1.63E-02	0.998	61.79	180707	81090
2210	9.70E-03	1.000	1.46E-02	0.999	53.62	183122	81090
2211	1.63E-02	0.996	1.63E-02	0.998	46.79	185536	81090
2212	1.00E-02	1.000	1.46E-02	0.999	52.78	191951	81090
2213	9.03E-03	0.997	1.43E-02	0.999	53.29	194415	81090
2214	9.56E-03	1.000	1.06E-02	0.998	33.23	200827	81090
2215	9.93E-03	1.000	1.08E-02	0.998	33.31	203241	81090
2216	9.99E-03	1.000	9.80E-03	0.998	29.00	205653	81090
2217	8.73E-03	1.000	1.44E-02	0.999	54.70	212120	81090
2218							
2219							
2220	1.02E-02	1.000	1.15E-02	0.998	33.41	221716	81090
2221	8.32E-03	1.000	1.23E-02	0.999	40.43	224134	81090
2222	7.16E-03	0.993	1.53E-02	0.999	56.81	230550	81090
2223	1.62E-02	0.998	1.47E-02	0.999	38.69	233008	81090
2224	9.26E-03	1.000	1.48E-02	0.999	49.78	235425	81090
2225	7.56E-03	0.999	9.76E-03	0.998	30.30	1841	81190
2226	7.16E-03	0.999	1.10E-02	0.999	36.64	4257	81190
2227	9.73E-03	1.000	1.39E-02	1.000	42.29	10714	81190
2228	9.77E-03	1.000	1.87E-02	0.998	57.69	13130	81190
2229	1.02E-02	1.000	1.48E-02	0.998	48.18	15646	81190
2230	5.00E-03	0.974	1.06E-02	0.997	36.62	22006	81190
2231	9.66E-03	1.000	1.04E-02	1.000	28.96	24423	81190
2232	9.46E-03	1.000	9.19E-03	0.997	24.30	30841	81190
2233	9.08E-03	1.000	8.22E-03	0.995	20.65	33305	81190
2234	9.58E-03	1.000	1.54E-02	0.999	51.97	36724	81190
2235	9.64E-03	1.000	8.42E-03	0.998	20.54	42144	81190
2236	9.72E-03	1.000	8.12E-03	0.996	19.03	44606	81190
2237	6.38E-03	1.000	7.47E-03	0.997	18.51	51031	81190
2238	8.65E-03	1.000	7.70E-03	0.997	18.70	53454	81190
2239	9.50E-03	1.000	1.40E-02	0.999	45.86	55919	81190
2240	8.64E-03	0.999	1.37E-02	0.999	46.01	62347	81190
2241	9.07E-03	1.000	7.68E-03	0.998	18.23	64809	81190
2242	8.95E-03	1.000	7.42E-03	0.997	17.29	71231	81190
2243	8.64E-03	1.000	7.36E-03	0.997	17.64	73700	81190
2244							
2245	7.34E-03	1.000	6.76E-03	0.996	12.28	83033	81190
2246	6.61E-03	1.000	7.21E-03	0.997	14.67	85601	81190
2247	6.41E-03	0.993	7.03E-03	0.997	14.36	91928	81190
2248	7.22E-03	1.000	7.23E-03	0.998	13.96	94362	81190
2249	9.22E-03	1.000	8.24E-03	0.997	14.64	100808	81190
2250	9.21E-03	1.000	7.65E-03	0.998	13.39	103229	81190
2251	8.90E-03	1.000	8.21E-03	0.999	14.96	105644	81190
2252	9.12E-03	1.000	8.07E-03	0.997	14.20	112057	81190
2253	8.57E-03	1.000	8.25E-03	0.997	15.48	114611	81190
2254	7.89E-03	0.998	8.09E-03	0.997	15.78	120928	81190
2255	4.49E-03	0.991	1.36E-02	0.997	37.64	123340	81190
2256	7.13E-03	1.000	8.52E-03	0.998	18.16	125751	81190
2257	8.07E-03	1.000	9.01E-03	0.997	18.00	132201	81190
2258	6.50E-03	0.999	8.71E-03	0.997	19.65	134613	81190
2259	5.92E-03	0.969	9.06E-03	0.996	21.51	141024	81190
2260	9.22E-03	1.000	9.45E-03	0.998	18.53	143433	81190
2261	8.96E-03	1.000	9.46E-03	0.998	18.85	145841	81190
2262	7.06E-03	1.000	8.20E-03	0.996	20.61	152251	81190
2263	9.56E-03	1.000	9.59E-03	0.996	18.51	154700	81190

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No.	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2264	8.40E-03	1.000	8.98E-03	0.996	18.07	161113	81190
2265	9.89E-03	1.000	9.59E-03	0.998	18.10	163521	81190
2266	9.58E-03	1.000	9.61E-03	0.998	18.61	165931	81190
2267	9.61E-03	1.000	9.71E-03	0.997	18.96	172339	81190
2268	9.00E-03	1.000	9.60E-03	0.995	19.29	174753	81190
2269	9.46E-03	1.000	9.47E-03	0.996	18.28	181207	81190
2270	9.33E-03	1.000	9.74E-03	0.995	19.30	183610	81190
2271	9.58E-03	1.000	9.71E-03	0.998	18.90	190016	81190
2272	8.45E-03	1.000	9.54E-03	0.997	19.80	192425	81190
2273	9.66E-03	1.000	9.16E-03	0.998	17.02	194833	81190
2274	9.84E-03	1.000	9.82E-03	0.997	18.26	201239	81190
2275	9.46E-03	0.999	9.20E-03	0.998	17.41	203700	81190
2276	9.46E-03	1.000	9.43E-03	0.999	18.18	210109	81190
2277	9.43E-03	1.000	9.46E-03	0.997	18.25	212513	81190
2278	9.29E-03	1.000	9.44E-03	0.999	18.41	223928	81190
2279	9.21E-03	0.999	9.38E-03	0.993	18.32	230036	81190
2280	8.40E-03	0.976	8.02E-03	0.995	14.98	232447	81190
2281	9.74E-03	0.999	7.29E-03	0.995	14.13	234901	81190
2282	8.31E-03	0.999	7.59E-03	0.993	13.72	1317	81290
2283	8.41E-03	0.999	7.89E-03	0.994	14.52	3731	81290
2284	8.87E-03	1.000	8.00E-03	0.995	14.32	10144	81290
2285	7.93E-03	1.000	7.43E-03	0.994	13.67	12602	81290
2286	8.91E-03	0.999	7.24E-03	0.998	11.63	21931	81290
2287	8.59E-03	1.000	7.71E-03	0.994	13.73	24349	81290
2288	8.47E-03	1.000	7.09E-03	0.995	11.91	[illegible]	[illegible]
2289	8.62E-03	1.000	7.72E-03	0.998	13.47	[illegible]	[illegible]
2290	8.44E-03	0.999	7.93E-03	0.998	14.63	[illegible]	[illegible]
2291	Note 26:No test due to low Raw influent flow						
2292							
2293							
2294							
2295							
2296							
2297							
2298							
2299							
2300							
2301							
2302	8.46E-03	1.000	6.37E-03	0.997	10.33	91627	81290
2303	6.50E-03	0.999	5.77E-03	0.998	10.98	94063	81290
2304	7.07E-03	1.000	5.84E-03	0.997	10.42	100617	81290
2305	6.88E-03	1.000	4.76E-03	0.997	8.94	104513	81290
2306	7.01E-03	1.000	6.37E-03	0.998	12.36	110947	81290
2307	7.08E-03	1.000	6.64E-03	0.999	13.18	114349	81290
2308							
2309							
2310							
2311							
2312							
2313	7.33E-03	0.999	7.80E-03	0.997	16.17	142004	81290
2314	7.94E-03	0.999	1.79E-02	0.999	50.54	144415	81290
2315	8.91E-03	1.000	7.89E-03	0.998	14.86	150827	81290
2316	7.79E-03	1.000	7.74E-03	0.998	16.02	153240	81290
2317	8.07E-03	0.999	7.49E-03	0.998	14.74	155652	81290
2318	7.72E-03	1.000	8.13E-03	0.999	17.46	162106	81290
2319	7.89E-03	1.000	8.82E-03	0.999	19.92	164519	81290
2320	5.39E-03	1.000	1.11E-02	0.999	30.98	170934	81290
2321	6.68E-03	0.997	1.00E-02	1.000	25.56	173348	81290
2322	8.24E-03	0.999	9.39E-03	1.000	21.09	175803	81290
2323	8.07E-03	1.000	1.01E-02	0.999	23.69	182218	81290
2324	7.89E-03	1.000	8.03E-03	0.999	16.87	184633	81290
2325	7.68E-03	1.000	8.47E-03	0.998	18.71	191108	81290
2326	8.01E-03	1.000	9.27E-03	1.000	21.02	193522	81290
2327	7.84E-03	1.000	8.16E-03	0.998	17.39	195950	81290
2328	Note 29:DO Probe coated with grease						
2329							
2330							
2331							
2332							
2333							
2334							
2335							
2336							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No	OUR 1 mg/L sec	Coef Corr	OUR 2 mg/L sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2337	8 12E-03	1 000	9 42E-03	0.999	21 36	234322	8129C
2338	8 00E-03	1 000	8 10E-03	0 999	16 94	735	81390
2339	7 56E-03	1 000	7 81E-03	0 997	16 56	3148	81390
2340	7 84E-03	1 000	8 34E-03	0 997	18 01	5601	81390
2341	7 31E-03	0 999	1 25E-02	0 998	33 22	12016	81390
2342	7 60E-03	1 000	1 36E-02	0 998	36 37	14431	81390
2343	7 77E-03	1 000	1.03E-02	0 998	25 04	20847	81390
2344	7 80E-03	1 000	9 40E-03	0 999	21 73	23303	81390
2345	7 63E-03	0 999	8 10E-03	0 999	17 49	25718	81390
2346	7 76E-03	1 000	1 01E-02	0 999	24 21	32136	81390
2347	7 81E-03	1 000	9 48E-03	0 999	22 01	34552	81390
2348	7 77E-03	1 000	7 08E-03	0 998	13.66	41010	81300
2349	7 66E-03	1 000	7 36E-03	0 997	14 56	43427	81300
2350	7 70E-03	1 000	7 18E-03	0.998	14 18	45846	81310
2351	Note 30 RAS seed tank empty						
2352							
2353							
2354							
2355							
2356							
2357							
2358							
2359							
2360							
2361							
2362							
2363							
2364							
2365							
2366	7 59E-03	1 000	1.16E-02	0 999	30.76	110918	81390
2367	5 57E-03	1 000	1 06E-02	0.999	30 02	113331	81390
2368	5 19E-03	0 999	1 04E-02	0.997	30 03	115812	81390
2369	6 52E-03	1 000	1.36E-02	0.999	39.64	122217	81390
2370	7 29E-03	1 000	1 29E-02	0.997	36.12	124629	81390
2371	6 62E-03	0.999	1.38E-02	1.000	40.15	131040	81390
2372	6 87E-03	1 000	1.37E-02	1.000	39 42	133454	81390
2373	7 23E-03	0.999	1.33E-02	1 000	37.59	135905	81390
2374	7 24E-03	0 999	1.40E-02	0.999	39.84	142317	81390
2375	7 83E-03	1 000	1.31E-02	1.000	35.80	144729	81390
2376	7 38E-03	1 000	1.38E-02	0.999	39 09	151140	81390
2377	7 56E-03	1.000	1.31E-02	0.998	36.34	153549	81390
2378	7 31E-03	1.000	1.31E-02	0.999	36.77	155959	81390
2379	7.29E-03	1 000	1.30E-02	0.999	36.19	162408	81390
2380	7 30E-03	0.999	1.26E-02	1.000	34.75	164818	81390
2381	7 06E-03	0 998	1.16E-02	0.999	31.61	171229	81390
2382	6 99E-03	1 000	1.14E-02	1.000	30.92	173639	81390
2383	7.27E-03	1 000	1.16E-02	1.000	31 29	180048	81390
2384	7 00E-03	0.999	1.14E-02	1.000	31.00	182458	81390
2385	7.45E-03	0 999	1.12E-02	1.000	29.63	184909	81390
2386	7 04E-03	1 000	1.08E-02	0.999	27.86	191320	81390
2387	6.76E-03	0 998	1.16E-02	1.000	31.51	193731	81390
2388	6.68E-03	0 996	9.75E-03	1.000	25.50	200142	81390
2389	6 60E-03	0 999	8.70E-03	0.999	21.81	202554	81390
2390	7 17E-03	0.999	6.76E-03	0.999	14.02	205006	81390
2391	6 84E-03	0.999	6.16E-03	0.998	12.34	211415	81390
2392	6.68E-03	1.000	7.50E-03	0.997	17.36	213825	81390
2393							
2394	6.76E-03	0 999	1.29E-02	1 000	36.56	223811	81390
2395	8.07E-03	1.000	1.42E-02	1.000	39.43	230222	81390
2396	7 92E-03	1.000	1.50E-02	0 999	42.70	232631	81390
2397	8.08E-03	1.000	1.36E-02	0.999	37.33	235040	81390
2398	7.83E-03	1.000	1.33E-02	0.999	36.70	1452	81490
2399	7.99E-03	1.000	1.31E-02	0.999	35.56	3901	81490
2400	7.78E-03	1 000	1.28E-02	0.999	34.96	10310	81490
2401	7.76E-03	1 000	1 29E-02	0.999	35.40	12721	81490
2402	7.79E-03	1.000	1.33E-02	0.999	36.83	15132	81490
2403	7.89E-03	1.000	1.14E-02	0.999	29.79	21543	81490
2404	8.41E-03	1.000	1.28E-02	1.000	33.82	23954	81490
2405	8 04E-03	1 000	1.02E-02	1.000	25.11	30407	81490
2406	1.14E-02	1 000	1.24E-02	1.000	28.14	32819	81490
2407	8.91E-03	1.000	1.32E-02	0.999	34.74	35230	81490
2408	8 31E-03	1 000	1.28E-02	0.999	34.20	41643	81490
2409	8 13E-03	0 999	1.23E-02	0.999	32.80	44058	81490

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L sec	Coef. Corr.	OUR 2 mg/L sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2410	7 69E-03	1.000	1.09E-02	0.999	28.62	50613	81490
2411	7.15E-03	1.000	1.03E-02	0.998	26.94	52927	81490
2412	7.20E-03	1.000	1.08E-02	0.999	27.96	55341	81490
2413	7.09E-03	1.000	1.04E-02	0.999	27.39	61757	81490
2414	7.20E-03	1.000	9.59E-03	0.998	24.13	64214	81490
2415	6.34E-03	1.000	1.01E-02	0.999	27.30	70630	81490
2416	6.29E-03	1.000	8.43E-03	1.000	21.29	73048	81490
2417	6.06E-03	1.000	8.36E-03	0.999	21.36	75503	81490
2418							
2419							
2420							
2421							
2422							
2423							
2424							
2425	5.86E-03	1 000	8.67E-03	1.000	23.72	105416	81490
2426	6.11E-03	1.000	9.41E-03	1.000	20.14	111826	81490
2427	6 61E-03	1.000	1.27E-02	0.998	37.82	114239	81490
2428	6.54E-03	0.999	9.24E-03	0.999	24.86	120653	81490
2429	7 13E-03	1.000	1 15E-02	0.998	32.31	123106	81490
2430	6.81E-03	1.000	1.25E-02	0.999	36.49	125517	81490
2431	6.81E-03	1.000	1.12E-02	0.996	31.91	131926	81490
2432	6.44E-03	1.000	1.11E-02	0.998	31.97	134337	81490
2433	6.84E-03	1.000	1.07E-02	0.998	29.83	140746	81490
2434	6.14E-03	1.000	1.13E-02	0.999	33.27	143155	81490
2435	6.50E-03	1.000	9.91E-03	1.000	27.40	145603	81490
2436	6.61E-03	1.000	8.17E-03	0.999	20.71	152012	81490
2437	6.90E-03	1.000	9.87E-03	1.000	26.66	154422	81490
2438	7.10E-03	1.000	6.56E-03	1.000	13.97	160833	81490
2439	6.73E-03	1.000	8.47E-03	0.999	21.67	163244	81490
2440	6.85E-03	1.000	9.10E-03	0.999	23.87	165655	81490
2441	7.01E-03	1.000	9.04E-03	0.999	23.39	172106	81490
2442	6.70E-03	1.000	5.77E-03	0.999	11 57	174520	81490
2443							
2444							
2445							
2446							
2447							
2448	6.16E-03	1.000	9.96E-03	0.998	28.06	204334	81490
2449							
2450							
2451							
2452	7.72E-03	1.000	2.08E-02	0.992	65.29	224624	81490
2453	1.06E-02	0.975	2.08E-02	0.996	62.24	231039	81490
2454	9.02E-03	0.979	1.97E-02	0.996	60.29	233451	81490
2455	8.67E-03	0.998	2.18E-02	0.997	68.90	235906	81490
2456	8.65E-03	0.999	1.99E-02	1.000	61.44	2320	81590
2457	9.20E-03	1.000	2.09E-02	1.000	64.31	4736	81590
2458	8.73E-03	0.976	1.99E-02	1.000	61.61	11151	81590
2459	8.69E-03	1.000	2.13E-02	1.000	66.92	13607	81590
2460	9.53E-03	0.999	2.05E-02	1.000	62.54	20023	81590
2461	9.03E-03	1.000	2.22E-02	1.000	69.63	22440	81590
2462	8.64E-03	0.998	1.95E-02	1.000	59.71	24858	81590
2463	8.84E-03	0.999	2.11E-02	1.000	65.92	31316	81590
2464	8.89E-03	1.000	2.24E-02	0.987	70.76	33739	81590
2465	9.39E-03	1.000	1.99E-02	1.000	60.52	40202	81590
2466	8.48E-03	0.998	1.81E-02	1.000	56.21	42828	81590
2467	8.48E-03	1.000	1.98E-02	1.000	61.49	45050	81590
2468	8.83E-03	1.000	1.83E-02	1.000	56.49	51514	81590
2469	6.38E-03	0.971	1.90E-02	1.000	61.67	53939	81590
2470	3.36E-03	1.000	1.98E-02	1.000	60.87	60406	81590
2471	8.21E-03	1.000	1.93E-02	0.998	60.02	62831	81590
2472	8.19E-03	1.000	1.87E-02	1.000	57.96	65259	81590
2473	8.20E-03	1.000	1.97E-02	1.000	61.61	71726	81590
2474	8.67E-03	0.999	1.77E-02	1.000	53.52	74154	81590
2475							
2476	6.25E-03	0.999	1.41E-02	0.996	37.13	84102	81590
2477	6.12E-03	0.997	1.31E-02	0.997	34.10	90629	81590
2478	6.15E-03	0.996	9.24E-03	0.988	21.12	93000	81590
2479	6.26E-03	0.984	1.06E-02	0.989	25.69	95414	81590
2480	6.26E-03	0.989	1.23E-02	0.999	31.49	101832	81590
2481	6.14E-03	0.989	1.73E-02	1.000	47.23	104257	81590
2482	6.62E-03	1.000	1.45E-02	1.000	38.25	110700	81590

