Use of Swelling Elastomers in Drilling and Development of Oil and Gas Wells; Elastomer Research at Sultan Qaboos University

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Abstract (not more than 300 words)

Swelling elastomers are advanced polymers that swell when in contact with certain fluids. They are used as sealing elements and packers in different petroleum drilling and development operations. Case studies focus on only a few related applications, so an overall picture of swelling elastomers cannot be found in published literature. This paper presents a thorough overview of different swelling elastomer applications in the oil and gas industry.

Separation of unwanted zones from production zones to avoid the mixing of redundant fluids is known as zonal isolation. Swelling elastomers are considered to be the default material for such isolation work. One specific form of zonal isolation is water-shutoff, used to overcome the problem of water production. Swellable packers have been successfully employed for enhanced oil recovery through relatively low-cost yet long-term and effective water-shutoff. Sand control is any method by which sand from a formation is restricted to enter the wellbore, as it can cause plugging and wear of well equipment. Swellable packers are used with sand screens in many applications. The term well completion refers to all the tasks involved in making the well ready for production, including the stage known as cementing. Problem of crack initiation and propagation in the formation is notable when using conventional method for cementing, resulting in mixing of unwanted fluids and loss of circulation. Swelling elastomers have found success in well completion together with cementing, and also as an efficient alternate to cementing. Enlarging of old channels or creation of new ones in the producing zone of well formation is known as stimulation. Stimulation processes require proper isolation of zones, and swellable packers are therefore used for this purpose also. Many other applications are also discussed in the paper. This review can be useful for field engineers as well as research and development personnel.

Keywords — *Swelling elastomer, Zonal isolation, Enhanced oil recovery, Well completion, Intelligent well, Stimulation, Underbalanced drilling*

Professional Biography (100-150 words)

Prof Sayyad Zahid Qamar is currently associated with the Mechanical and Industrial Engineering Department, Sultan Qaboos University, Muscat, Oman. He has worked both as a university academician/researcher, and as a field engineer (mechanical), during his thirty-plus years of professional service. His main research areas are Applied materials and manufacturing; Applied mechanics and design; Reliability engineering; and Engineering education. He has worked on different funded projects in excess of 4 million US dollars. He has over 185 research/technical publications to his credit: one research monograph (book), three edited

books, four book chapters, 145 publications in refereed international journals and conferences, and 32 technical reports). He is currently editing one volume for the Elsevier Encyclopedia of Renewable and Sustainable Materials, and is serving on the editorial boards of various well-known research journals. He has conducted experimental, numerical, analytical, and stochastic studies in the areas of Swelling and inert elastomers; Solid expandable tubulars; Metalforming (especially extrusion) process, product, and tooling; etc.



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Any Comments: