Effect of Elasticity of Viscoelastic Polymer Flooding on Sweep Efficiency

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Research Objectives

- Literature review on the screening criteria for selecting polymer
- Help to conduct experiments to investigate the effect of elastic fluid properties on oil recovery

Literature Review on Polymer Screening

- polymer fluid is gel-like, water-miscible fluid
- polymer fluids help sweeping more residual oil left in rocks
- Viscous fingering could be avoided with polymer flooding

Literature Review on Polymer Screening

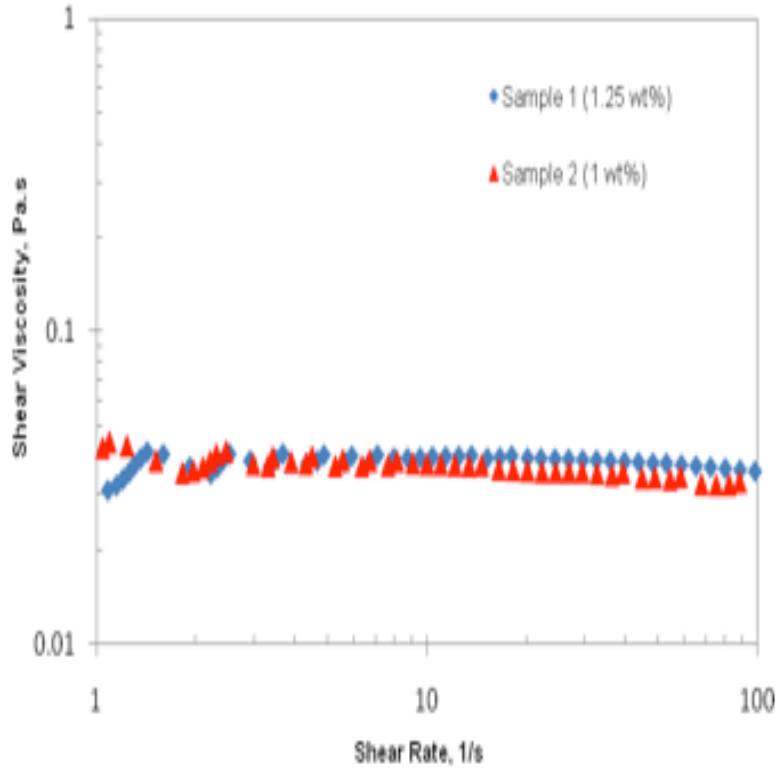
- higher polymer molecular weights, a broader range of polymer molecular weights and higher polymer concentrations would help to improve sweeping efficiency
- polymer solution with high elasticity exhibits higher resistance to flow, resulting in higher sweep efficiency

Rheological Characteristics of Polymer Fluids

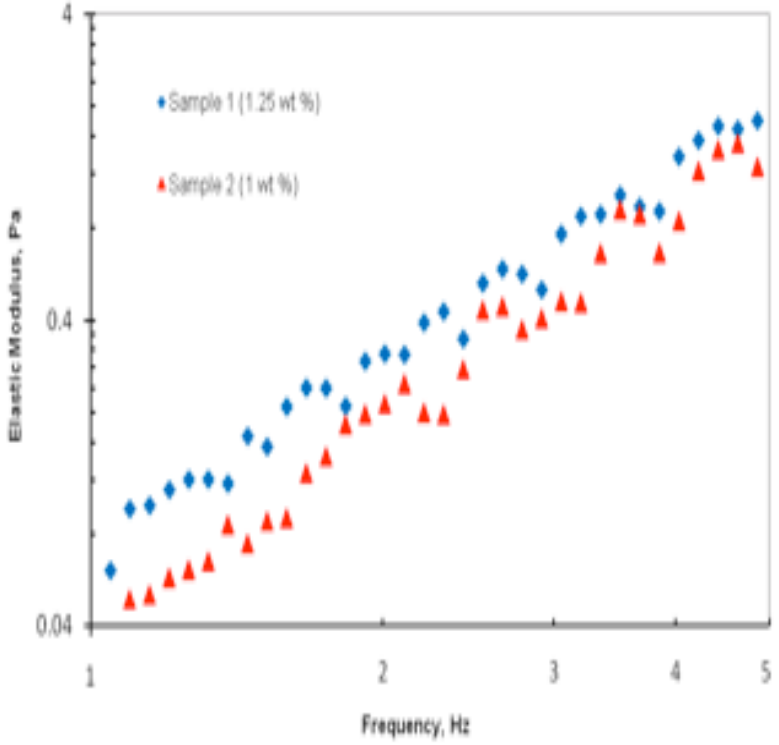
- two samples were prepared with various grades of polyethylene oxide
- Both samples had similar shear viscosity and polymer concentration but different elastic properties