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2483	6.92E-03	0.939	1.69E-02	1.000	45.47	113119	81590
2484	6.87E-03	0.999	1.75E-02	1.000	47.43	115533	81590
2485	8.45E-03	1.000	1.79E-02	0.999	46.72	121945	81590
2486	8.58E-03	1.000	2.33E-02	0.999	63.99	124358	81590
2487	8.89E-03	1.000	2.63E-02	1.000	72.95	130808	81590
2488	9.08E-03	0.997	2.66E-02	1.000	73.76	133221	81590
2489	9.04E-03	1.000	2.19E-02	0.997	58.63	135632	81590
2490	8.89E-03	1.000	2.78E-02	1.000	77.91	142044	81590
2491	9.11E-03	0.999	2.51E-02	1.000	68.95	144459	81590
2492	8.80E-03	1.000	2.07E-02	0.998	55.46	150911	81590
2493	8.87E-03	1.000	2.68E-02	1.000	81.22	153325	81590
2494	9.31E-03	0.993	2.49E-02	0.999	60.16	155735	81590
2495	9.03E-03	1.000	2.82E-02	1.000	78.90	162149	81590
2496	9.12E-03	1.000	2.98E-02	1.000	84.09	164601	81590
2497	9.57E-03	0.998	2.92E-02	1.000	81.43	171015	81590
2498	9.44E-03	1.000	2.78E-02	1.000	77.27	173430	81590
2499	9.24E-03	0.999	2.69E-02	1.000	74.63	175846	81590
2500	9.11E-03	1.000	2.48E-02	1.000	67.96	182302	81590
2501	9.07E-03	0.999	2.69E-02	1.000	74.89	184719	81590
2502	8.82E-03	0.998	2.72E-02	1.000	76.18	191134	81590
2503	9.86E-03	0.998	2.70E-02	1.000	74.00	193552	81590
2504	9.59E-03	1.000	2.44E-02	1.000	65.95	200008	81590
2505	9.14E-03	1.000	2.47E-02	1.000	67.80	202425	81590
2506	9.37E-03	0.999	2.54E-02	1.000	69.71	204841	81590
2507	9.32E-03	1.000	2.43E-02	1.000	66.14	211253	81590
2508	9.46E-03	1.000	2.33E-02	0.998	62.58	213708	81590
2509	6.43E-03	0.990	1.92E-02	0.963	53.35	220124	81590
2510	9.78E-03	1.000	1.93E-02	0.999	49.37	222539	81590
2511	9.66E-03	1.000	2.15E-02	0.998	56.79	224954	81590
2512	9.62E-03	1.000	2.70E-02	0.996	74.28	231409	81590
2513	9.87E-03	1.000	2.76E-02	0.998	75.97	233825	81590
2514	9.68E-03	1.000	3.11E-02	1.000	87.42	241	81690
2515	9.55E-03	0.999	3.32E-02	0.994	94.40	2658	81690
2516	9.96E-03	1.000	3.12E-02	1.000	87.45	5116	81690
2517	8.48E-03	0.994	2.86E-02	1.000	81.06	11536	81690
2518	9.90E-03	0.999	2.94E-02	1.000	81.72	13953	81690
2519	9.90E-03	1.000	2.69E-02	1.000	73.86	20411	81690
2520	9.32E-03	0.999	2.27E-02	1.000	60.95	22831	81690
2521	9.79E-03	1.000	2.93E-02	1.000	81.60	25250	81690
2522	9.90E-03	0.998	3.01E-02	1.000	83.91	31711	81690
2523	9.45E-03	0.999	3.01E-02	1.000	84.71	34129	81690
2524	1.06E-02	1.000	1.40E-02	1.000	31.53	40543	81690
2525	9.20E-03	1.000	1.12E-02	1.000	24.03	42956	81690
2526	9.19E-03	1.000	6.24E-03	0.979	14.60	45408	81690
2527	8.88E-03	0.998	3.54E-03	0.699	-0.03	51018	81690
2528	8.25E-03	1.000	4.25E-03	1.000	3.06	54229	81690
2529	8.15E-03	0.970	4.22E-03	0.966	3.10	60643	81690
2530	8.26E-03	0.991	4.21E-03	1.000	2.92	63058	81690
2531							
2532							
2533							
2534	9.17E-03	0.999	3.08E-03	0.629	-1.90	82930	81690
2535	8.56E-03	0.999	6.32E-03	0.916	9.31	85343	81690
2536	8.97E-03	0.992	6.20E-03	1.000	8.41	91754	81690
2537	8.49E-03	1.000	6.09E-03	1.000	6.64	94208	81690
2538	8.54E-03	1.000	1.66E-02	1.000	42.26	100619	81690
2539	9.06E-03	1.000	1.06E-02	0.998	22.38	103031	81690
2540	8.59E-03	1.000	6.82E-03	0.999	10.88	105441	81690
2541	8.76E-03	1.000	6.55E-03	1.000	9.78	111853	81690
2542	8.72E-03	1.000	6.88E-03	0.959	10.83	114306	81690
2543	8.50E-03	1.000	1.34E-02	1.000	32.11	120721	81690
2544	8.66E-03	0.999	6.78E-03	1.000	10.65	123136	81690
2545	8.48E-03	1.000	9.72E-03	0.998	20.34	125552	81690
2546	8.71E-03	1.000	1.09E-02	0.999	23.63	132007	81690
2547	8.67E-03	0.999	1.76E-02	1.000	45.28	134424	81690
2548	8.94E-03	1.000	9.59E-03	1.000	19.33	140842	81690
2549							
2550							
2551	8.72E-03	1.000	1.74E-02	1.000	44.86	153819	81690
2552	9.15E-03	1.000	2.02E-02	0.991	53.15	160040	81690
2553	9.31E-03	1.000	1.59E-02	1.000	39.13	162459	81690
2554	9.18E-03	1.000	1.67E-02	1.000	41.74	164918	81690
2555	9.32E-03	1.000	1.83E-02	1.000	46.54	171340	81690

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2556	9.96E-03	1.000	1.94E-02	1.000	48.95	173800	81690
2557	1.01E-02	1.000	2.10E-02	1.000	54.61	180218	81690
2558	1.01E-02	1.000	2.37E-02	1.000	63.12	182642	81690
2559	1.02E-02	1.000	1.96E-02	0.[illegible]	50.03	185104	81690
2560	1.01E-02	0.999	2.20E-02	1.000	57.90	191526	81690
2561	1.04E-02	1.000	1.68E-02	1.000	40.48	193940	81690
2562	1.06E-02	0.998	1.61E-02	1.000	38.29	200410	81690
2563	9.64E-03	1.000	2.56E-02	1.000	69.73	202833	81690
2564	1.09E-02	0.999	2.26E-02	1.000	58.71	205258	81690
2565	1.04E-02	1.000	1.57E-02	1.000	37.24	211718	81690
2566							
2567	9.40E-03	1.000	2.37E-02	1.000	81.76	221934	81690
2568	9.33E-03	1.000	1.90E-02	0.999	47.43	224[illegible]	[illegible]90
2569	9.06E-03	0.998	2.52E-02	1.000	66.95	23065	[illegible]690
2570	9.82E-03	1.000	2.70E-02	1.000	71.90	233307	81690
2571	1.01E-02	1.000	2.58E-02	1.000	67.40	235738	81690
2572	1.00E-02	1.000	1.58E-02	1.000	36.93	2213	81790
2573	9.84E-03	1.000	1.49E-02	1.000	33.91	4647	81790
2574	9.64E-03	1.000	1.68E-02	0.985	40.06	11120	81790
2575	9.93E-03	1.000	1.61E-02	1.000	37.65	13601	81790
2576	9.32E-03	1.000	1.46E-02	1.000	33.73	20926	81790
2577	9.58E-03	1.000	1.48E-02	1.000	33.91	22459	81790
2578	9.09E-03	0.999	2.51E-02	1.000	66.47	24938	81790
2579	9.82E-03	1.000	2.57E-02	1.000	67.61	31415	81790
2580	1.00E-02	1.000	1.91E-02	1.000	44.98	33853	81790
2581	1.01E-02	1.000	1.66E-02	1.000	3[illegible].16	40332	81790
2582	9.63E-03	1.000	1.00E-02	0.998	19.17	45602	81790
2583	9.58E-03	1.000	2.30E-02	1.000	59.44	52041	81790
2584	9.63E-03	1.000	1.67E-02	1.000	[illegible]8.19	54518	81790
2585	9.29E-03	1.000	1.39E-02	1.000	3[illegible].96	60958	81790
2586	8.53E-03	0.993	1.20E-02	1.000	26.62	63433	81790
2587	8.71E-03	1.000	1.39E-02	0.991	32.24	65912	81790
2588	4.39E-03	0.977	2.21E-02	1.000	63.10	72354	81790
2589							
2590	7.[illegible]E-03	1.000	1.01E-02	1.000	19.92	81843	81790
2591	9.[illegible]E-03	1.000	1.15E-02	1.000	22.09	84416	81790
2592	8.89E-03	0.964	2.59E-02	1.000	62.72	90847	81790
2593	1.04E-02	0.97[illegible]	1.29E-02	1.000	24.67	93319	81790
2594	9.71E-03	1.000	1.29E-02	1.000	25.49	95744	81790
2595	9.65E-03	1.000	1.22E-02	1.000	23.38	102211	81790
2596	1.02E-02	0.987	1.26E-02	1.000	24.01	104637	81790
2597	9.47E-03	1.000	1.44E-02	1.000	29.72	111104	81790
2598	9.45E-03	1.000	2.41E-02	1.000	57.02	113631	81790
2599	1.01E-02	1.000	1.83E-02	0.998	42.94	115958	81790
2600	9.82E-03	1.000	2.28E-02	0.998	53.22	122413	81790
2601	1.00E-02	1.000	1.59E-02	1.000	32.71	124832	81790
2602	9.77E-03	0.977	1.50E-02	1.000	31.27	131257	81790
2603	9.89E-03	1.000	2.06E-02	0.999	48.84	133723	81790
2604	1.01E-02	1.000	2.71E-02	1.000	66.02	14015[illegible]	81790
2605	1.06E-02	1.000	2.89E-02	0.999	72.38	142625	81790
2606	2.29E-04	0.949	2.96E-02	1.000	82.58	145056	81790
2607	9.92E-03	0.999	2.75E-02	1.000	68.10	151457	81790
2608	1.09E-02	1.000	3.61E-02	1.000	89.33	153900	81790
2609	1.14E-02	1.000	2.18E-02	1.000	48.33	160303	81790
2610	1.10E-02	1.000	1.82E-02	1.000	38.91	1626[illegible]	81790
2611	1.11E-02	1.000	1.93E-02	1.000	41.79	165101	81790
2612	1.10E-02	1.000	3.32E-02	1.000	81.07	171430	81790
2613	1.09E-02	1.000	3.20E-02	1.000	77.67	173757	81790
2614	9.94E-03	0.987	1.87E-02	1.000	41.42	180200	81790
2615	5.92E-06	0.634	1.82E-02	1.000	51.20	182627	81790
2616	3.08E-04	0.915	2.36E-02	1.000	66.88	184830	81790
2617	2.79E-04	0.977	2.04E-02	1.000	57.17	191329	81790
2618	4.12E-04	0.564	2.44E-02	1.000	69.10	193726	81790
2619	2.32E-04	0.991	2.54E-02	1.000	71.26	200125	81790
2620	8.59E-04	0.483	3.40E-02	1.000	94.79	202623	81790
2621	3.03E-04	0.998	2.32E-02	0.996	64.90	204827	81790
2622	1.50E-04	0.991	2.61E-02	0.999	73.10	211324	81790
2623	4.23E-04	0.966	2.32E-02	1.000	64.68	213729	81790
2624	Note 31 Power failure						
2625							
2626							
2627							
2628							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2629							
2630							
2631							
2632							
2633							
2634							
2635							
2636							
2637							
2638							
2639							
2640							
2641							
2642							
2643							
2644							
2645							
2646							
2647							
2648							
2649	8 07E-03	0 999	8 32E-03	1 000	13 46	85444	81890
2650	7 17E-03	0 999	5 98E-03	1 000	8 23	94209	81890
2651	6 78E-03	1.000	7 39E-03	0 976	12.38	100647	81890
2652	7 12E-03	1 000	8 19E-03	1.000	14.13	103128	81890
2653							
2654							
2655	7 40E-03	0 997	5.84E-03	1 000	7.62	120921	81890
2656	6 27E-03	1 000	9.24E-03	1.000	17.82	123345	81890
2657	7 23E-03	1.000	9.17E-03	1.000	16.62	125809	81890
2658	7.12E-03	1.000	9.77E-03	1.000	18.33	132232	81890
2659	7 22E-03	1.000	1.01E-02	1.000	19.16	134654	81890
2660	7 17E-03	1.000	9.71E-03	0.999	18 09	141116	81890
2661	7 28E-03	1 000	1 00E-02	1.000	18 87	143539	81890
2662	7.41E-03	1 000	9.79E-03	1.000	18.07	150002	81890
2663	6 12E-03	0 999	1.08E-02	1.000	22.17	152427	81890
2664	7 22E-03	1.000	1 13E-02	1.000	22.28	154850	81890
2665	7 45E-03	1.000	1.52E-02	0 999	32.31	161313	81890
2666	6 48E-03	0.995	1.47E-02	0.999	32.01	163740	81890
2667	7 77E-03	1.000	1 34E-02	0.999	27.14	170205	81890
2668	7 68E-03	1 000	1 86E-02	0.983	41.00	172630	81890
2669	7.59E-03	1 000	1.69E-02	1.000	36.59	175051	81890
2670	7 48E-03	0 986	1.73E-02	1.000	37.78	181515	81890
2671	7 98E-03	0.998	1.54E-02	0.998	32.30	183939	81890
2672	7 88E-03	1.000	1.30E-02	0.999	26.19	190359	81890
2673	7 57E-03	1.000	1.38E-02	0.999	28.47	192826	81890
2674	8 04E-03	0.972	1.20E-02	1.000	23.23	195248	81890
2675	7.67E-03	1 000	1.40E-02	0.990	28 88	201714	81890
2676	6 97E-03	0.986	1.41E-02	0.999	29.92	204143	81890
2677	7 64E-03	1.000	1.68E-02	1.000	35 90	210608	81890
2678	7 89E-03	0.996	1.20E-02	0.999	23.43	213036	81890
2679	7 56E-03	1 000	1.10E-02	1.000	21.17	215509	81890
2680	8.49E-03	1.000	1.11E-02	1.000	20 50	221943	81890
2681	8.48E-03	1 000	9.80E-03	0.907	18.98	224412	81890
2682	8.37E-03	0.999	1 32E-02	0.999	26.15	230843	81890
2683	7.30E-03	0.998	1.22E-02	1.000	24 44	233317	81890
2684	8.88E-03	0 999	1.18E-02	1 000	21.94	235749	81890
2685	8.68E-03	1.000	1.28E-02	1.000	24.78	2227	81990
2686	8.23E-03	1 000	1.18E-02	1.000	22.92	4700	81990
2687	8.43E-03	1.000	1 21E-02	1.000	23.22	11138	81990
2688	9.39E-03	0.996	1.17E-02	1.000	21.08	13610	81990
2689	8.75E-03	1.000	1.23E-02	1.000	23.38	20048	81990
2690	8.74E-03	0 999	1.22E-02	1.000	22.93	22521	81990
2691	8.72E-03	1.000	1.24E-02	1.000	23.52	24953	81990
2692	8 64E-03	1.000	1.18E-02	1 000	22.13	31423	81990
2693	8 86E-03	0.998	1.15E-02	1.000	21.01	33902	81990
2694	8 52E-03	0.997	1.12E-02	1.000	20.89	40345	81990
2695	Note 32:Auto-sampler pump tube broken						
2696							
2697							
2698							
2699							
2700							
2701							

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2702							
2703							
2704							
2705							
2706	7.05E-03	1.000	8.02E-03	1.000	13.77	84944	81990
2707	6.36E-03	0 999	5.57E-03	0.936	8.02	91400	81990
2708	6.09E-03	0.999	6.10E-03	0.999	9.69	93829	81990
2709	6.38E-03	1.000	7.11E-03	1.000	12.10	100309	81990
2710	6.36E-03	1.000	6.07E-03	0.999	9 35	104342	81990
2711	6.17E-03	1.000	6.18E-03	1.000	9.77	110754	81990
2712	5.88E-03	0.999	7.69E-03	1.000	14.12	113223	81990
2713	8.22E-03	1.000	9.26E-03	0.999	15.79	115701	81990
2714	8.67E-03	1.000	9.57E-03	1.000	16.14	122123	81990
2715	8 13E-03	1.000	9.57E-03	1.000	16.73	124545	81990
2716	9.33E-03	0.997	9.65E-03	1.000	16.74	131006	81990
2717	7.28E-03	1.000	1.01E-02	1.000	16.92	133429	81990
2718	8.60E-03	0.998	1.02E-02	1.000	17.88	135850	81990
2719	8.18E-03	1.000	1.02E-02	1.000	18.28	142314	81990
2720	8.03E-03	0.999	1.12E-02	1.000	21.24	144733	81990
2721	9.22E-03	1.000	1.09E-02	1.000	19.16	151154	81990
2722	9.15E-03	1.000	1.09E-02	0.999	19 29	153612	81990
2723	9.28E-03	1.000	1.22E-02	1.000	22.39	160030	81990
2724	9.18E-03	1.000	1.19E-02	1.000	21.70	162450	81990
2725	9.32E-03	1.000	1.31E-02	1.000	24.82	164911	81990
2726	9.32E-03	1.000	1.47E-02	0.999	29.15	171332	81990
2727	9 21E-03	1.000	1.34E-02	1.000	25.71	173758	81990
2728	9.21E-03	1.000	1.80E-02	0.997	37.94	180217	81990
2729	9.43E-03	1 000	1.67E-02	0.990	34.33	182637	81990
2730	9.29E-03	1.000	1.34E-02	1 000	25.63	185058	81990
2731	8.71E-03	1.000	1.23E-02	1.000	23.26	191519	81990
2732	9.04E-03	1.000	1.31E-02	1.000	25.08	193941	81990
2733	9.30E-03	0.995	1.27E-02	1.000	23.90	200402	81990
2734	9.08E-03	0.972	1.43E-02	0.998	28.15	202823	81990
2735	8.99E-03	1.000	1.85E-02	1.000	34.14	205246	81990
2736	8.82E-03	1.000	1.42E-02	0.999	28.22	211704	81990
2737	8.75E-03	1.000	1.37E-02	1.000	27.10	214126	81990
2738	1.03E-02	0.998	1.24E-02	1.000	22.03	220556	81990
2739	1.00E-02	1.000	1.28E-02	1.000	23.30	223021	81990
2740	1.02E-02	1.000	1.57E-02	0.944	30.66	225447	81990
2741	1.01E-02	1.000	1.30E-02	1.000	23.67	231914	81990
2742	9.76E-03	1.000	1.24E-02	0.999	22.56	234342	81990
2743	9 84E-03	1.000	1.75E-02	0.998	35.87	809	82090
2744	1.08E-02	0.999	1.25E-02	0.999	21.50	3238	82090
2745	9.98E-03	0.998	1.25E-02	0.999	22.66	5707	82090
2746	9.84E-03	1.000	1.29E-02	1.000	23.68	13134	82090
2747	9.79E-03	1.000	1.28E-02	1.000	23.49	14606	82090
2748	9.58E-03	1.000	1.32E-02	1.000	24.78	21033	82090
2749	9.51E-03	1.000	1.25E-02	1.000	23.13	23503	82090
2750	9.93E-03	1.000	1.26E-02	0.999	22.58	25932	82090
2751	9.83E-03	1.000	1.21E-02	1.000	21.68	32401	82090
2752	9.31E-03	1.000	1.19E-02	0.999	21.64	34833	82090
2753	9.51E-03	1.000	1.18E-02	0.999	21.22	41304	82090
2754	1.03E-02	0.997	1.18E-02	1.000	20.27	43734	82090
2755	9.52E-03	0.998	1.04E-02	1.000	17.43	50203	82090
2756	9.22E-03	1.000	1.13E-02	0.999	20.15	52632	82090
2757	8.97E-03	1.000	1.07E-02	1.000	18.72	55104	82090
2758	9.03E-03	1.000	1.04E-02	1.000	17.86	61534	82090
2759	8.82E-03	1.000	9.74E-03	0.999	16.45	64007	82090
2760	8.60E-03	1.000	9.88E-03	0.999	16.47	70438	82090
2761	8.31E-03	1.000	9.81E-03	1.000	17.18	72909	82090
2762							
2763	8.42E-03	1.000	1.13E-02	0.999	27.34	82536	82090
2764	8.27E-03	0.999	1.11E-02	1.000	26.97	85007	82090
2765	8.44E-03	1.000	1.88E-02	1.000	52.62	91436	82090
2766	8.57E-03	1.000	1.31E-02	1.000	33.64	93907	82090
2767	8.50E-03	1.000	1.15E-02	0.999	28.17	100343	82090
2768	8.41E-03	1.000	2.57E-02	0.997	77.21	102817	82090
2769	9.61E-03	1.000	2.11E-02	1.000	59.08	105249	82090
2770	8.58E-03	1.000	2.10E-02	1.000	60.86	111722	82090
2771	8.66E-03	1.000	1.98E-02	1.000	56.64	114153	82090
2772	8.33E-03	1.000	2.22E-02	0.998	66.18	120627	82090
2773	7.59E-03	1.000	2.32E-02	1.000	69.82	123053	82090
2774	8.82E-03	1.000	2.20E-02	1.000	64.32	125528	82090

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept. 1, 1990)

