

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

Sayyad Zahid Qamar* and Tasneem Pervez

Mechanical and Industrial Engineering Department, Sultan Qaboos University, Oman

Swelling elastomers are advanced polymers capable of self-healing and volume-increase when in contact with certain fluids. These elastomers are mainly used as sealing elements and packers in different petroleum drilling and development operations. As case studies generally focus on only a single or at most a few related applications, an overall picture of swelling elastomer versatility and scope 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 zonal 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

Images

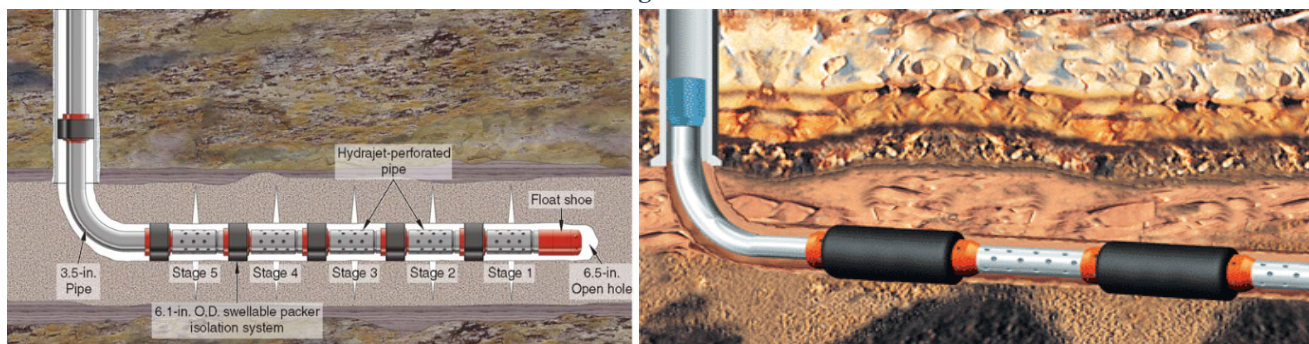


Figure: Swelling elastomer applications in well drilling

Biography:

Professor Zahid Qamar, Sayyad is currently associated with the Mechanical and Industrial Engineering Department, Sultan Qaboos University (SQU), Muscat, Oman. He has over 20 years of academic and research experience in different international universities.