Rheological Characteristics of Polymer Fluids

Shear Viscosity



Elastic Properties

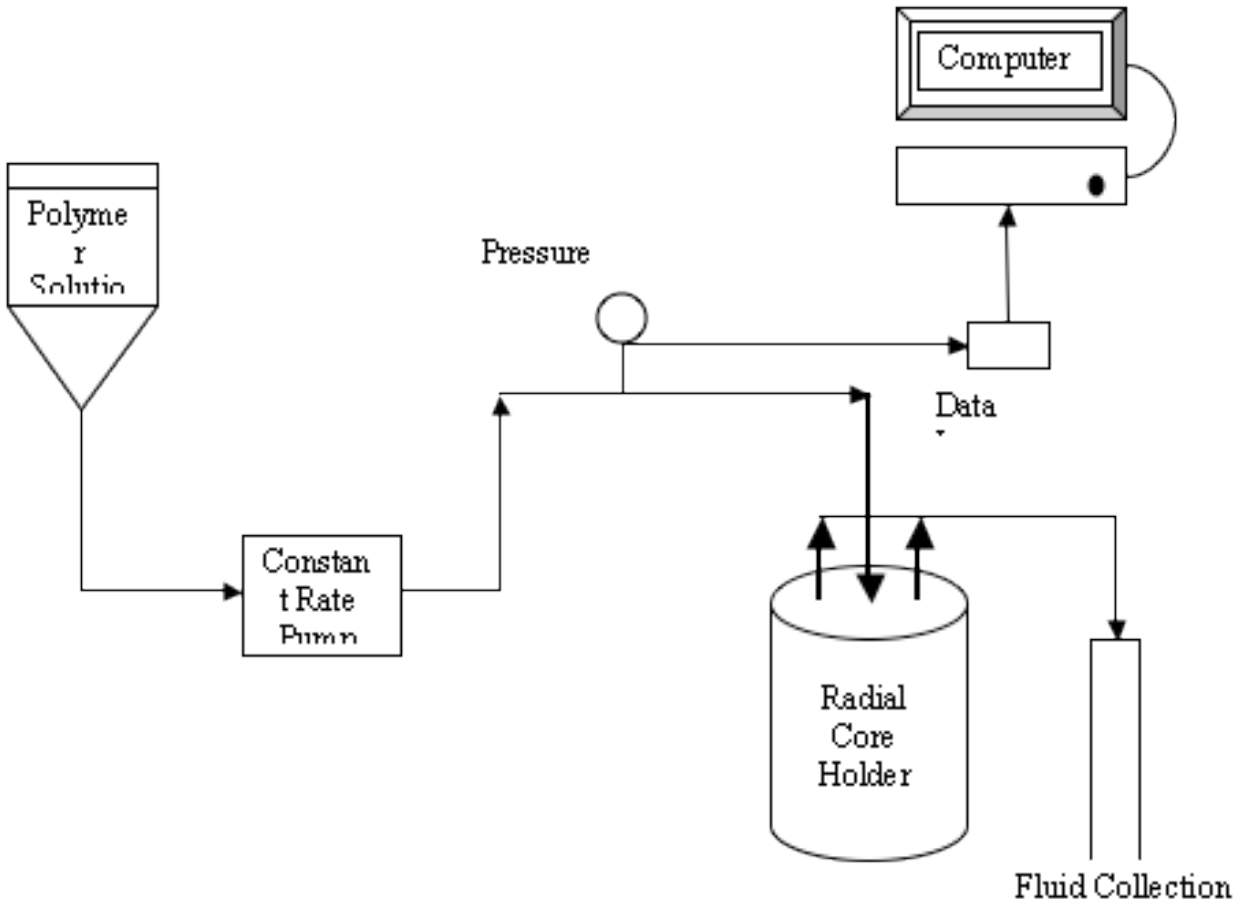


Polymer Flooding Experiment

- cell was packed with sand and sealed
- inject mineral oil and saturate the sandpack. Injection was done through a perforated line located in the center of the cell