Test No	OUR 1 mg/L.sec	Coef Corr.	OUR 2 mg/L.sec	Coef Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2775	8.40E-03	1.000	2.66E-02	1.000	80.61	131953	82090
2776	9.50E-03	0.996	2.63E-02	1.000	78.05	134423	82090
2777	8.62E-03	1.000	2.43E-02	1.000	72.27	140852	82090
2778	8.83E-03	1.000	2.69E-02	1.000	80.44	143321	82090
2779	9.12E-03	1.000	2.61E-0[illegible]	1.000	77.63	145750	82090
2780	9.07E-03	1.000	2.61E-02	1.000	77.86	152218	82090
2781	9.06E-03	1.000	2.63E-02	1.000	78.38	154849	82090
2782	9.00E-03	1.000	2.58E-02	1.000	76.93	161118	82090
2783	8.98E-03	1.000	2.72E-02	1.000	81.87	163648	82090
2784	9.49E-03	0.989	2.59E-02	1.000	76.47	170017	82090
2785	9.02E-0[illegible]	1.000	2.67E-02	1.000	79.99	172447	82090
2786	9.94E-03	1.000	2.59E-02	1.000	75.84	174916	82090
2787	9.76E-03	1.000	2.53E-02	1.000	74.18	181343	82090
2788	9.91E-03	1.000	2.41E-02	1.000	69.65	183810	82090
2789	9.65E-03	1.000	2.48E-02	1.000	72.44	190237	82090
2790	9.62E-03	1.000	2.38E-02	1.000	68.69	192705	82090
2791	9.09E-03	0.999	2.40E-02	1.000	70.40	195133	82090
2792	9.54E-03	1.000	2.63E-02	1.000	77.67	201603	82090
2793	9.69E-03	1.000	2.27E-02	1.000	64.92	204031	82090
2794	1.02E-02	0.997	2.26E-02	1.000	64.07	210457	82090
2795	9.55E-03	1.000	2.19E-02	1.000	62.64	212923	82090
2796	9.39E-03	1.000	2.24E-02	1.000	64.59	215348	82090
2797	1.04E-02	0.987	2.61E-02	1.000	75.99	221913	82090
2798	9.59E-03	0.999	2.74E-02	1.000	81.58	224240	82090
2799	1.12E-02	1.000	2.79E-02	1.000	81.20	230705	82090
2800	1.06E-02	1.000	1.88E-02	1.000	50.28	233133	82090
2801	1.04E-02	1.000	2.63E-02	1.000	76.53	235559	82090
2802	1.06E-02	1.000	2.42E-02	1.000	69.09	2023	82190
2803	9.04E-03	0.980	2.30E-02	1.000	67.09	4450	82190
2804	1.04E-02	0.989	2.32E-02	1.000	65.96	10917	82190
2805	9.72E-03	1.000	2.77E-02	1.000	82.45	13347	82190
2806	1.18E-02	1.000	2.73E-02	1.000	78.06	15816	82190
2807	1.11E-02	1.000	2.23E-02	1.000	61.70	22246	82190
2808	1.00E-02	1.000	2.10E-02	1.000	58.72	24714	82190
2809	1.00E-02	1.000	2.09E-02	1.000	58.49	31140	82190
2810	8.96E-03	0.999	1.81E-02	1.000	43.38	33607	82190
2811	9.37E-03	1.000	1.82E-02	1.000	49.86	40036	82190
2812	8.79E-03	1.000	1.65E-02	1.000	44.96	42504	82190
2813	9.17E-03	1.000	1.45E-02	1.000	37.37	44932	82190
2814	8.43E-03	1.000	1.45E-02	1.000	38.58	51401	82190
2815	8.41E-03	1.000	1.16E-02	1.000	28.64	53827	82190
2816	7.73E-03	0.994	1.09E-02	1.000	26.91	60254	82190
2817	7.62E-03	1.000	9.77E-03	0.999	23.09	62722	82190
2818	7.70E-03	1.000	1.86E-02	1.000	53.31	65150	82190
2819	7.88E-03	1.000	2.00E-02	1.000	58.24	71619	82190
2820	8.49E-03	1.000	1.72E-02	1.000	47.91	74051	82190
2821							
2822	8.54E-03	1.000	9.12E-03	0.998	23.34	83632	82190
2823	7.27E-03	1.000	8.62E-03	0.999	23.36	90302	82190
2824	8.66E-03	1.000	1.09E-02	0.998	30.37	92731	82190
2825	9.14E-03	1.000	1.10E-02	0.999	30.19	95156	82190
2826	8.72E-03	1.000	1.07E-02	0.999	29.65	101624	82190
2827	8.60E-03	1.000	2.14E-02	0.999	73.16	104057	82190
2828	8.93E-03	1.000	1.25E-02	0.999	38.48	110629	82190
2829	9.56E-03	1.000	1.36E-02	0.997	39.60	113005	82190
2830	Note 33: Solenoid #3 leaked due to debris blocking valve						
2831							
2832							
2833							
2834							
2835							
2836							
2837							
2838							
2839							
2840							
2841							
2842	9.45E-03	0.999	1.18E-02	0.998	32.78	162122	82190
2843	8.20E-03	0.998	2.44E-02	1.000	98.47	164552	82190
2844	9.61E-03	0.988	2.42E-02	0.999	83.17	171024	82190
2845	9.98E-03	1.000	2.50E-02	0.999	86.11	173454	82190
2846	1.04E-02	1.000	2.77E-02	1.000	98.48	175924	82190
2847	1.13E-02	1.000	1.89E-02	0.999	58.98	182353	82190

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1, 1990)

Test No.	OUR 1 mg/L.sec	Coef Corr.	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2848	1.08E-02	1.000	2.30E-02	0.999	78.56	164826	82190
2849	1.13E-02	1.000	2.18E-02	0.999	70.04	191255	82190
2850	1.01E-02	1.000	2.34E-02	1.000	79.20	193724	82190
2851	1.04E-02	0.999	2.15E-02	0.999	71.01	200154	82190
2852	1.10E-02	1.000	2.03E-02	0.999	66.01	202622	82190
2853	1.09E-02	1.000	1.86E-02	0.999	57.93	206061	82190
2854	1.03E-02	0.994	2.40E-02	1.000	81.23	211522	82190
2855	1.11E-02	0.982	2.03E-02	0.999	64.67	213950	82190
2856	1.03E-02	0.999	1.96E-02	0.999	62.76	220421	82190
2857	1.01E-02	1.000	2.03E-02	0.999	66.39	222852	82190
2858	9.93E-03	1.000	2.17E-02	0.999	72.51	225326	82190
2859	1.01E-02	1.000	2.02E-02	0.998	66.07	231755	82190
2860	1.01E-02	0.979	2.29E-02	1.000	77.04	234227	82190
2861	9.59E-03	0.998	2.07E-02	1.000	68.87	658	82290
2862							
2863	4.19E-03	1.000	4.98E-03	0.997	13.44	5637	82290
2864	3.87E-03	0.999	5.87E-03	0.999	17.69	12111	82290
2865	3.7[illegible]E-03	0.999	4.48E-03	0.997	12.13	14541	82290
2866	4.17E-03	0.997	4.85E-03	0.998	13.03	21000	82290
2867	3.93E-03	0.999	6.12E-03	0.999	19.62	23425	82290
2868	3.82E-03	1.000	5.30E-03	0.999	15.42	25853	82290
2869	3.75E-03	0.999	7.83E-03	0.998	25.91	32320	82290
2870	3.63E-03	0.999	6.26E-03	1.000	19.67	34747	82290
2871	3.83E-03	1.000	6.13E-03	0.999	18.80	41209	82290
2872	3.61E-03	0.999	6.94E-03	0.999	22.47	43637	82290
2873	3.93E-03	1.000	6.00E-03	0.999	18.51	50102	82290
2874	3.48E-03	1.000	8.74E-03	0.999	30.06	52530	82290
2875	3.81E-03	1.000	7.58E-03	0.999	24.77	54952	82290
2876	3.66E-03	1.000	8.62E-03	0.999	29.27	61421	82290
2877	6.00E-03	1.000	9.39E-03	0.997	28.58	63846	82290
2878	6.29E-03	1.000	9.04E-03	0.998	26.68	70307	82290
2879	6.30E-03	1.000	9.08E-03	0.998	26.86	72730	82290
2880	6.32E-03	1.000	7.52E-03	0.998	20.43	75203	82290
2881							
2882	5.69E-03	1.000	1.10E-02	0.997	36.75	83901	82290
2883	6.01E-03	0.990	6.56E-03	0.970	18.95	90330	82290
2884	5.38E-03	1.000	1.04E-02	0.999	33.57	92802	82290
2885	5.91E-03	1.000	1.09E-02	0.999	34.73	95232	82290
2886	6.04E-03	1.000	9.90E-03	0.998	30.61	101704	82290
2887	6.01E-03	0.983	8.02E-03	0.998	22.98	104136	82290
2888	6.23E-03	1.000	1.75E-02	1.000	61.41	110608	82290
2889	7.29E-03	1.000	1.25E-02	0.962	39.19	113039	82290
2890	6.48E-03	1.000	1.36E-02	1.000	44.81	115510	82290
2891	6.74E-03	0.999	1.33E-02	0.999	43.47	121943	82290
2892	6.86E-03	0.998	1.67E-02	1.000	57.26	124414	82290
2893	6.67E-03	1.000	1.61E-02	0.999	56.02	130847	82290
2894	6.79E-03	1.000	1.60E-02	1.000	54.53	133308	82290
2895	7.45E-03	1.000	1.56E-02	0.999	51.16	135728	82290
2896	8.87E-03	0.994	1.32E-02	0.998	38.51	142150	82290
2897	7.00E-03	0.997	1.38E-02	0.998	44.15	144810	82290
2898	7.51E-03	1.000	1.28E-02	0.999	39.26	151030	82290
2899	7.10E-03	0.999	1.22E-02	0.998	38.13	153456	82290
2900	7.33E-03	1.000	1.24E-02	0.998	38.86	155919	82290
2901	8.89E-03	1.000	1.29E-02	0.998	39.19	162344	82290
2902	8.71E-03	1.000	1.41E-02	0.997	43.39	164810	82290
2903	8.87E-03	1.000	2.15E-02	1.000	73.48	171240	82290
2904	8.91E-03	0.999	1.74E-02	0.997	56.77	173707	82290
2905	9.32E-03	1.000	1.77E-02	0.999	57.04	180134	82290
2906	9.48E-03	1.000	1.79E-02	0.998	57.69	182602	82290
2907	9.04E-03	1.000	1.82E-02	0.999	51.62	185034	82290
2908	8.89E-03	1.000	1.74E-02	0.998	57.10	191504	82290
2909	9.21E-03	1.000	1.11E-02	0.990	30.49	193934	82290
2910	8.46E-03	1.000	1.54E-02	0.998	49.25	200404	82290
2911	8.42E-03	1.000	1.92E-02	0.999	64.95	202837	82290
2912	7.97E-03	1.000	1.38E-02	0.997	43.64	205306	82290
2913	8.14E-03	0.999	1.14E-02	0.997	33.24	211730	82290
2914	8.27E-03	1.000	1.10E-02	0.999	33.82	214200	82290
2915	9.25E-03	0.999	1.89E-02	0.995	62.20	220624	82290
2916	9.84E-03	0.992	1.50E-02	0.999	45.62	223053	82290
2917	8.51E-03	0.983	2.71E-02	0.999	97.14	225519	82290
2918	1.01E-02	1.000	1.82E-02	0.998	61.99	231949	82290
2919	1.01E-02	0.995	1.79E-02	0.999	58.64	234415	82290
2920	1.10E-02	1.000	1.64E-02	0.997	49.04	841	82390

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2921	1.10E-02	0.999	2.29E-02	0.999	75.66	3308	82390
2922	1.06E-02	0.999	2.51E-02	1.000	85.59	5735	82390
2923	1.06E-02	0.999	2.61E-02	0.999	89.52	12200	82390
2924	1.08E-02	1.000	1.90E-02	0.991	60.40	14828	82390
2925	1.05E-02	1.000	1.5[illegible]E-02	0.998	45.43	21058	82390
2926	9.64E-03	0.999	2.35E-02	1.000	60.46	23522	82390
2927	1.02E-02	1.000	1.70E-02	0.999	52.79	25946	82390
2928	1.03E-02	1.000	1.38E-02	0.995	39.61	324[illegible]	82390
2929	9.42E-03	0.997	1.07E-02	0.998	28.19	34846	82390
2930	9.75E-03	1.000	1.89E-02	0.998	61.44	41318	82390
2931	8.86E-03	0.975	1.98E-02	1.000	66.62	43748	82390
2932	9.23E-03	0.999	1.59E-02	0.998	49.90	50219	82390
2933	8.83E-03	0.999	9.65E-03	0.995	25.03	52848	82390
2934	9.01E-03	0.999	8.44E-03	0.998	19.77	55118	82390
2935	8.19E-03	0.99[illegible]	1.26E-02	0.997	38.22	61552	82390
2936	8.62E-03	0.999	1.17E-02	0.997	33.74	64023	82390
2937	8.77E-03	0.997	8.03E-03	0.998	18.52	70453	82390
2938	8.61E-03	0.992	1.16E-02	1.000	33.56	72924	82390
2939	8.61E-03	0.992	1.16E-02	1.000	33.56	72924	82390
2940							
2941	[illegible]-03	0.999	5.77E-03	0.973	10.40	83732	82390
2942	8.[illegible]8E-03	0.999	5.28E-03	0.991	8.64	90157	82390
2943	7.42E-03	1.000	7.15E-03	0.989	14.48	92627	82390
2944	7.98E-03	1.000	2.31E-02	1.000	69.07	95057	82390
2945	7.34[illegible]-03	0.997	5.47E-03	0.977	8.78	101527	82390
2946	7.36E-03	0.999	8.32E-03	0.994	17.94	103958	82390
2947	7.99E-03	0.999	7.09E-03	0.997	13.27	110427	82390
2948	8.38E-03	0.998	7.31E-03	0.989	13.71	112858	82390
2949	7.97E-03	0.999	6.96E-03	0.990	13.08	115327	82390
2950	7.49E-03	0.999	8.63E-03	0.994	19.51	121800	82390
2951	7.68E-03	0.999	9.43E-03	0.995	22.00	124231	82390
2952	8.10E-03	0.999	1.59E-02	0.999	42.66	130701	82390
2953	7.74E-03	0.999	1.34E-02	0.998	35.60	133130	82390
2954	7.37E-03	0.999	9.23E-03	0.990	21.76	135603	82390
2955	7.72E-03	0.999	1.08E-02	0.993	26.81	142034	82390
2956	7.90E-03	0.999	9.09E-03	0.989	20.53	144503	82390
2957	7.71E-03	0.999	7.53E-03	0.997	15.40	150932	82390
2958	7.73E-03	0.998	6.66E-03	0.989	12.36	153407	82390
2959	7.47E-03	0.999	7.19E-03	0.985	14.56	155839	82390
2960	6.77E-03	0.998	9.42E-03	0.993	23.22	162301	82390
2961	1.05E-02	1.000	8.06E-03	0.978	13.41	164734	82390
2962	6.66E-03	0.998	6.04E-03	0.970	8.63	171210	82390
2963	6.95E-03	0.999	5.29E-03	0.980	5.90	173641	82390
2964	6.30E-03	0.973	7.52E-03	0.979	14.54	180111	82390
2965	6.43E-03	0.998	5.17E-03	0.958	[illegible].21	182542	82390
2966	6.37E-03	0.999	6.39E-03	0.976	10.46	185010	82390
2967	6.25E-03	0.998	7.97E-03	0.979	16.16	191438	82390
2968	6.93E-03	0.998	4.75E-03	0.953	4.08	193911	82390
2969	8.02E-03	0.998	7.21E-03	0.983	13.87	200340	82390
2970	8.57E-03	0.998	5.58E-03	0.976	7.44	202807	82390
2971	8.16E-03	0.997	4.31E-03	0.988	3.82	205236	82390
2972	7.82E-03	0.997	7.59E-03	0.981	15.32	211702	82390
2973	7.66E-03	0.997	4.82E-03	0.843	5.42	214131	82390
2974	7.66E-03	0.998	4.01E-03	0.948	3.03	220602	82390
2975	7.59E-03	0.999	3.33E-03	0.905	1.04	223029	82390
2976	7.43E-03	0.998	5.54E-03	0.924	8.91	225458	82390
2977	7.99E-03	0.997	2.93E-03	0.861	-1.27	231922	82390
2978	7.28E-03	0.995	4.93E-03	0.894	7.00	234351	82390
2979	7.97E-03	0.997	1.09E-03	0.858	-7.29	820	82490
2980	7.99E-03	0.998	4.06E-03	0.949	3.38	3249	82490
2981	7.15E-03	0.998	1.84E-03	0.729	-3.52	5717	82490
2982	7.12E-03	0.992	6.39E-03	0.914	12.27	12142	82490
2983	6.82E-03	0.993	2.41E-03	0.838	-1.12	14610	82490
2984	7.24E-03	0.998	5.20E-03	0.981	7.97	21043	82490
2985	7.28E-03	0.995	5.40E-03	0.842	8.81	23513	82490
2986	7.03E-03	0.995	4.0[illegible]E-03	0.999	4.20	25938	82490
2987	6.49E-03	0.993	4.43E-03	0.990	6.38	32408	82490
2988	6.84E-03	[illegible]994	9.19E-03	0.997	22.33	34836	82490
2989	6.61E-03	0.992	5.43E-03	0.997	9.64	41307	82490
2990	7.04E-03	0.994	6.44E-03	0.991	12.54	43736	82490
2991	6.84E-03	0.995	4.67E-03	0.987	8.36	50203	82490
2992	6.50E-03	0.998	4.51E-03	0.972	8.59	52633	82490
2993	5.31E-03	0.994	4.33E-03	0.977	7.64	55103	82490

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
2994	6.31E-03	0.998	5.30E-03	0.970	9.61	61531	82490
2995	5.75E-03	0.992	3.33E-03	0.989	3.58	64004	82490
2996	5.82E-03	0.992	4.15E-03	0.978	6.32	70435	82490
2997	6.08E-03	0.995	4.15E-03	0.983	5.95	72908	82490
2998	5.94E-03	0.998	4.45E-03	0.985	7.19	75335	82490
2999							
3000	6.16E-03	1.000	9.43E-03	1.000	24.12	84926	82490
3001	5.91E-03	1.000	9.30E-03	1.000	20.55	91348	82490
3002	6.08E-03	1.000	7.63E-03	0.999	18.04	93807	82490
3003	6.15E-03	1.000	9.13E-03	1.000	18.95	100227	82490
3004	6.57E-03	1.000	8.80E-03	1.000	21.37	102648	82490
3005	5.97E-03	0.998	8.58E-03	0.999	21.35	105104	82490
3006	5.75E-03	0.999	7.78E-03	0.998	18.91	111518	82490
3007	5.88E-03	0.999	7.62E-03	0.998	18.23	113938	82490
3008	5.88E-03	1.000	7.84E-03	1.000	18.99	120404	82490
3009	5.82E-03	0.999	8.12E-03	0.999	2[illegible].[illegible]7	122828	82490
3010	5.79E-03	1.000	6.73E-03	0.997	15.27	125244	82490
3011	5.29E-03	0.999	7.38E-03	0.999	18.22	131710	82490
3012	5.52E-03	0.999	7.54E-03	0.998	18.46	134132	82490
3013	5.04E-03	0.999	6.59E-03	0.999	15.80	140547	82490
3014	5.08E-03	1.000	5.75E-03	0.9[illegible]	12.88	143008	82490
3015	5.31E-03	0.999	7.14E-03	0.999	17.38	145425	82490
3016	5.00E-03	0.999	6.68E-03	0.998	16.18	151842	82490
3017	4.89E-03	1.000	7.14E-03	0.999	17.94	154305	82490
3018	4.75E-03	0.999	6.84E-03	0.997	16.39	160722	82490
3019							
3020	3.20E-03	0.992	1.07E-02	1.000	32.56	171632	82490
3021	6.94E-03	0.995	1.10E-02	1.000	28.57	174059	82490
3022	5.59E-03	0.969	1.20E-02	1.000	33.73	180526	82490
3023	5.48E-03	0.997	1.19E-02	1.000	33.77	182953	82490
3024	6.09E-03	1.000	1.17E-02	1.000	31.94	185415	82490
3025	6.03E-03	0.998	1.24E-02	1.000	34.53	191040	82490
3026	5.88E-03	1.000	1.14E-02	0.998	31.39	194305	82490
3027	6.02E-03	1.000	1.17E-02	1.000	31.99	200729	82490
3028	5.65E-03	1.000	2.72E-02	1.000	86.97	203158	82490
3029	6.04E-03	1.000	1.19E-02	1.000	32.71	205825	82490
3030	5.85E-03	1.000	1.05E-02	1.000	28.31	212047	82490
3031	5.68E-03	0.997	1.23E-02	1.000	34.72	214512	82490
3032	5.70E-03	0.995	1.89E-02	0.994	57.48	220937	82490
3033	6.20E-03	1.000	1.30E-02	1.000	36.38	223408	82490
3034	5.73E-03	1.000	1.15E-02	1.000	31.78	225830	82490
3035	6.06E-03	1.000	1.38E-02	0.999	38.70	232258	82490
3036	6.41E-03	1.000	1.04E-02	1.000	27.26	234725	82490
3037	6.19E-03	1.000	1.15E-02	1.000	31.27	1152	82590
3038	6.32E-03	1.000	1.06E-02	1.000	27.44	3619	82590
3039	6.04E-03	0.999	1.03E-02	1.000	27.43	10047	82590
3040	6.03E-03	1.000	1.08E-02	1.000	28.38	12513	82590
3041	5.98E-03	1.000	1.01E-02	1.000	26.78	14938	82590
3042	6.00E-03	1.000	1.03E-02	1.000	27.45	21403	82590
3043	5.43E-03	1.000	1.17E-02	1.000	32.93	23829	82590
3044	6.22E-03	1.000	9.89E-03	1.000	25.61	30256	82590
3045	6.13E-03	1.000	1.56E-02	0.995	45.04	32722	82590
3046	6.02E-03	1.000	1.03E-02	1.000	27.17	35147	82590
3047	6.10E-03	1.000	9.67E-03	1.000	25.01	41613	82590
3048	5.81E-03	1.000	9.53E-03	1.000	24.94	44041	82590
3049	5.86E-03	1.000	9.44E-03	1.000	24.58	50509	82590
3050	5.93E-03	1.000	8.90E-03	1.000	22.58	52936	82590
3051	5.40E-03	1.000	9.08E-03	1.000	23.87	55407	82590
3052	5.62E-03	1.000	9.00E-03	1.000	23.38	61836	82590
3053	5.53E-03	1.000	8.98E-03	0.999	23.41	64309	82590
3054	5.25E-03	1.000	1.00E-02	0.975	27.42	70743	82590
3055	5.28E-03	1.000	8.86E-03	1.000	23.33	73215	82590
3056	4.99E-03	1.000	9.05E-03	0.999	24.40	75647	82590
3057							
3058	4.89E-03	0.999	8.04E-03	1.000	21.07	85428	82590
3059	5.09E-03	1.000	7.77E-03	0.999	19.03	91848	82590
3060	5.36E-03	1.000	7.69E-03	1.000	19.12	94309	82590
3061	5.62E-03	1.000	8.30E-03	1.000	21.08	100731	82590
3062	6.08E-03	1.000	9.59E-03	1.000	24.80	103151	82590
3063	5.82E-03	1.000	9.31E-03	1.000	24.19	105612	82590
3064	6.24E-03	0.998	9.28E-03	1.000	23.41	112037	82590
3065	5.89E-03	1.000	9.81E-03	1.000	25.79	114601	82590
3066	6.02E-03	1.000	9.61E-03	1.000	24.94	120924	82590

