

Geomechanical modeling construction for wellbore failure problems and technical solutions

Mohmed S. Nasr

Professor of Petroleum Engineering

Technical Petroleum Engineering Consultant

msmnasr@yahoo.com

SUMMARY

Geomechanics is the science of studying the behavior of underground rocks when they are subjected to external applied forces. The importance of studying the geomechanics behavior of bore hole rocks is; to predict bore hole wall conditions causing rock failure (bore hole instability) during drilling, to predict conditions causing well bore rock failure during production operations (sand production) and to give information about rock failure needed for well and reservoir intervention operations (hydraulic fracturing, IOR and EOR projects, reservoir pressure maintenance).

The investigation of these geomechanical problems requires the evaluation of the petrophysical, elastic and dynamic mechanical rock data. This data can be obtained from both wire line logging and core analysis. Therefore, the geomechanical rock data is essential for the success of the design of the above-mentioned drilling, reservoir and production intervention operations. If these problems were solved by using proper geomechanical techniques, time, cost and safety hazards will be minimized.

Consequentially, this training workshop is proposed to follow three different approaches:

1. Explain the methods and techniques for determining the rock mechanical data, from laboratory tests and from open hole well log records, needed for the construction of the one-dimensional (1D) geomechanical earth model (MEM).
2. Explain the methodology for construction the 1D geomechanical model using the calibrated rock mechanical properties, rock strengths and the in-situ rock stresses.
3. Provide the techniques for the development and solution of the 1D geomechanical model for the three above mentioned field operations (drilling, production and reservoir intervention applications)

PROF. DR. MOHAMED S. NASR SHORT CV

Prof. Nasr received his B. Sc. and M. Sc. Degrees in petroleum engineering from the University of Southern California, Los Angeles, USA, in 1975 and 1979 respectively and Ph. D. degree in petroleum engineering from the University of Wyoming in 1983, USA. He has spent more than 35 years providing consulting services to NOC'S, IOC'S and the Petroleum Research Center in Libya. Dr. Nasr has participated in several research projects for the major oil companies, universities and research institutes, and authored more than 30 technical papers in the areas of drilling engineering, well completion, formation damage, production engineering, fluid flow in porous media and improved oil recovery.



Dr. Nasr has given several short courses in petroleum engineering for the engineers of ZadcO Oil Company of the United Arab Emirates (UAE) and he has given short courses to the Libyan National Corporation and the Oil Operating and surface Companies in Libya. Dr. Nasr is currently professor of Emeritus in the petroleum engineering at University of Tripoli, Tripoli, Libya, where he was chairman of the petroleum engineering department from 1991 until 2006.

He was an associate research professor at the Environmental Institute in the Technical University of Hamburg, Hamburg, Germany. Dr. Nasr was a part time professor at the French Institute of Petroleum in Paris teaching graduate courses in well completion and formation damage in the institute Master Program. He was part time professor at the Clausthal Technical University in Germany teaching acidizing, hydraulic fracturing and sand control course to the Master Program of the university. He also taught short course for the Master and Ph.D. student at the university of Teesside University Middlesbrough, UK. Currently Dr. Nasr is an International Petroleum Engineering Technical Consultant and He is a Professor of Petroleum Engineering at the University of Tripoli since 1984 and until now.