Radial Cell

Experimental Set-up



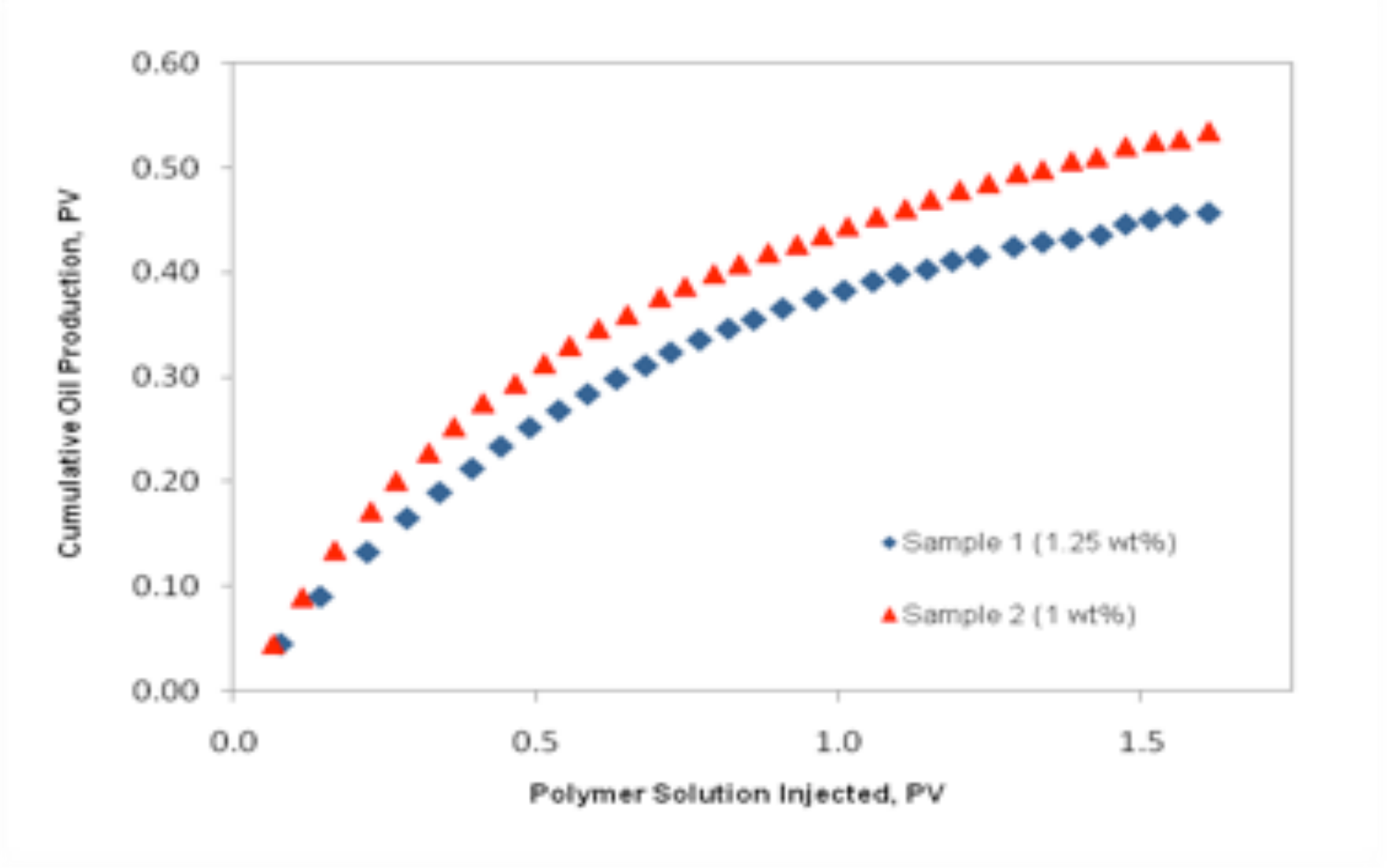
Polymer Fluids

PEO Grade	Approximate Molecular Weight
WSR-308	8,000,000
WSR-1105	900,000
WSR N-80	200,000

PEO Solution	Weight Percentage of Polymer Solution Components		
	WSR N-80	WSR-1105	WSR-308
Sample 1	0	100	0
Sample 2	25	50	25

PEO Solution	Average Molecular Weight	Polydispersity Index
Sample 1	900,000	1
Sample 2	1,000,000	4.6

Oil Recovery



Results and Conclusion

- Sample 2 yielded higher cumulative oil production than sample 1
- At constant shear viscosity and concentration of polymer, the polymer solution with higher viscoelasticity has yielded higher oil recovery

Closure

- Through this research experience, I increased my knowledge in polymer flooding technology
- I have a better understanding of how experimental research is conducted in petroleum engineering
- I gained practical teamwork and communication skills through working with Tolkynay and Dr. Kuru

Reference

- Liu He, Li Jinling and Yan Jidong, 2009 "*Successful Practices and Development of Polymer Flooding in Daqing Oilfield*", SPE 123975
- Tolkynay S. U., Japan T. and Ergun Kuru, 2010, "*Effect of Elasticity during Viscoelastic Polymer Flooding: A possible Mechanism of Increasing the Sweep Efficiency*", SPE 133471