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No	OUR 1 mg/L.sec	Coef. Corr.	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
3067	6.63E-03	1.000	1.02E-02	1.000	26.02	123349	82590
3068	6.55E-03	1.000	9.91E-03	1.000	25.24	125814	82590
3069	6.48E-03	1.000	1.02E-02	1.000	26.42	132238	82590
3070	6.19E-03	1.000	1.03E-02	1.000	27.06	134702	82590
3071	6.44E-03	1.000	1.05E-02	1.000	27.42	141126	82590
3072	6.66E-03	1.000	1.08E-02	1.000	27.48	143548	82590
3073	6.60E-03	1.000	1.07E-02	1.000	28.01	150015	82590
3074	6.28E-03	1.000	1.11E-02	1.000	29.68	152447	82590
3075	6.43E-03	1.000	1.09E-02	1.000	28.53	154918	82590
3076	6.56E-03	1.000	1.09E-02	1.000	28.49	161349	82590
3077	6.34E-03	1.000	1.19E-02	1.000	32.38	163821	82590
3078	6.50E-03	1.000	1.09E-02	1.000	28.64	170252	82590
3079	6.43E-03	1.000	1.08E-02	1.000	28.41	172722	82590
3080	6.59E-03	1.000	1.09E-02	1.000	28.41	175153	82590
3081	6.56E-03	1.000	1.15E-02	1.000	30.70	181624	82590
3082	6.71E-03	1.000	1.10E-02	1.000	28.95	1840[illegible]	82590
3083	6.90E-03	1.000	1.08E-02	1.000	27.98	190522	82590
3084	6.60E-03	1.000	1.06E-02	0.999	27.67	192952	82590
3085	6.56E-03	1.000	1.04E-02	1.000	27.03	195425	82590
3086	6.63E-03	1.000	1.05E-02	1.000	27.10	201857	82590
3087	6.56E-03	1.000	1.06E-02	0.999	27.56	204329	82590
3088	6.64E-03	1.000	1.01E-02	0.996	25.86	212800	82590
3089	6.92E-03	1.000	1.05E-02	1.000	26.59	215218	82590
3090	6.81E-03	1.000	1.07E-02	1.000	27.59	221643	82590
3091	7.06E-03	1.000	9.95E-03	1.000	24.65	224100	82590
3092	6.87E-03	1.000	1.02E-02	1.000	25.63	230527	82590
3093	7.02E-03	1.000	1.02E-02	1.000	25.71	232952	82590
3094	6.54E-03	1.000	1.03E-02	1.000	26.47	235412	82590
3095	6.75E-03	1.000	1.10E-02	1.000	28.75	1836	82690
3096	6.75E-03	1.000	1.02E-02	1.000	26.01	4258	82690
3097	6.65E-03	1.000	1.03E-02	1.000	26.49	10717	82690
3098	6.87E-03	1.000	1.03E-02	1.000	26.30	13142	82690
3099	6.64E-03	1.000	1.10E-02	1.000	28.76	15608	82690
3100	6.56E-03	1.000	1.04E-02	1.000	26.79	22329	82690
3101	6.78E-03	1.000	1.03E-02	1.000	26.30	24452	82690
3102	6.72E-03	1.000	9.99E-03	1.000	25.27	30917	82690
3103	6.61E-03	1.000	1.01E-02	0.999	25.90	33341	82690
3104	6.60E-03	1.000	9.76E-03	1.000	24.65	35806	82690
3105	6.52E-03	1.000	9.66E-03	1.000	24.39	42230	82690
3106	6.49E-03	1.000	9.61E-03	1.000	24.30	44657	82690
3107	6.54E-03	1.000	9.52E-03	1.000	23.89	51122	82690
3108	6.49E-03	1.000	9.37E-03	1.000	23.43	53547	82690
3109	6.31E-03	1.000	8.68E-03	1.000	22.02	60013	82690
3110	6.24E-03	1.000	8.89E-03	1.000	22.11	62438	82690
3111	6.34E-03	1.000	8.77E-03	1.000	21.58	64906	82690
3112	6.17E-03	1.000	8.37E-03	1.000	20.43	71334	82690
3113							
3114							
3115	5.15E-03	0.999	7.07E-03	1.000	18.03	85625	82690
3116	5.72E-03	1.000	6.82E-03	1.000	18.32	92347	82690
3117	5.92E-03	1.000	7.78E-03	0.999	19.40	94809	82690
3118	5.83E-03	1.000	8.98E-03	1.000	18.77	101232	82690
3119	5.96E-03	1.000	7.40E-03	1.000	18.09	103658	82690
3120	6.03E-03	1.000	7.91E-03	1.000	19.77	110117	82690
3121	5.81E-03	1.000	7.22E-03	1.000	17.62	112538	82690
3122	6.28E-03	1.000	7.46E-03	1.000	17.79	114958	82690
3123	6.28E-03	1.000	8.04E-03	1.000	19.91	121417	82690
3124	6.33E-03	1.000	8.24E-03	1.000	20.56	123833	82690
3125	6.24E-03	1.000	8.87E-03	1.000	22.86	130250	82690
3126	6.67E-03	1.000	8.62E-03	1.000	21.44	132704	82690
3127	6.62E-03	1.000	8.98E-03	1.000	22.72	135121	82690
3128	6.81E-03	1.000	8.53E-03	0.999	20.88	141536	82690
3129	6.64E-03	1.000	8.70E-03	0.999	21.45	143949	82690
3130	6.86E-03	1.000	9.25E-03	1.000	23.42	150403	82690
3131	6.90E-03	1.000	9.02E-03	1.000	22.52	152817	82690
3132	6.15E-03	0.999	8.93E-03	1.000	23.29	155232	82690
3133	6.89E-03	1.000	8.74E-03	1.000	21.64	161646	82690
3134	6.84E-03	1.000	8.2[illegible]	0.999	19.86	164058	82690
3135	6.71E-03	1.000	8.0[illegible]	0.999	19.46	170511	82690
3136	6.69E-03	1.000	8.71E-03	1.000	21.71	172928	82690
3137	3.43E-04	0.958	8.74E-03	1.000	30.89	175348	82690
3138	7.12E-03	1.000	8.27E-03	0.999	19.50	181806	82690
3139	6.57E-03	1.000	8.34E-03	0.999	20.54	184222	82690

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept.1,1990)

Test No.	OUR 1 mg/L.sec	Coef. Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
3140	6.92E-03	1.000	7.86E-03	0.999	19.30	190539	82690
3141	6.61E-03	1.000	7.95E-03	1.000	19.11	193061	82690
3142	6.49E-03	1.000	7.52E-03	0.999	17.72	195509	82690
3143	6.49E-03	1.000	7.91E-03	0.999	19.19	201924	82690
3144	6.47E-03	1.000	7.80E-03	1.000	18.79	204342	82690
3145	6.58E-03	1.000	8.40E-03	1.000	20.79	210759	82690
3146	6.44E-03	1.000	8.29E-03	1.000	20.59	214539	82690
3147	6.68E-03	1.000	8.80E-03	0.999	21.34	220654	82690
3148	6.65E-03	1.000	8.54E-03	0.999	20.47	223409	82690
3149	6.82E-03	1.000	9.16E-03	1.000	23.14	225823	82690
3150	7.06E-03	1.000	9.22E-03	1.000	23.04	232236	82690
3151	6.80E-03	1.000	9.55E-03	1.000	24.58	234651	82690
3152	7.20E-03	1.000	1.07E-02	1.000	28.01	1107	82790
3153	7.21E-03	1.000	1.96E-02	1.000	59.86	3622	82790
3154	7.36E-03	1.000	1.97E-02	1.000	60.38	5837	82790
3155	7.23E-03	1.000	1.84E-02	1.000	55.98	12363	82790
3156	6.78E-03	1.000	1.28E-02	0.999	35.59	14808	82790
3157	6.86E-03	1.000	1.25E-02	0.999	35.04	21225	82790
3158	7.11E-03	1.000	1.13E-02	0.999	30.49	23642	82790
3159	6.74E-03	1.000	1.15E-02	0.999	31.58	30059	82790
3160	6.85E-03	1.000	1.06E-02	1.000	27.92	32515	82790
3161	6.71E-03	1.000	1.03E-02	1.000	27.56	34933	82790
3162	6.40E-03	1.000	1.88E-02	1.000	50.81	[illegible]	82790
3163	6.16E-03	1.000	1.81E-02	1.000	58.48	43811	82790
3164	6.50E-03	1.000	8.83E-03	1.000	22.43	50231	82790
3165	6.07E-03	1.000	8.92E-03	1.000	23.38	52653	82790
3166	5.88E-03	1.000	1.89E-02	1.000	52.56	56114	82790
3167	5.93E-03	1.000	9.12E-03	0.999	20.69	61536	82790
3168	5.58E-03	1.000	7.93E-03	1.000	20.50	63957	82790
3169	5.38E-03	1.000	1.38E-02	0.999	42.40	70419	82790
3170	5.27E-03	1.000	7.36E-03	0.999	19.98	72840	82790
3171							
3172	6.07E-03	0.999	7.78E-03	1.000	21.91	82721	82790
3173	6.29E-03	1.000	1.35E-02	1.000	44.92	85139	82790
3174	6.00E-03	0.999	8.81E-03	1.000	26.20	91567	82790
3175	6.31E-03	1.000	7.69E-03	0.999	21.00	94014	82790
3176	6.27E-03	1.000	7.48E-03	1.000	20.39	100429	82790
3177	5.91E-03	1.000	8.07E-03	1.000	23.36	102846	82790
3178	6.18E-03	1.000	1.89E-02	1.000	57.67	105303	82790
3179	6.54E-03	1.000	1.30E-02	1.000	42.32	111717	82790
3180	6.28E-03	1.000	1.12E-02	1.000	35.56	114130	82790
3181	6.32E-03	1.000	1.70E-02	1.000	58.27	120544	82790
3182	6.23E-03	1.000	1.82E-02	1.000	64.28	123002	82790
3183	6.43E-03	1.000	1.89E-02	1.000	58.23	125418	82790
3184	6.41E-03	1.000	2.01E-02	1.000	71.84	131834	82790
3185	7.14E-03	1.000	2.18E-02	1.000	77.88	134250	82790
3186	7.23E-03	1.000	1.97E-02	1.000	68.73	140706	82790
3187	7.11E-03	1.000	2.00E-02	1.000	70.36	143122	82790
3188	7.08E-03	1.000	2.11E-02	1.000	74.86	145538	82790
3189	7.29E-03	1.000	2.19E-02	1.000	77.70	151954	82790
3190	7.47E-03	1.000	1.86E-02	1.000	67.51	154410	82790
3191	7.48E-03	1.000	2.06E-02	1.000	71.51	160827	82790
3192	7.58E-03	1.000	1.90E-02	1.000	65.13	163242	82790
3193	7.48E-03	1.000	2.04E-02	1.000	71.20	165657	82790
3194	7.54E-03	1.000	2.08E-02	1.000	72.83	172112	82790
3195	7.48E-03	1.000	1.93E-02	1.000	[illegible]	174627	82790
3196	7.37E-03	1.000	2.06E-02	1.000	71.04	180943	82790
3197	7.48E-03	1.000	1.94E-02	1.000	67.21	183357	82790
3198	7.29E-03	1.000	1.87E-02	1.000	68.53	185809	82790
3199	7.32E-03	1.000	1.88E-02	1.000	66.24	192222	82790
3200	6.98E-03	0.999	2.06E-02	1.000	72.47	194638	82790
3201	7.04E-03	1.000	1.83E-02	1.000	62.37	201058	82790
3202	7.41E-03	1.000	1.88E-02	1.000	64.80	203511	82790
3203	7.11E-03	1.000	1.74E-02	1.000	59.74	205924	82790
3204	7.10E-03	1.000	1.89E-02	1.000	69.86	212338	82790
3205	7.32E-03	1.000	1.84E-02	1.000	67.53	214750	82790
3206	7.08E-03	1.000	1.84E-02	1.000	65.80	221202	82790
3207							
3208	5.00E-03	1.000	8.08E-03	0.999	24.98	230143	82790
3209	4.94E-03	1.000	4.58E-03	0.999	10.57	232617	82790
3210	4.87E-03	1.000	9.88E-03	0.999	31.39	235047	82790
3211	5.19E-03	0.999	5.12E-03	0.999	12.44	1817	82890
3212	4.78E-03	1.000	5.20E-03	0.999	13.48	3848	82890

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No	OUR 1 mg/L sec	Coef Corr	OUR 2 mg/L sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
3213	4.87E-03	1.000	5.93E-03	1.000	16.31	10411	82990
3214	4.94E-03	1.000	4.81E-03	0.998	[illegible]	12831	82990
3215	4.78E-03	1.000	8.93E-03	0.998	26.70	15250	82990
3216	4.89E-03	1.000	8.95E-03	0.999	28.62	21708	82990
3217	4.87E-03	1.000	9.03E-03	0.999	29.31	24124	82990
3218	4.83E-03	1.000	9.89E-03	0.999	33.24	30642	82990
3219	4.72E-03	1.000	9.03E-03	0.999	29.22	33008	82990
3220	4.53E-03	1.000	9.54E-03	0.999	31.61	35430	82990
3221	4.59E-03	1.000	8.54E-03	1.000	27.44	41852	32990
3222	4.39E-03	1.000	8.35E-03	0.999	26.98	44314	82990
3223	4.41E-03	0.999	9.54E-03	0.998	31.81	50739	82990
3224	4.49E-03	1.000	1.04E-02	1.000	35.39	53156	82990
3225	4.45E-03	1.000	1.02E-02	0.999	34.25	55818	82990
3226	4.12E-03	0.999	9.75E-03	0.999	33.15	62043	82990
3227	4.16E-03	1.000	9.94E-03	1.000	33.86	64503	82990
3228	4.17E-03	1.000	9.70E-03	0.999	32.86	70926	82990
3229	4.05E-03	0.999	1.00E-02	0.998	34.32	73362	82990
3230	4.04E-03	1.000	9.75E-03	1.000	33.29	75815	82990
3231	5.03E-03	1.000	1.19E-02	1.000	30.71	82826	82990
3232	3.51E-03	0.987	1.07E-02	1.000	26.83	85247	82990
3233	4.26E-03	1.000	7.79E-03	0.999	18.86	91709	82990
3234	4.14E-03	1.000	1.07E-02	1.000	28.03	94123	82990
3235	4.30E-03	1.000	8.91E-03	1.000	22.32	100642	82990
3236	4.38E-03	0.999	8.96E-03	1.000	22.36	102958	82990
3237	4.87E-03	1.000	1.21E-02	1.000	31.68	105409	82990
3238	4.73E-03	1.000	1.29E-02	1.000	34.27	111826	82990
3239	5.31E-03	1.000	1.19E-02	1.000	30.37	114240	82990
3240	4.31E-03	0.999	1.20E-02	1.000	31.97	120702	82990
3241	4.75E-03	1.000	1.13E-02	0.999	29.11	123116	82990
3242	4.69E-03	[illegible]	1.10E-02	1.000	28.39	125636	82990
3243	4.66E-03	1.000	1.27E-02	1.000	33.58	131950	82990
3244	5.20E-03	1.000	1.42E-02	0.999	37.60	134404	82990
3245	5.48E-03	1.000	1.32E-02	1.000	34.07	140819	82990
3246	5.29E-03	1.000	1.32E-02	0.999	34.32	143235	82990
3247	5.49E-03	1.000	1.24E-02	1.000	31.63	145653	82990
3248	5.24E-03	1.000	1.41E-02	1.000	37.27	152109	82990
3249	6.13E-03	0.999	1.44E-02	1.000	36.98	154525	82990
3250	5.48E-03	1.000	1.42E-02	0.999	37.13	160939	82990
3251	6.10E-03	1.000	1.29E-02	1.000	31.67	163354	82990
3252	6.86E-03	1.000	1.66E-02	1.000	42.78	165804	82990
3253	7.04E-03	1.000	1.43E-02	1.000	36.77	172219	82990
3254	7.03E-03	1.000	1.45E-02	1.000	38.14	174634	82990
3255	6.48E-03	1.000	1.79E-02	1.000	47.66	181047	82990
3256	6.94E-03	1.000	1.83E-02	1.000	48.04	183500	82990
3257	7.14E-03	1.000	1.77E-02	1.000	46.06	185911	82990
3258	7.08E-03	1.000	1.87E-02	1.000	49.38	192323	82990
3259	7.53E-03	1.000	1.92E-02	1.000	50.37	194734	82990
3260	7.51E-03	1.000	1.80E-02	1.000	46.60	201146	82990
3261	7.31E-03	1.000	1.75E-02	1.000	46.32	203558	82990
3262	7.42E-03	1.000	1.70E-02	1.000	43.51	210008	82990
3263	7.21E-03	1.000	1.72E-02	1.000	44.44	212416	82990
3264	7.37E-03	1.000	1.58E-02	0.998	39.85	214828	82990
3265	7.24E-03	1.000	1.85E-02	1.000	48.49	221238	82990
3266	7.80E-03	1.000	1.72E-02	1.000	43.62	223649	82990
3267	6.99E-03	1.000	1.76E-02	1.000	45.90	230209	82990
3268	8.03E-03	1.000	1.78E-02	1.000	45.29	232619	82990
3269	7.76E-03	1.000	2.01E-02	1.000	52.87	235029	82990
3270	7.73E-03	1.000	2.02E-02	1.000	52.86	1441	82990
3271	7.66E-03	1.000	1.77E-02	1.000	45.49	3848	82990
3272	7.69E-03	1.000	2.10E-02	1.000	56.49	10258	82990
3273	8.15E-03	1.000	2.06E-02	1.000	53.38	12707	82990
3274	7.97E-03	1.000	1.98E-02	1.000	51.66	15119	82990
3275	7.77E-03	1.000	1.65E-02	1.000	41.50	21530	82990
3276	7.64E-03	1.000	1.30E-02	1.000	33.61	23946	82990
3277	7.36E-03	1.000	1.92E-02	1.000	50.49	30358	82990
3278	7.66E-03	1.000	1.94E-02	1.000	50.83	32814	82990
3279	7.10E-03	1.000	1.58E-02	1.000	39.58	35230	82990
3280	7.34E-03	1.000	1.69E-02	1.000	43.29	41644	82990
3281	7.49E-03	1.000	1.64E-02	1.000	41.64	44057	82990
3282	6.57E-03	1.000	1.96E-02	1.000	52.24	50507	82990
3283	7.19E-03	1.000	1.09E-02	1.000	25.03	52923	82990
3284	6.97E-03	1.000	1.64E-02	1.000	42.27	55338	82990
3285	6.71E-03	1.000	6.75E-03	1.000	16.81	61749	82990

