

*McLellan, P.J. and Hawkes, C.D., Applications of Probabilistic Techniques for Assessing Sand Production and Borehole Instability Risks, SPE/ISRM 47334, Presented at SPE/ISRM Eurock '98, Trondheim, Norway, July 8-10, 1998.*

## **Abstract**

The mechanical stability of a borehole or perforation tunnels can have a critical influence on petroleum drilling and recovery processes. For instance, extensive failure of rock surrounding an open-hole completion may result in massive sand production. Furthermore, it is often necessary to evaluate the risk of borehole instability when drilling through weak shale cap-rocks, or when drilling underbalanced through poorly cemented reservoir rocks. Numerous geomechanical modeling techniques have been developed to address these issues. However, the existing models are limited in that they fail to account for the inherent variability of mechanical and petrophysical properties of rock, as well as uncertain or poorly constrained values for these and other critical input parameters. This paper describes the adaptation of probabilistic techniques for quantitatively evaluating the risks of borehole instability or sand production. This technique involves the use of a versatile poro-elastoplastic model, implemented within the framework of a spreadsheet-based Monte Carlo simulation tool. The typical results generated by this model indicate that rock strength parameters, bottomhole pressure, reservoir pressure and near-borehole permeability changes have the most significant influence on the extent of yielding for underbalanced drilling or production conditions in weak sandstones.