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

Test No.	OUR 1 mg/L sec	Coef. Corr.	OUR 2 mg/L sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
3286	6.19E-03	1.000	6.28E-03	0.999	16.00	64203	82990
3287	6.29E-03	1.000	6.52E-03	0.999	16.64	70617	82990
3288	5.94E-03	1.000	7.93E-03	0.999	17.25	73027	82990
3289							
3290	6.84E-03	1.000	9.89E-03	0.999	19.09	82509	82990
3291	6.39E-03	1.000	6.58E-03	0.999	16.74	84923	82990
3292	6.72E-03	1.000	1.52E-02	0.998	38.97	91328	82990
3293	7.25E-03	1.000	6.54E-03	0.999	17.52	9373	82990
3294	6.26E-03	1.000	1.94E-02	1.000	52.31	100145	82990
3295	7.45E-03	1.000	1.94E-02	1.000	50.97	102553	82990
3296	5.49E-04	0.536	9.88E-03	0.999	29.28	105000	82990
3297	5.56E-03	1.000	1.74E-02	1.000	47.09	111408	82990
3298	8.74E-03	0.999	1.06E-02	0.999	24.26	113812	82990
3299	5.22E-03	0.999	1.99E-02	1.000	55.18	120219	82990
3300	6.22E-03	0.997	1.03E-02	0.999	24.34	122628	82990
3301	2.96E-03	0.991	1.03E-02	1.000	28.44	125031	82990
3302	1.56E-04	0.583	1.18E-02	1.000	36.46	131437	82990
3303	3.20E-03	0.953	1.35E-02	1.000	37.83	133842	32990
3304	1.08E-04	0.667	1.95E-02	1.000	60.33	140248	82990
3305	4.03E-03	0.996	1.18E-02	1.000	31.53	142648	82990
3306	1.67E-04	0.696	1.58E-02	1.000	49.01	145048	82990
3307	2.81E-04	0.898	1.64E-02	1.000	50.41	151449	82990
3308	1.62E-04	0.540	1.73E-02	1.000	53.62	153852	82990
3309	2.09E-03	0.828	1.74E-02	1.000	51.34	160256	82990
3310	3.20E-04	0.471	1.97E-02	1.000	60.86	162657	82990
3311	8.40E-03	0.999	2.31E-02	1.000	61.23	165022	82990
3312	1.97E-04	0.690	2.28E-02	1.000	69.91	171419	82990
3313	7.24E-04	0.706	2.45E-02	1.000	75.24	173820	82990
3314	7.37E-06	0.580	2.18E-02	1.000	66.92	180220	82990
3315	8.71E-03	1.000	2.29E-02	1.000	62.59	182621	82990
3316	2.14E-04	0.898	1.49E-02	1.000	45.86	185021	82990
3317	1.66E-03	0.984	1.52E-02	1.000	45.27	191424	82990
3318	8.33E-06	0.780	2.15E-02	1.000	66.63	193821	82990
3319	1.74E-04	0.834	1.82E-02	1.000	56.29	200221	82990
3320	2.54E-04	0.917	1.72E-02	1.000	53.21	202625	82990
3321	[illegible]	0.985	1.43E-02	1.000	39.80	206024	82990
3322	2.54E-04	0.927	1.83E-02	1.000	56.38	211349	82990
3323	4.58E-03	0.630	1.88E-02	1.000	45.90	213715	82990
3324	2.65E-04	0.881	4.43E-04	0.981	1.05	220040	82990
3325	7.29E-03	0.999	7.35E-03	0.999	13.78	222402	82990
3326	1.53E-04	0.780	7.13E-04	0.924	2.02	224727	82990
3327	3.80E-04	0.848	3.69E-04	0.993	0.87	231054	82990
3328	1.60E-03	0.896	1.30E-04	0.705	-1.59	233419	82990
3329	1.97E-03	0.946	7.72E-04	0.926	-0.08	235744	82990
3330	9.10E-04	0.905	1.19E-03	0.880	2.53	2110	83090
3331	3.51E-04	0.974	6.22E-04	0.990	1.49	4434	83090
3332	2.54E-04	0.809	4.27E-04	0.932	1.01	10758	83090
3333	1.53E-04	0.729	7.92E-06	0.391	0.08	13125	83090
3334	3.95E-04	0.933	1.69E-04	0.810	0.02	15451	83090
3335	5.21E-04	0.749	7.50E-04	0.936	1.88	21818	83090
3336	3.99E-04	0.988	5.44E-04	0.997	1.19	25040	83090
3337	5.30E-04	0.972	5.08E-04	0.791	0.91	31405	83090
3338	1.60E-04	0.834	5.80E-04	0.970	1.54	33731	83090
3339	4.10E-04	0.861	3.23E-04	0.882	0.49	40056	83090
3340	3.20E-04	0.948	5.28E-04	0.983	1.23	42421	83090
3341	3.34E-04	0.985	6.87E-04	0.956	1.72	44747	83090
3342	2.97E-04	0.887	8.39E-06	0.390	-0.11	51112	83090
3343	4.92E-06	0.291	6.16E-04	0.804	1.86	53437	83090
3344	2.77E-04	0.819	6.32E-04	0.923	1.62	55803	83090
3345	3.79E-04	0.901	5.10E-04	0.840	1.11	62128	83090
3346	2.34E-04	0.906	1.90E-04	0.958	0.27	64454	83090
3347	2.64E-04	0.918	2.89E-04	0.873	0.57	70820	83090
3348	3.06E-04	0.920	9.75E-06	0.394	-0.09	73146	83090
3349							
3350	5.39E-03	1.000	1.05E-02	0.999	23.35	83929	83090
3351	2.41E-03	1.000	2.05E-03	1.000	3.05	90353	83090
3352	5.86E-04	0.999	1.73E-03	0.999	4.22	92815	83090
3353	3.62E-04	0.982	1.88E-03	1.000	4.33	95237	83090
3354	1.29E-04	0.139	1.79E-03	1.000	4.90	101701	83090
3355	1.58E-03	0.999	1.61E-03	0.998	3.32	104121	83090
3356	1.67E-03	0.999	1.60E-03	0.998	3.20	110541	83090
3357	1.49E-03	0.996	9.39E-04	1.002	0.97	113002	83090
3358	1.84E-03	0.997	1.31E-02	0.999	34.86	115418	83090

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept. 1, 1990)

Test No	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef. Corr.	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
3359	7.06E-03	1.000	1.57E-02	0.999	36.09	121834	83090
3360	7.15E-03	1.000	1.62E-02	1.000	37.44	124248	83090
3361	7.33E-03	1.000	1.84E-02	0.999	43.37	130702	83090
3362	7.33E-03	1.000	1.67E-02	1.000	38.64	133115	83090
3363	7.36E-03	1.000	1.76E-02	0.999	41.19	135529	83090
3364	7.49E-03	1.000	1.80E-02	0.999	42.07	141945	83090
3365	7.66E-03	1.000	1.57E-02	0.999	35.42	144358	83090
3366	7.14E-03	1.000	1.31E-02	0.999	28.91	150812	83090
3367	7.38E-03	0.999	1.12E-02	0.999	23.10	153224	83090
3368	7.39E-03	1.000	1.42E-02	0.999	31.67	155636	83090
3369	7.08E-03	1.000	9.16E-03	1.000	17.68	162046	83090
3370	7.30E-03	1.000	1.17E-02	0.999	24.75	164457	83090
3371	7.23E-03	1.000	1.13E-02	0.998	23.73	170818	83090
3372	6.87E-03	1.000	9.16E-03	0.999	18.25	173330	83090
3373	6.86E-03	1.000	6.77E-03	0.998	11.33	175744	83090
3374	6.62E-03	1.000	1.37E-02	0.999	31.05	182201	83090
3375	7.00E-03	1.000	1.15E-02	0.999	24.43	184618	83090
3376	6.70E-03	1.000	1.23E-02	0.999	27.02	191038	83090
3377	6.71E-03	1.000	[illegible]33E-[illegible]	0.999	28.98	193456	83090
3378	2.98E-05	0.366	9.02E-03	0.999	25.32	195934	83090
3379	2.28E-06	0.012	9.64E-03	1.000	27.12	202404	83090
3380	6.04E-03	1.000	7.22E-03	0.999	13.51	204823	83090
3381	1.77E-05	0.238	6.70E-03	0.999	18.62	211247	83090
3382	1.53E-04	0.744	4.88E-03	0.999	13.57	213707	83090
3383	6.83E-03	1.000	6.30E-03	0.994	15.67	220122	83090
3384	1.68E-04	0.868	5.52E-03	1.000	15.36	222540	83090
3385	5.98E-03	1.000	5.11E-03	0.999	7.68	224957	83090
3386	6.42E-03	1.000	6.72E-03	1.000	11.68	231412	83090
3387	6.46E-03	1.000	7.52E-03	0.999	13.67	233828	83090
3388	2.91E-04	0.950	5.18E-03	0.999	14.24	244	83190
3389	6.32E-03	1.000	5.64E-03	1.000	8.74	2659	83190
3390	3.71E-03	0.993	5.43E-03	1.000	11.10	5115	83190
3391	6.07E-03	1.000	8.99E-03	1.000	18.45	11538	83190
3392	1.46E-04	0.886	9.45E-03	1.000	26.41	13953	83190
3393	6.47E-03	1.000	4.30E-03	1.000	4.82	20407	83190
3394	5.62E-03	0.999	3.46E-03	0.998	3.42	22821	83190
3395	5.84E-03	1.000	3.90E-03	0.994	4.39	25233	83190
3396	5.49E-03	1.000	3.75E-03	1.000	4.37	31647	83190
3397	5.40E-03	1.000	3.77E-03	0.999	4.54	34107	83190
3398	5.42E-03	1.000	3.51E-03	0.999	3.78	40521	83190
3399	5.06E-03	1.000	3.62E-03	0.999	4.51	42937	83190
3400	4.84E-03	1.000	3.45E-03	0.999	4.27	45353	83190
3401	4.29E-03	0.998	3.86E-03	0.998	6.03	51808	83190
3402	4.68E-03	1.000	3.80E-03	0.999	5.43	54228	83190
3403	4.02E-03	1.000	3.05E-03	0.998	4.07	60647	83190
3404	4.31E-03	0.999	3.12E-03	1.001	3.92	63104	83190
3405	4.00E-03	1.000	3.[illegible]E-03	0.996	4.29	65525	83190
3406							
3407							
3408	4.65E-03	1.000	3.37E-03	0.998	4.26	80119	83190
3409	4.79E-03	1.000	3.82E-03	0.997	4.81	82535	83190
3410	4.98E-03	1.000	4.09E-03	0.998	5.94	84950	83190
3411	4.86E-03	1.000	3.92E-03	0.999	5.78	91406	83190
3412	4.75E-03	1.000	4.21E-03	0.998	6.50	93821	83190
3413	4.54E-03	1.000	8.04E-03	1.000	17.51	100238	83190
3414	4.74E-03	1.000	6.85E-03	0.997	13.83	102652	83190
3415	5.06E-03	1.000	4.65E-03	0.996	6.50	105119	83190
3416	5.73E-03	1.000	5.32E-03	0.999	8.51	111544	83190
3417	5.62E-03	1.000	4.89E-03	0.997	7.39	114008	83190
3418	5.48E-03	1.000	5.53E-03	0.999	9.38	120432	83190
3419	5.71E-03	0.999	4.77E-03	0.980	6.99	122854	83190
3420	5.40E-03	1.000	4.74E-03	0.998	7.27	125316	83190
3421	5.34E-03	1.000	4.93E-03	0.999	7.87	131739	83190
3422	5.26E-03	1.000	6.13E-03	0.999	11.31	134202	83190
3423	5.53E-03	0.999	5.46E-03	0.994	9.15	140627	83190
3424	5.36E-03	0.999	5.64E-03	0.995	9.80	143052	83190
3425	5.38E-03	0.999	6.95E-03	0.997	13.48	145517	83190
3426	5.39E-03	1.000	8.74E-03	0.999	18.50	151939	83190
3427	5.29E-03	1.000	7.85E-03	0.999	16.12	154407	83190
3428	5.92E-03	1.000	9.05E-03	0.999	18.79	160831	83190
3429	5.45E-03	1.000	6.98E-03	0.999	13.46	163256	83190
3430	5.82E-03	1.000	5.12E-03	0.994	7.84	165725	83190
3431	6.12E-03	1.000	1.03E-02	0.999	22.17	172201	83190

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept. 1, 1990)

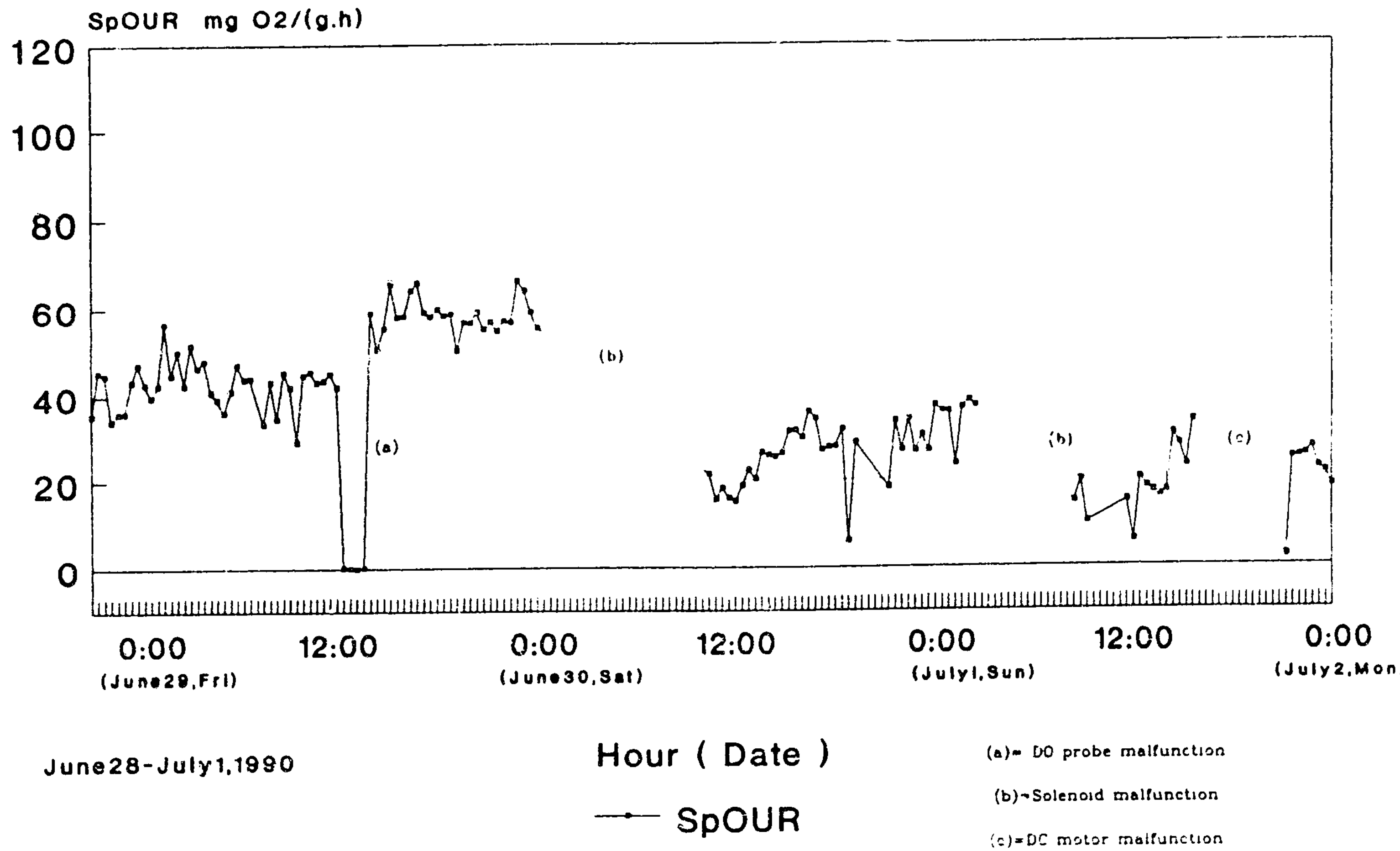
Test No.	OUR 1 mg/L.sec	Coef Corr	OUR 2 mg/L.sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
3432	5.90E-03	1.000	5.25E-03	1.000	8.25	174842	83190
3433	6.04E-03	1.000	1.25E-02	0.999	28.50	181117	83190
3434	5.84E-03	1.000	1.05E-02	0.998	22.86	183554	83190
3435	6.20E-03	0.999	1.42E-02	0.990	33.00	190029	83190
3436	6.06E-03	0.999	1.11E-02	0.999	24.28	192456	83190
3437	5.93E-03	1.000	1.40E-02	0.999	32.68	194825	83190
3438	6.08E-03	1.000	9.99E-03	1.000	21.25	201357	83190
3439	5.75E-03	1.000	1.47E-02	1.000	34.78	203828	83190
3440	6.04E-03	1.000	1.03E-02	1.000	22.28	210301	83190
3441	6.05E-03	1.000	5.83E-03	0.999	6.97	212726	83190
3442	6.20E-03	1.000	5.41E-03	0.998	8.24	215148	83190
3443	6.55E-03	1.000	5.52E-03	0.999	8.14	221613	83190
3444	6.26E-03	1.000	5.82E-03	1.000	9.33	224038	83190
3445	6.26E-03	1.000	5.33E-03	0.997	7.85	230502	83190
3446	6.00E-03	1.000	5.08E-03	0.999	7.55	232928	83190
3447	5.90E-03	1.000	4.79E-03	0.998	6.82	235351	83190
3448	6.13E-03	0.999	5.01E-03	0.999	7.20	1817	90190
3449	6.13E-03	1.000	6.89E-03	0.997	11.91	4240	90190
3450	5.87E-03	1.000	5.42E-03	0.994	8.64	10702	90190
3451	5.82E-03	1.000	5.70E-03	0.996	9.47	13129	90190
3452	5.72E-03	1.000	6.11E-03	0.998	10.74	15556	90190
3453	5.89E-03	1.000	5.84E-03	0.995	9.80	22026	90190
3454	5.54E-03	1.000	5.69E-03	0.998	8.78	24452	90190
3455	5.53E-03	1.000	5.71E-03	0.998	9.83	30923	90190
3456	5.50E-03	1.000	6.18E-03	0.999	11.14	33356	90190
3457	5.50E-03	0.999	5.41E-03	0.998	9.03	35824	90190
3458	5.17E-03	1.000	5.56E-03	0.996	9.78	42256	90190
3459	5.16E-03	0.999	5.77E-03	0.999	10.42	44730	90190
3460	5.26E-03	1.000	6.19E-03	0.998	11.48	51208	90190
3461	5.17E-03	0.999	6.00E-03	0.997	11.05	53645	90190
3462	4.98E-03	0.999	5.43E-03	0.997	9.67	60122	90190
3463	4.72E-03	0.999	5.28E-03	0.997	9.53	62603	90190
3464	4.55E-03	0.999	5.66E-03	0.999	10.80	65043	90190
3465							
3466	5.70E-03	1.000	4.62E-03	0.997	7.03	75626	90190
3467	5.84E-03	1.000	5.12E-03	0.997	8.36	82052	90190
3468	5.81E-03	1.000	4.77E-03	0.998	7.32	84518	90190
3469	5.75E-03	1.000	4.90E-03	0.998	8.07	90938	90190
3470	5.91E-03	1.000	5.22E-03	0.999	8.57	93401	90190
3471	5.88E-03	1.000	5.38E-03	0.998	9.16	95822	90190
3472	5.64E-03	1.000	4.98E-03	0.999	8.73	102241	90190
3473	5.78E-03	1.000	6.07E-03	0.999	11.25	104658	90190
3474	5.71E-03	1.000	5.16E-03	0.997	8.80	111118	90190
3475	5.80E-03	0.999	4.83E-03	0.971	7.75	113534	90190
3476	5.48E-03	0.999	5.52E-03	0.997	10.00	115950	90190
3477	5.82E-03	0.999	5.28E-03	0.990	8.88	122411	90190
3478	5.88E-03	0.996	5.87E-03	0.999	10.54	124827	90190
3479	6.00E-03	0.999	5.31E-03	0.996	8.74	131240	90190
3480	6.46E-03	1.000	5.66E-03	0.999	8.94	133654	90190
3481	6.65E-03	1.000	6.65E-03	0.999	11.98	140108	90190
3482	6.44E-03	1.000	5.98E-03	0.997	10.23	142522	90190
3483	6.22E-03	0.999	6.31E-03	0.995	11.45	144936	90190
3484	6.30E-03	1.000	6.26E-03	0.995	11.21	151351	90190
3485	6.21E-03	1.000	5.99E-03	0.995	10.50	153807	90190
3486	6.44E-03	0.999	5.93E-03	0.997	10.07	160224	90190
3487	6.44E-03	0.999	6.00E-03	0.992	10.29	162642	90190
3488	6.13E-03	1.000	5.88E-03	0.992	9.69	165059	90190
3489	6.36E-03	1.000	6.07E-03	0.963	10.57	171518	90190
3490	6.00E-03	0.999	5.99E-03	0.997	10.45	173936	90190
3491	6.36E-03	1.000	5.90E-03	0.999	10.09	180354	90190
3492	6.14E-03	1.000	5.89E-03	0.993	10.31	182814	90190
3493	6.05E-03	1.000	5.82E-03	0.992	10.19	185234	90190
3494	5.94E-03	0.999	5.83E-03	0.995	10.38	191653	90190
3495	6.33E-03	1.000	6.21E-03	0.999	11.04	194118	90190
3496	5.98E-03	0.999	5.57E-03	0.997	9.56	200536	90190
3497	5.74E-03	1.000	6.02E-03	0.996	11.17	202955	90190
3498	5.63E-03	1.000	6.10E-03	0.999	11.56	205414	90190
3499	5.58E-03	0.999	5.98E-03	0.993	11.23	211831	90190
3500	5.83E-03	0.994	5.28E-03	0.990	8.88	214250	90190
3501	6.28E-03	0.999	5.77E-03	0.997	9.78	220708	90190
3502	6.46E-03	1.000	5.94E-03	0.999	10.07	223127	90190
3503	6.82E-03	1.000	6.18E-03	0.999	10.29	225547	90190
3504	6.28E-03	1.000	5.82E-03	0.999	10.22	232006	90190

Specific Oxygen Uptake Rate (SpOUR) Monitoring at Gold Bar
Wastewater Treatment Plant
(June 28 to Sept 1,1990)

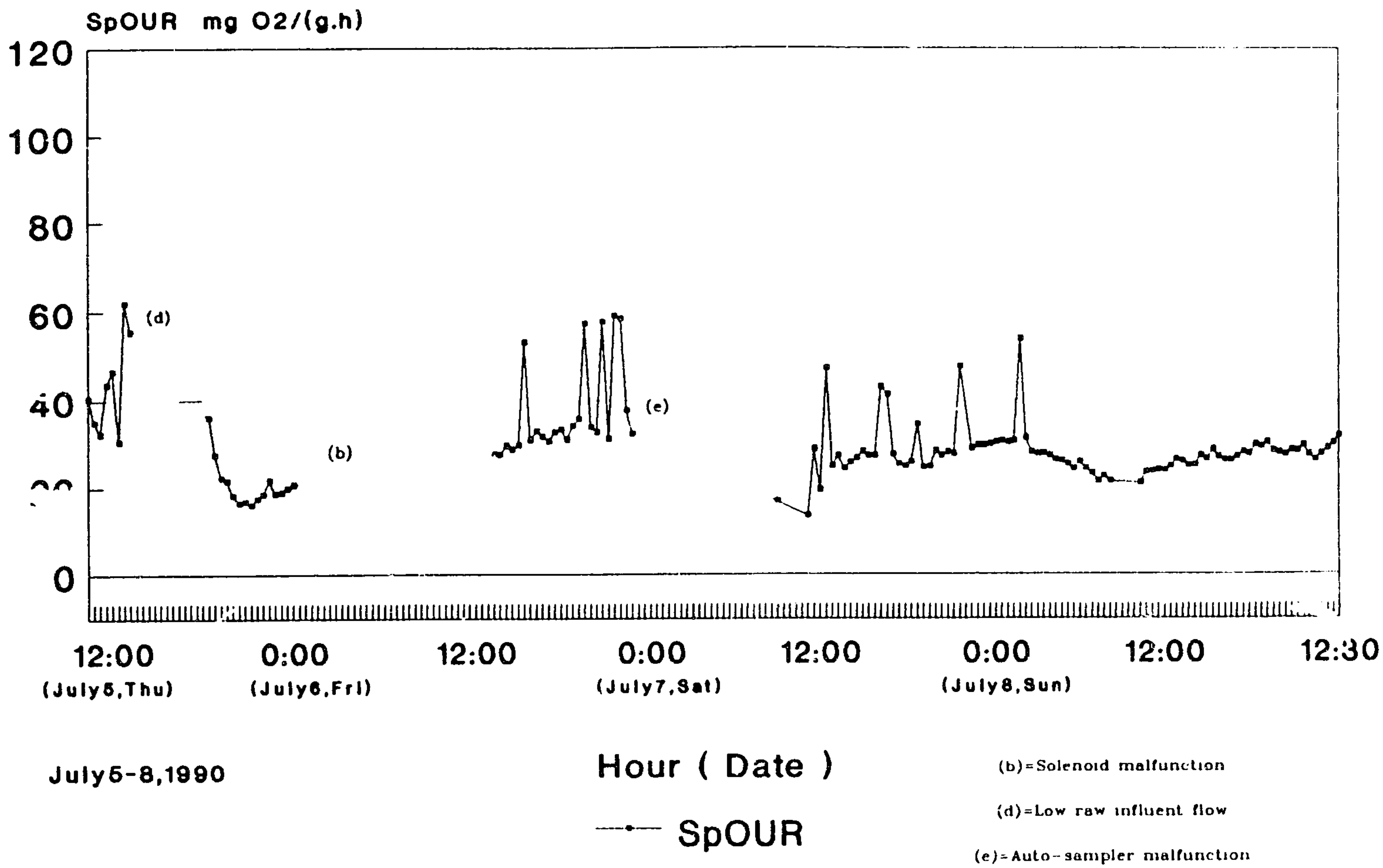
Test No	OUR 1 mg/L sec	Coef Corr	OUR 2 mg/L sec	Coef Corr	SpOUR mg/gHr	Time HHMMSS	Date MDDYY
3505	6 65E-03	1 000	6 58E-03	0 996	11 78	234423	90190
3506	6 55E-03	0 999	5 60E-03	0 990	8 96	845	90290
3507	6 41E-03	0 989	6 23E-03	0 990	10 90	3904	90290
3508	6 31E-03	1 000	6 04E-03	0 997	10 53	5728	90290
3509	6 34E-03	1 000	6 18E-03	0 998	10 94	12143	90290
3510	6 58E-03	1 000	5 35E-03	0 995	8 18	14803	90290
3511	6 27E-03	0 999	6 22E-03	0 998	11 15	21024	90290
3512	6 12E-03	0 999	6 11E-03	0 998	10 99	23448	90290
3513	5 98E-03	1 000	5 93E-03	0 998	10 63	25810	90290
3514	5 89E-03	1 000	6 07E-03	0 998	11 38	32333	90290
3515	5 97E-03	0 999	5 87E-03	0 994	10 43	34756	90290
3516	5 86E-03	0 999	6 04E-03	0 992	11 06	41227	90290
3517	5 86E-03	0 998	5 48E-03	0 998	9 39	43651	90290
3518	5 58E-03	1 000	5 78E-03	0 997	10 65	50118	90290
3519	5 42E-03	1 000	6 01E-03	0.995	11 53	52546	90290
3520	5 55E-03	1 000	5 68E-03	0 998	10 38	56015	90290
3521	5 64E-03	0 999	5 87E-03	0 997	10 86	61446	90290
3522	5 46E-03	0 999	5 61E-03	0 996	10 29	63913	90290
3523	5 34E-03	0 999	5 27E-03	0 995	9 41	70344	90290
3524	5 14E-03	0 999	5 22E-03	0 997	9 49	72016	90290
3525	5 14E-03	0 999	5 22E-03	0 997	9 49	72616	90290

Appendix I. SpOUR Monitoring from June 28 to Sept. 1, 1990

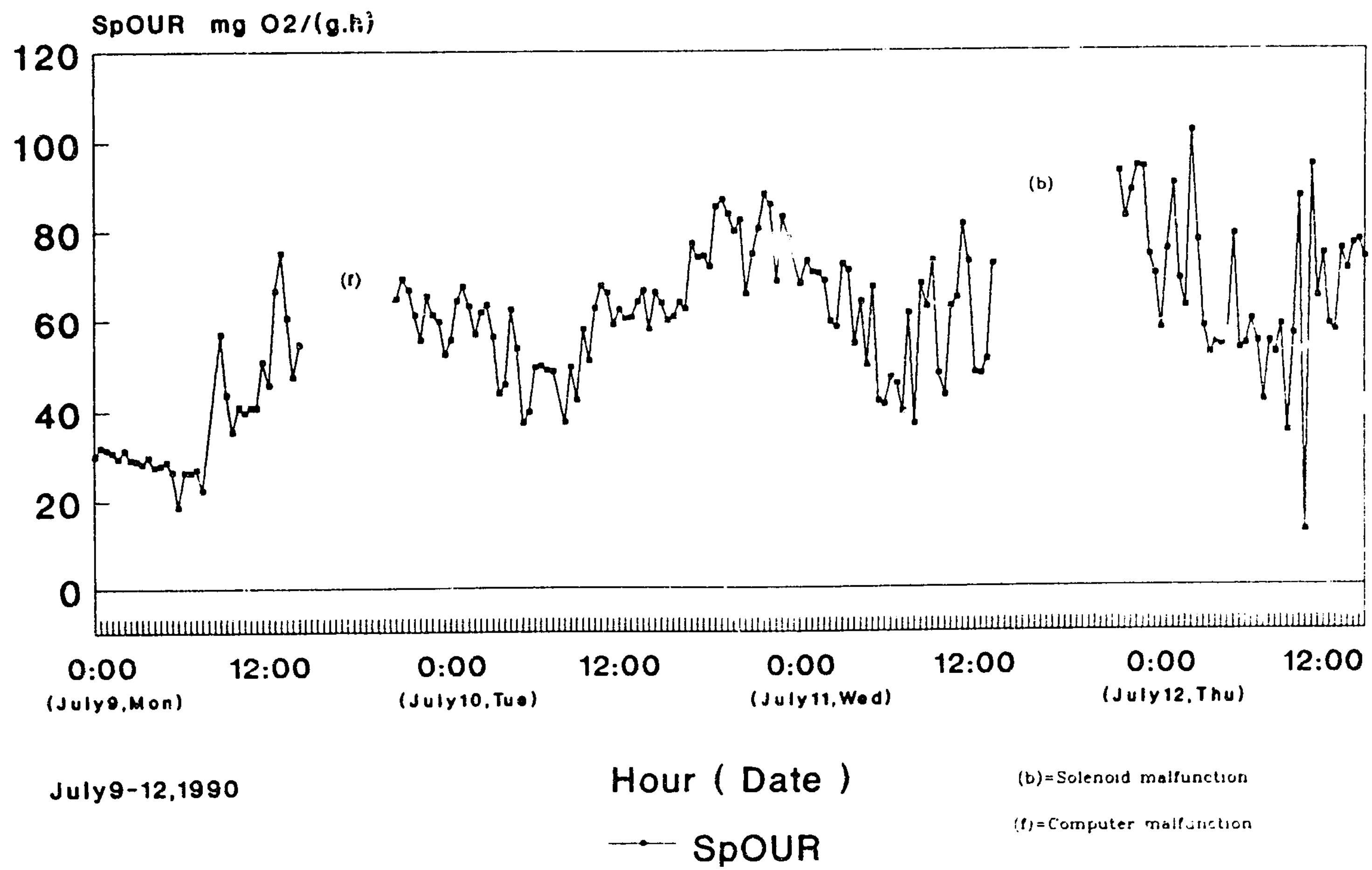
Specific Oxygen Uptake Rate Monitoring
at Gold Bar Wastewater Treatment Plant



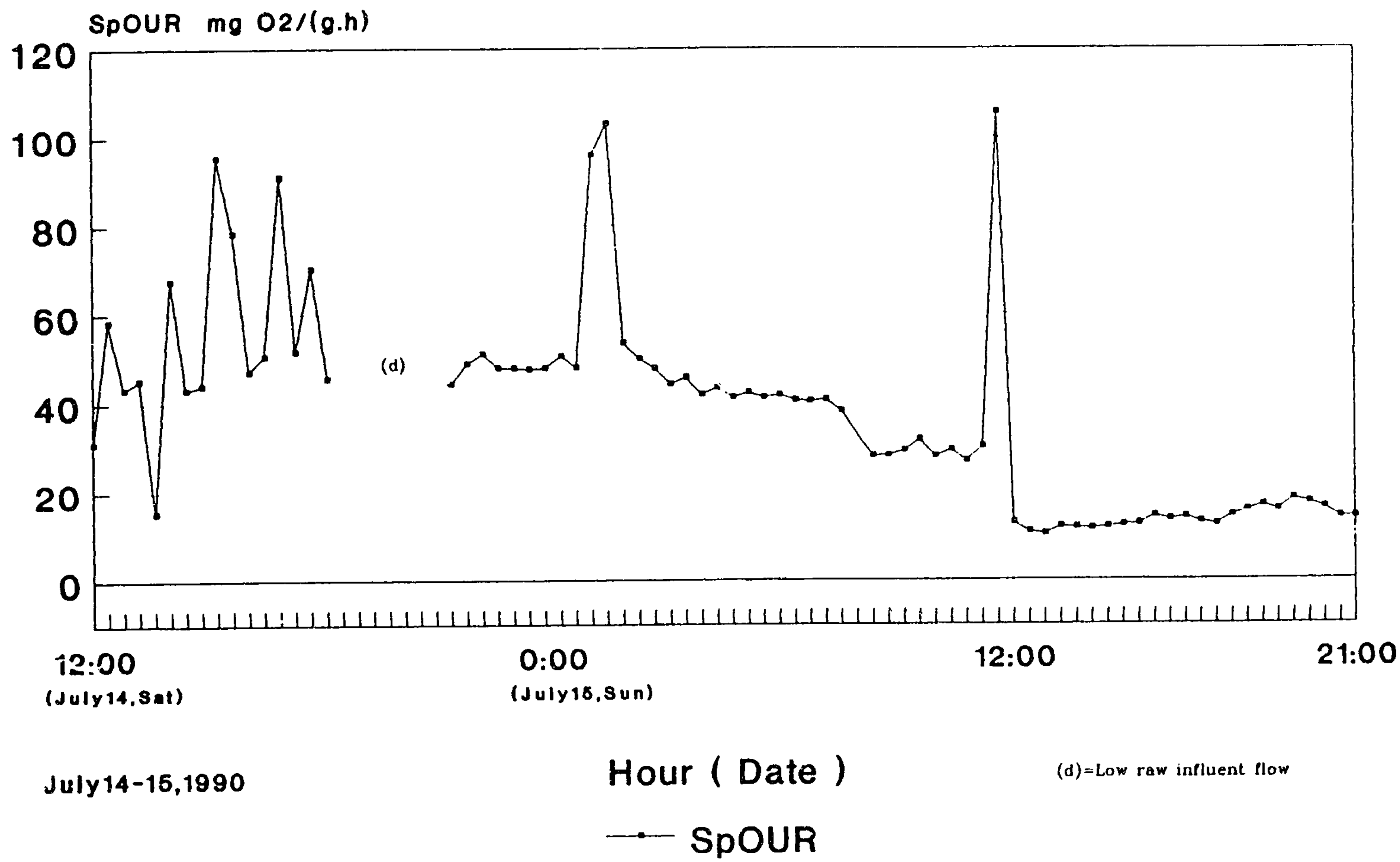
Specific Oxygen Uptake Rate Monitoring
at Gold Bar Wastewater Treatment Plant



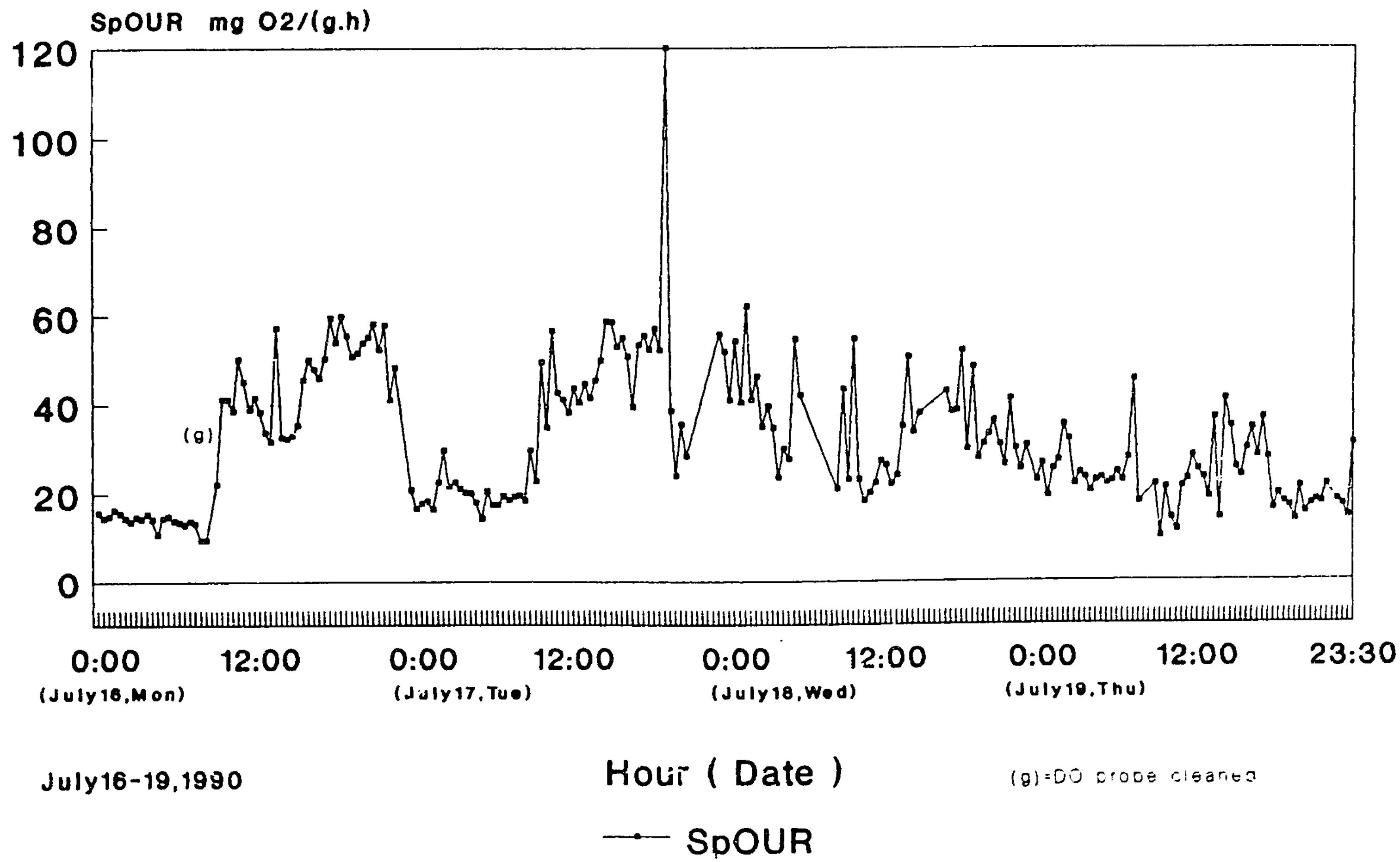
Specific Oxygen Uptake Rate Monitoring
at Gold Bar Wastewater Treatment Plant



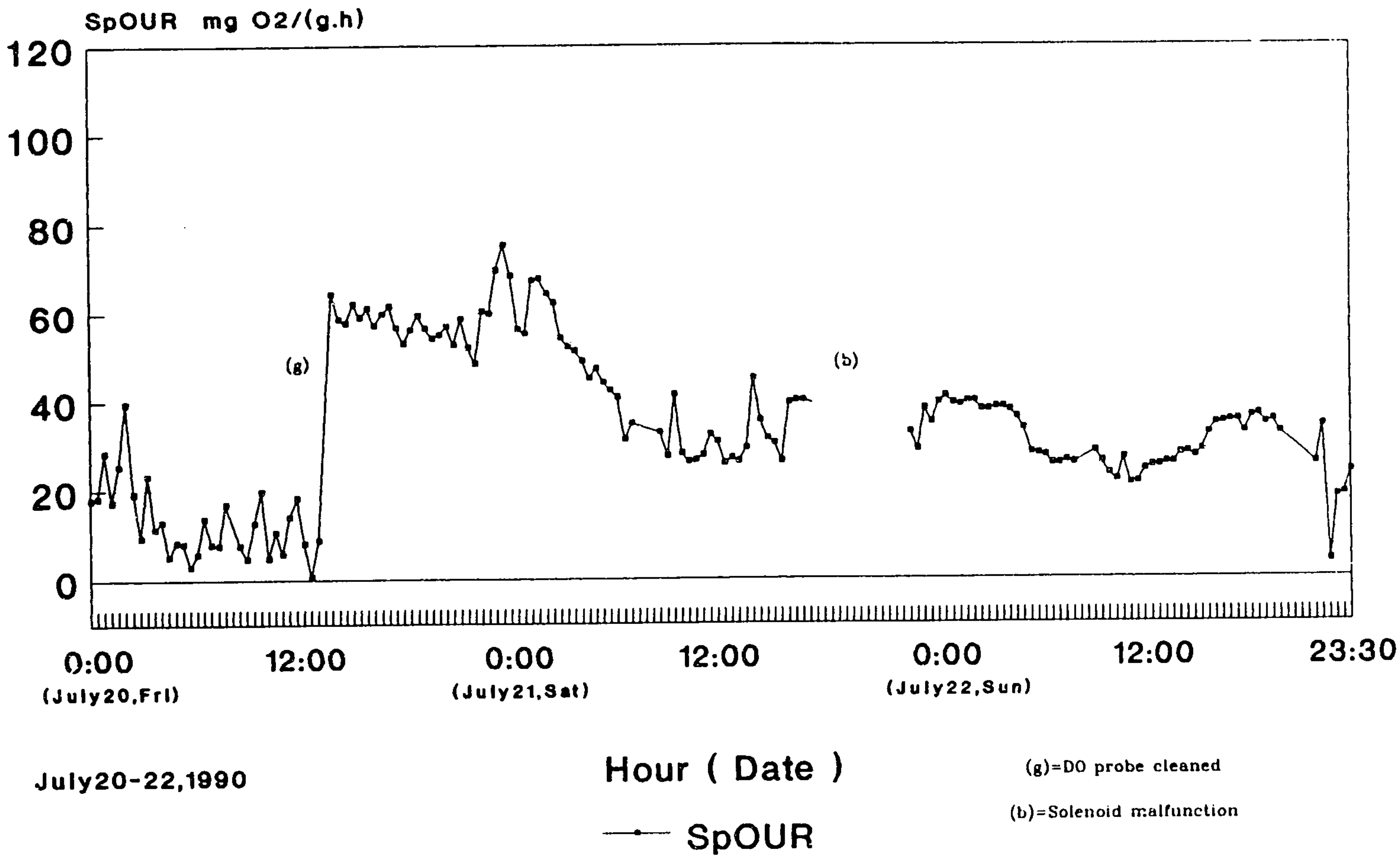
Specific Oxygen Uptake Rate Monitoring
at Gold Bar Wastewater Treatment Plant



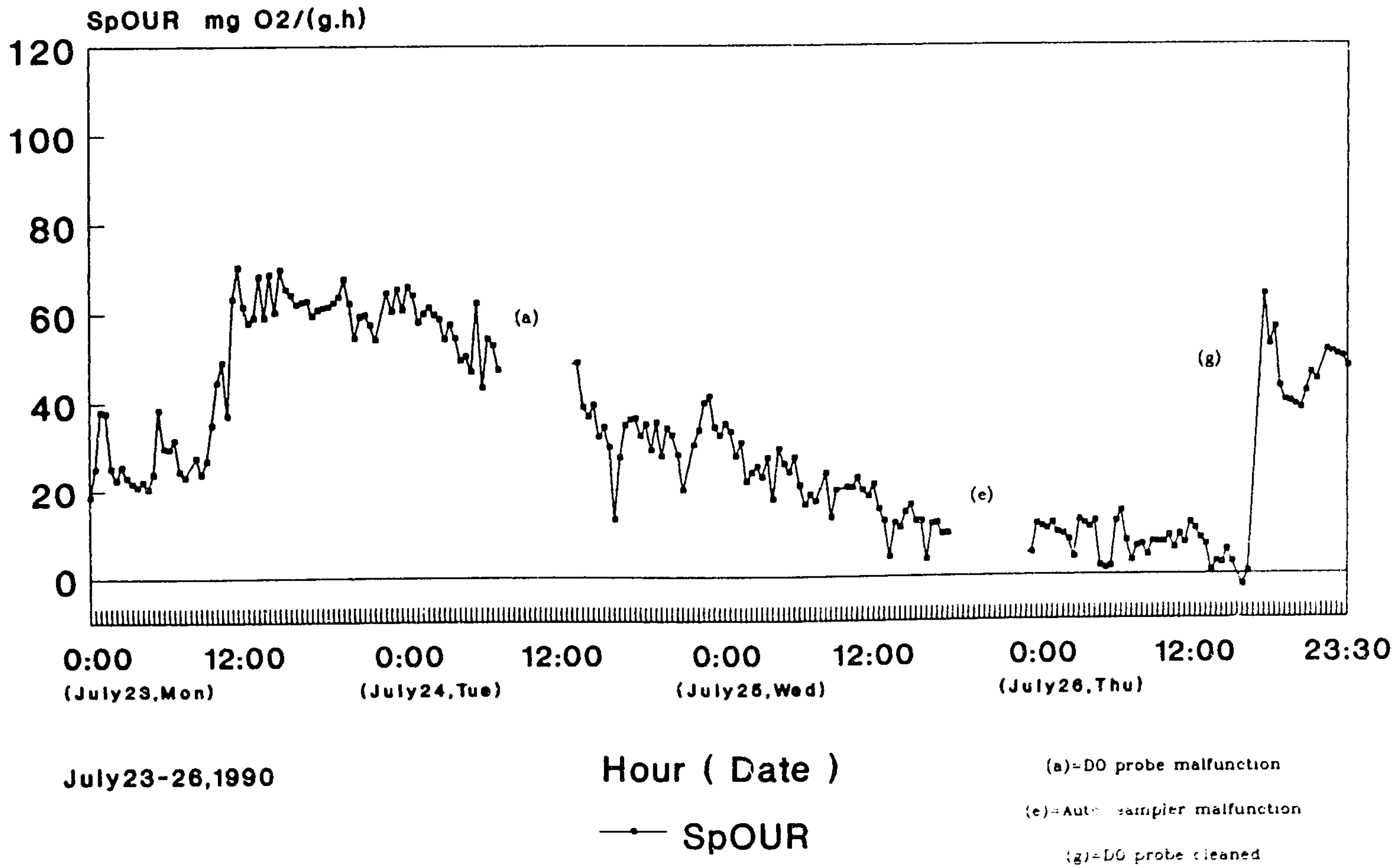
Specific Oxygen Uptake Rate Monitoring
at Gold Bar Wastewater Treatment Plant



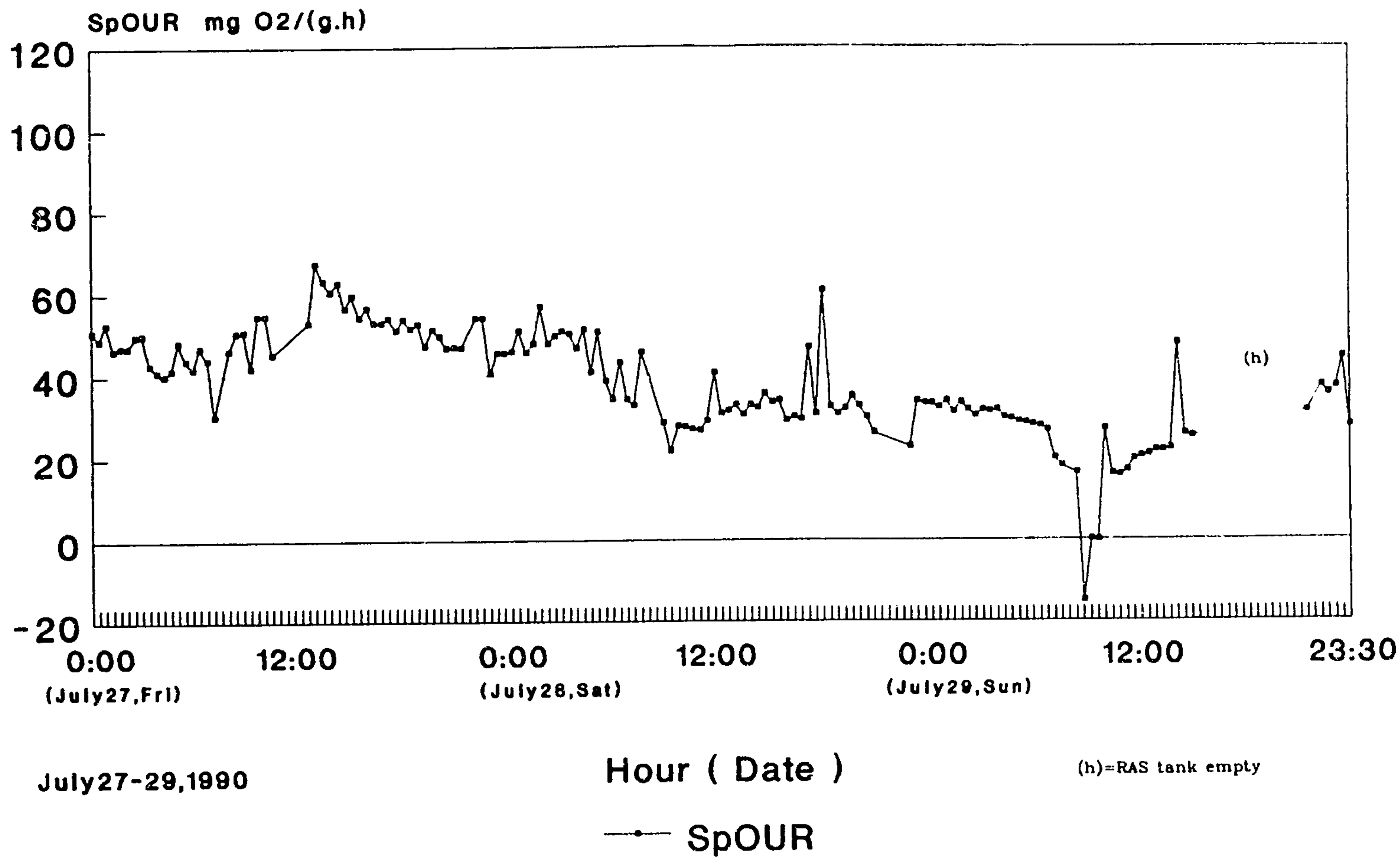
Specific Oxygen Uptake Rate Monitoring
at Gold Bar Wastewater Treatment Plant



Specific Oxygen Uptake Rate Monitoring
at Gold Bar Wastewater Treatment Plant



Specific Oxygen Uptake Rate Monitoring
at Gold Bar Wastewater Treatment Plant



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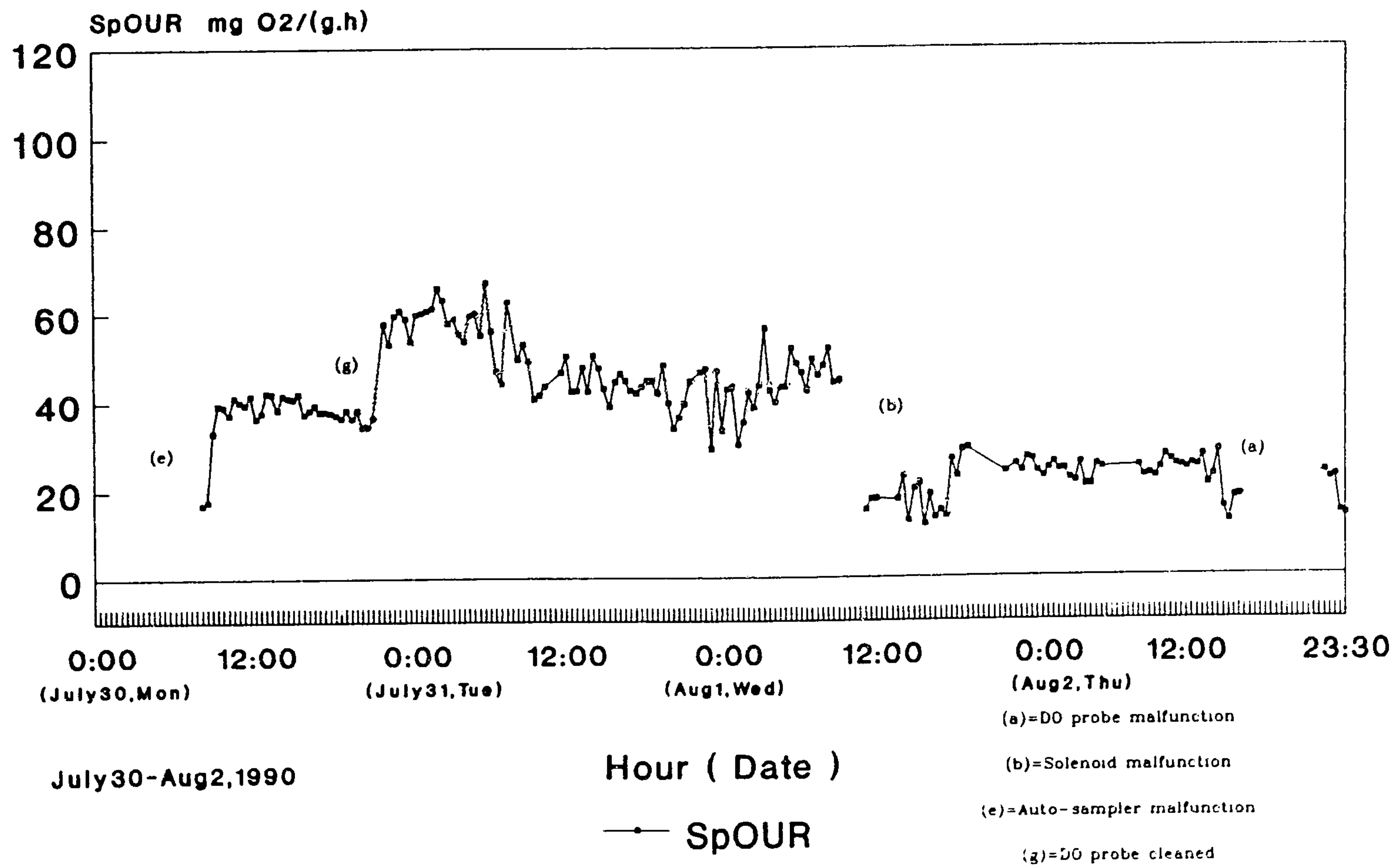

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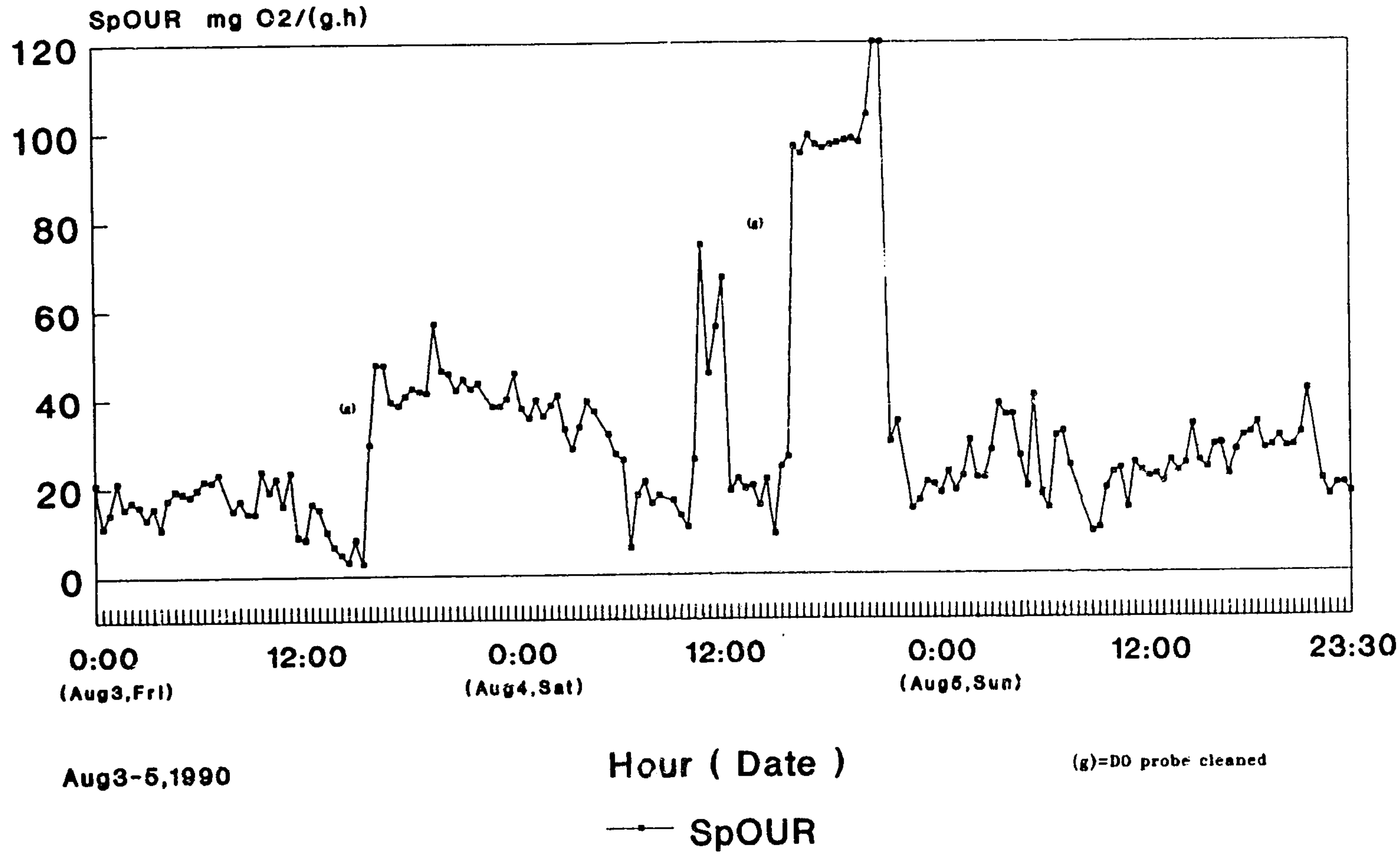

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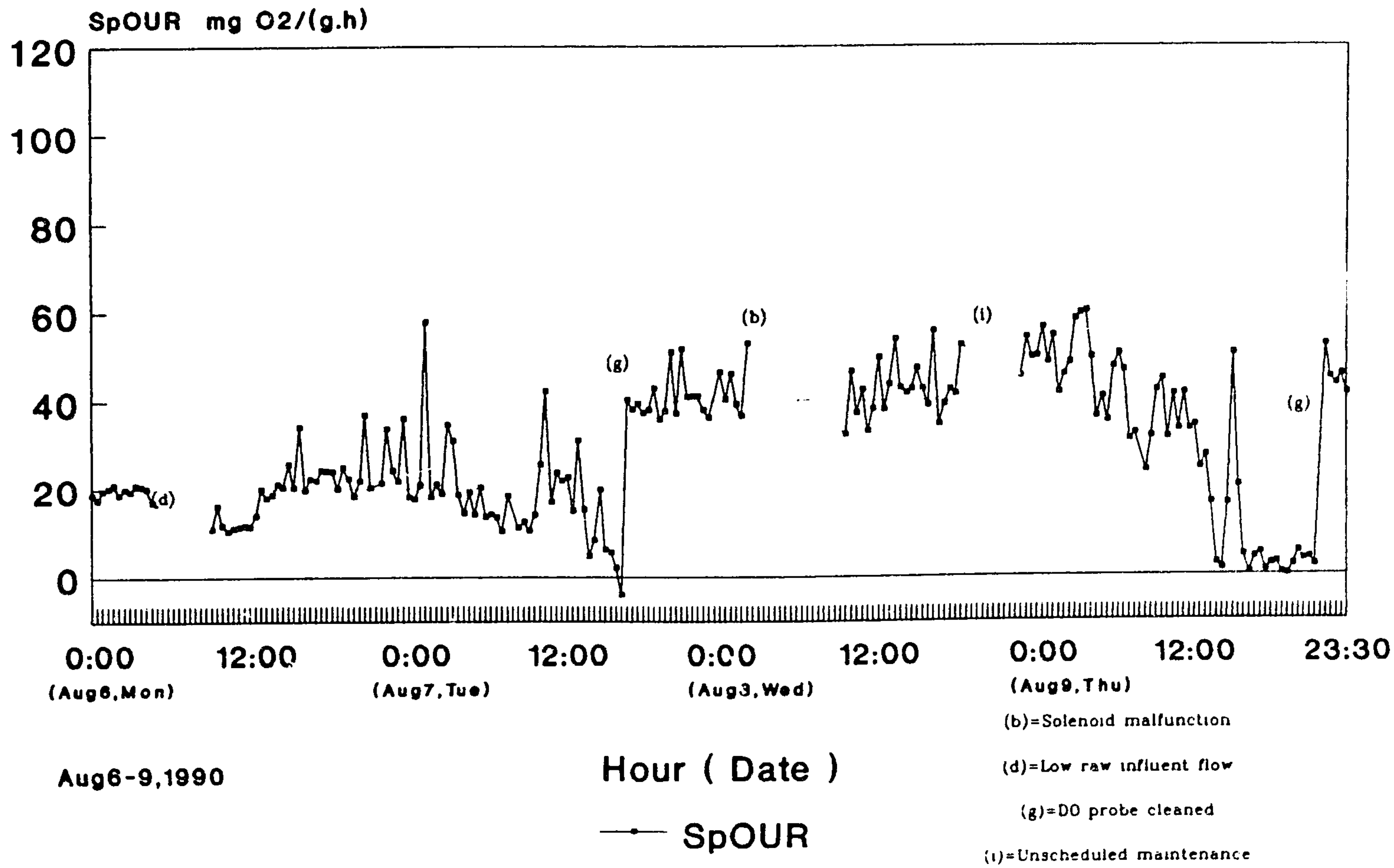

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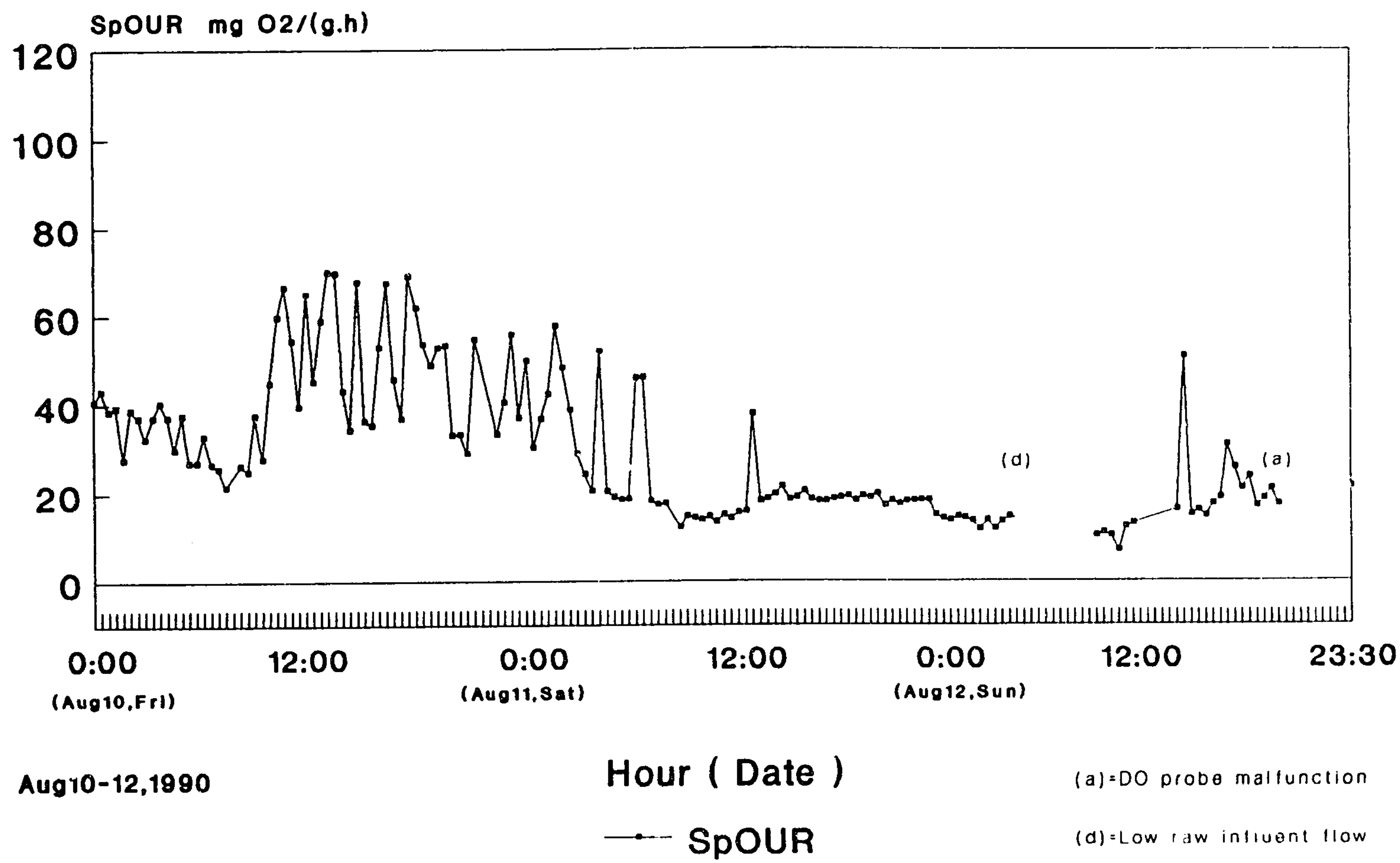

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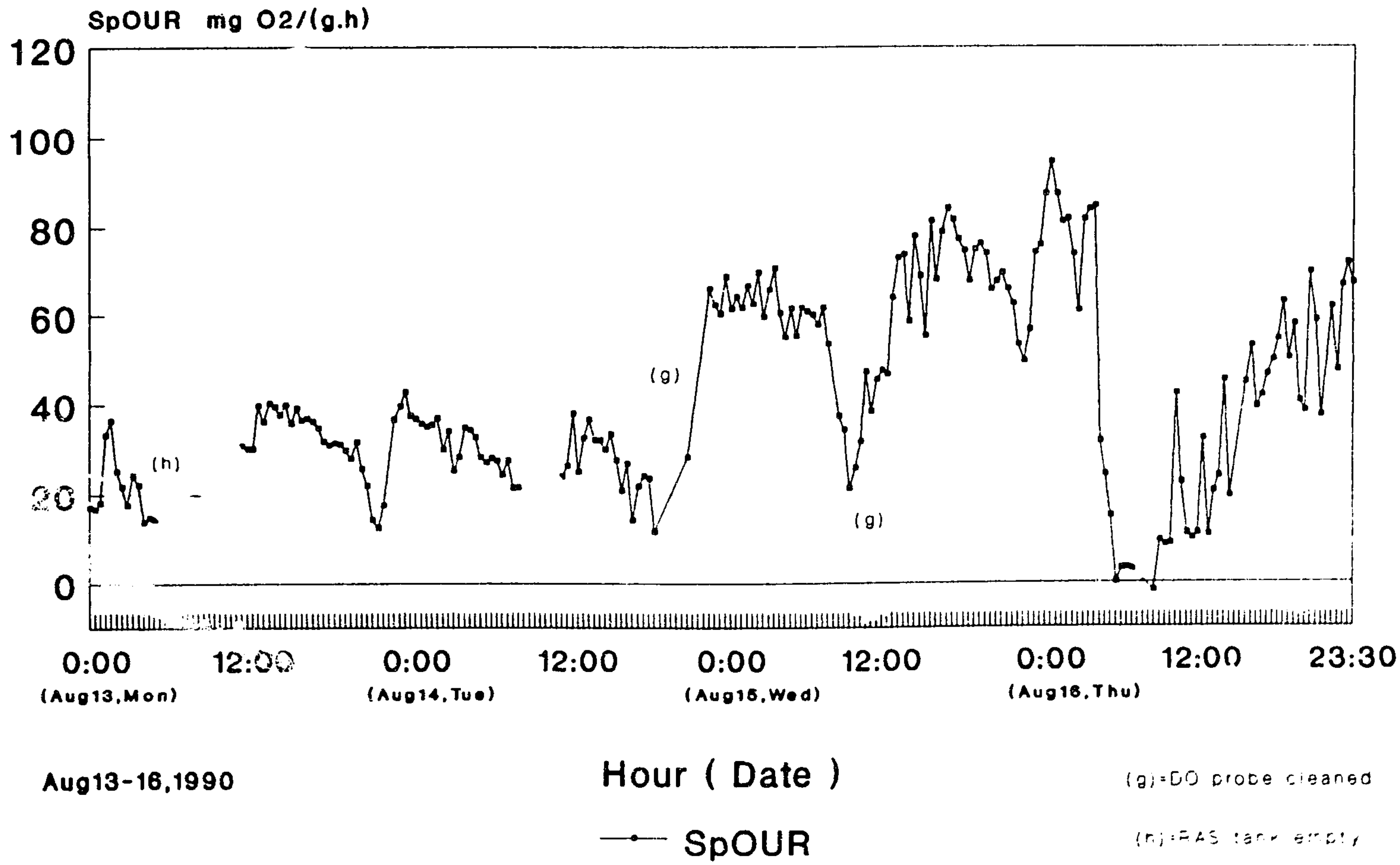

Aug13-16,1990

(g)=DO probe cleaned

(h)=RAS tank empty

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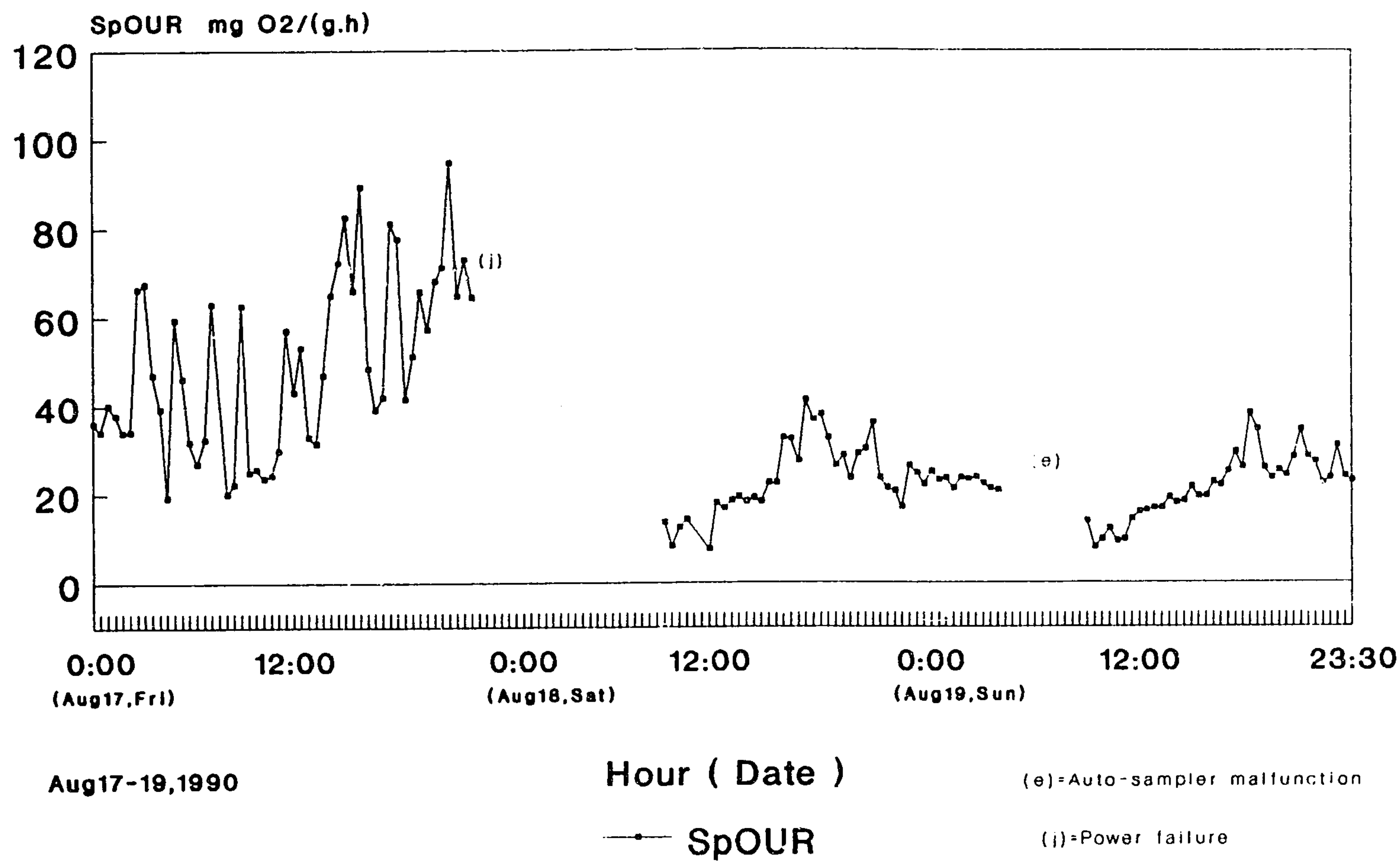

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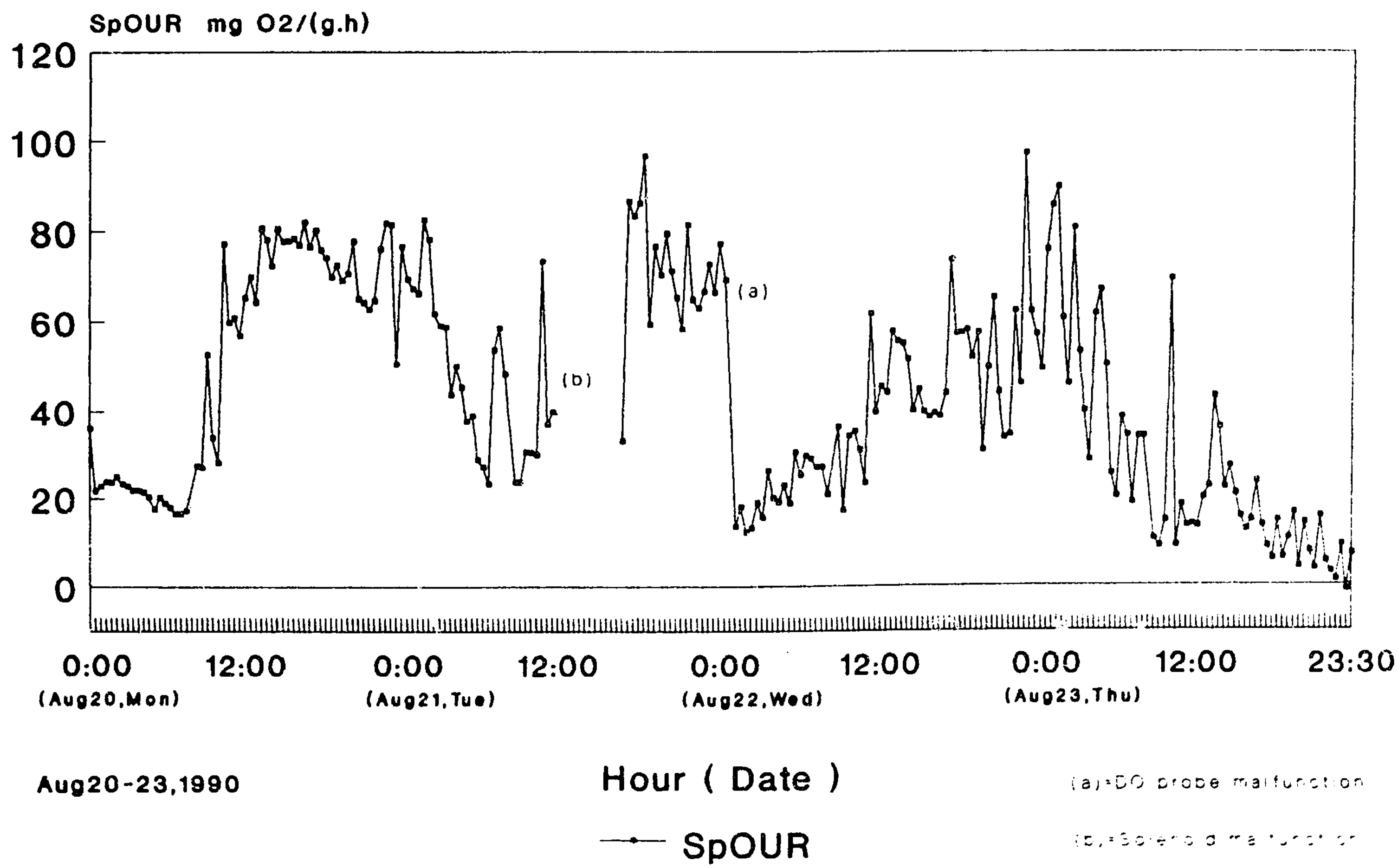

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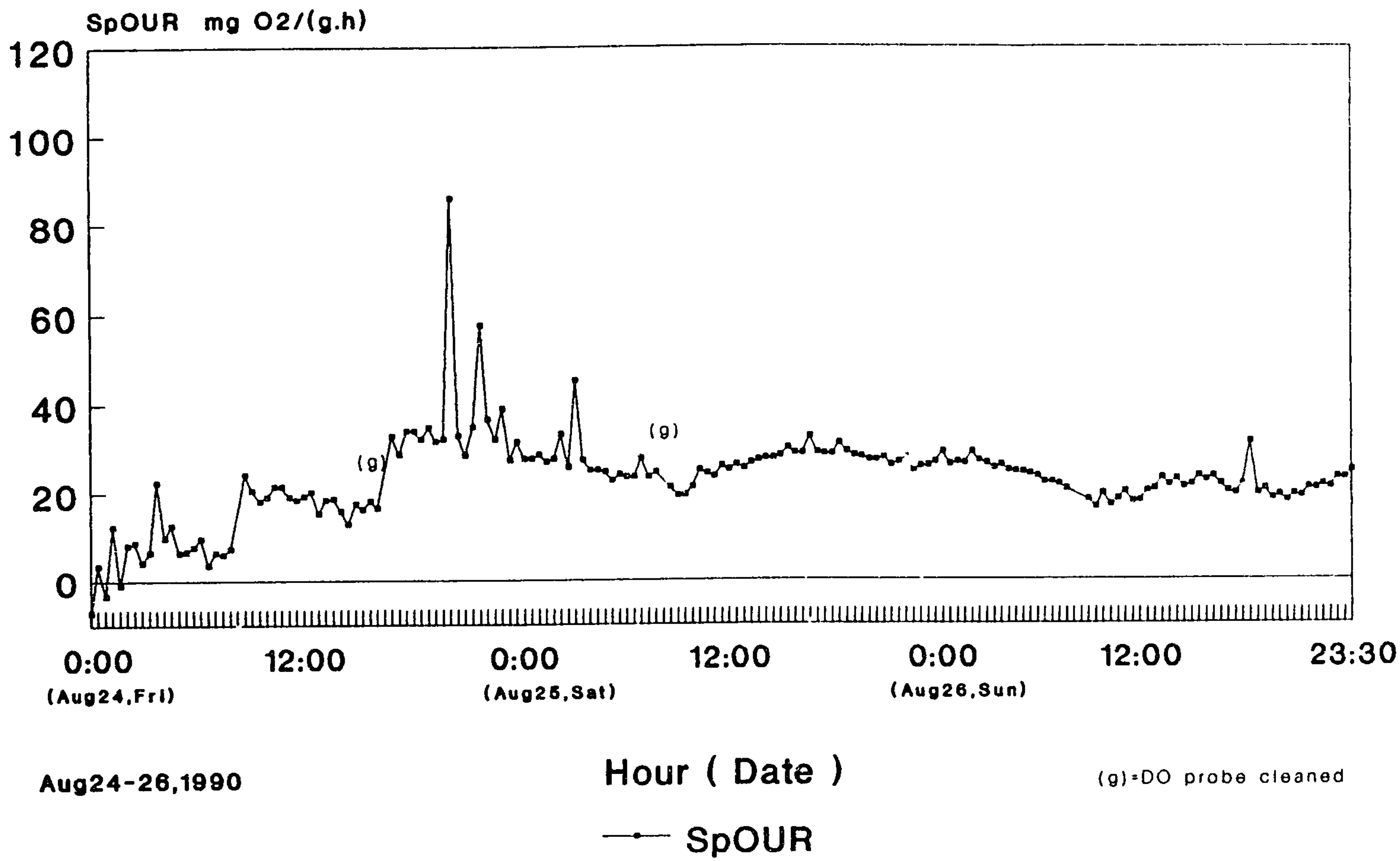

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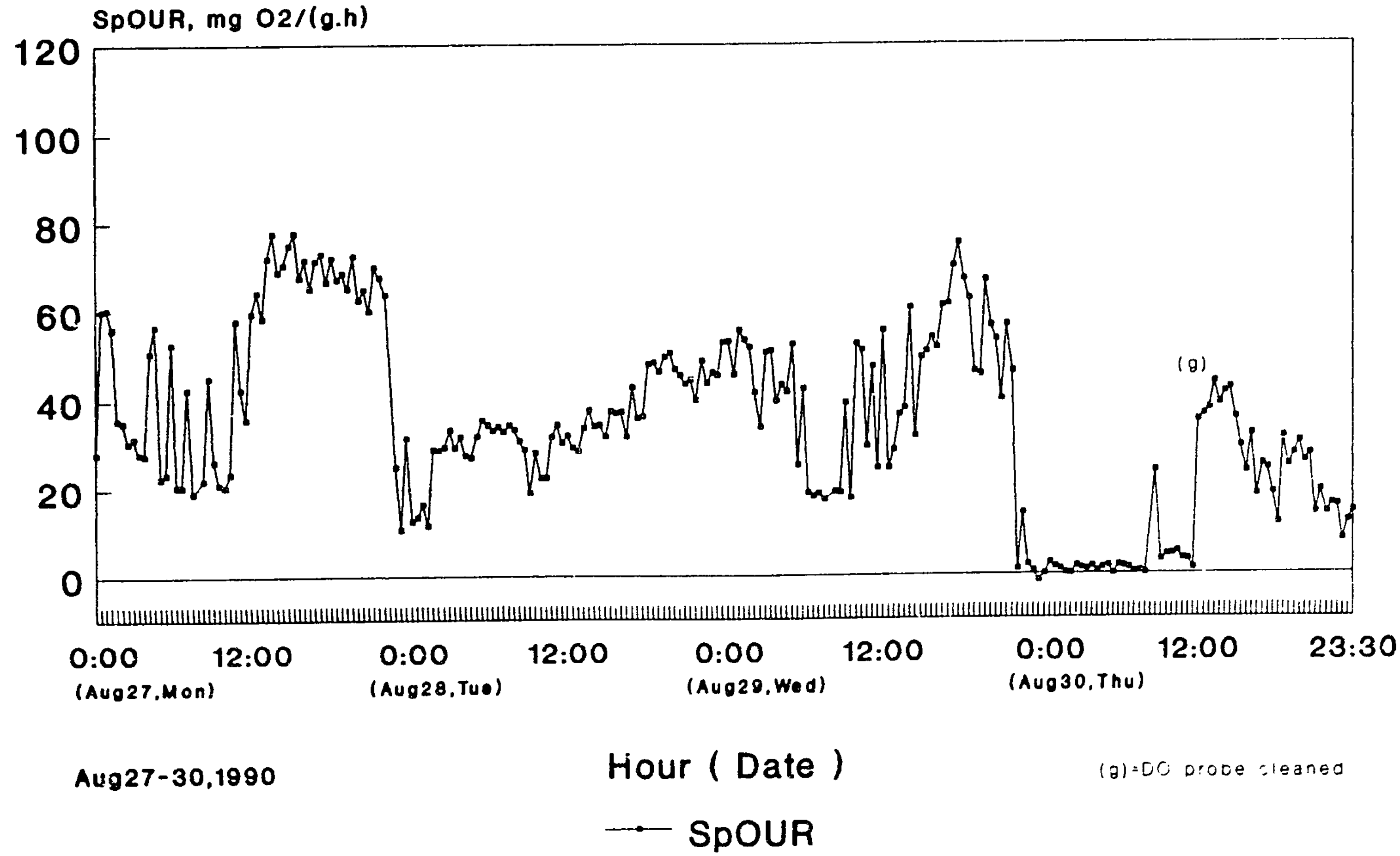

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