

# Shear Modulus and Insitu Stress from Pressuremeter Testing - Reflections on Experience with a Reservoir Geomechanical Pressuremeter (RGP)

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Prof. Rick Chalaturnyk, P.Eng., is a Professor of Geotechnical Engineering in the Department of Civil and Environmental Engineering at the University of Alberta and founder of GeoVer Inc. Dr. Chalaturnyk will speak on Thursday April 14, 2022. The seminar will be at 9:00 Central Time. The topic is “*Shear Modulus and Insitu Stress from Pressuremeter Testing - Reflections on Experience with a Reservoir Geomechanical Pressuremeter (RGP).*”

## Abstract

Knowledge of in situ formation properties, such as shear modulus and in situ stress magnitude and orientation play a very important role in geomechanics and are key parameters in designing safe and effective development of energy resources, such as tight oil/gas, caprock integrity assessments, waste fluid disposal, geological storage of CO<sub>2</sub>, and geothermal energy extraction.

Significant effort has been invested in the execution and interpretation of the results from minifrac (DFIT, diagnostic fracture injection tests) tests for measurement of minimum in situ stress as means of constraining the in situ stress tensor. All variations of DFIT’s continue to be the state-of-practice for in situ measurements. Shear modulus can be determined on laboratory specimens but increasingly, challenges with upscaling requires assessing shear modulus at scales beyond lab scale specimens. Shear modulus can also be extracted from seismic acquisition and borehole geophysics, but these are typically relevant at very small strains. For many geomechanical applications, interpreting meaningful shear modulus values at larger strains is important for design.

Over that last several years, increasing attention has been given to pressuremeter (dilatometer) technology, which is a well-accepted technology in geotechnical engineering, for acquiring formation properties and in situ stresses for reservoir

geomechanical applications. Following a very brief review of pressuremeter (dilatometer) technology, this presentation will provide reflections on the experience within the UAlberta reservoir geomechanics research group on deployment of a reservoir geomechanical pressuremeter (RGP) within several field applications. These applications include five pressuremeter tests conducted in three clay shale formations (to depths of 450 m) at a thermal operation site in NE Alberta, a significant campaign of RGP tests in Opalinus clay at the Mont Terri facility in Switzerland and more recent applications of a customized RGP tool for deployment to 900 m in deep boreholes in Switzerland. The presentation will discuss issues with in situ stress interpretation, shear modulus calculation, uncertainty assessment, impact of borehole damage and other issues associated with these types of tests.

## **Biography**

Rick Chalaturnyk is a Professor of Geotechnical Engineering in the Department of Civil and Environmental Engineering at the University of Alberta and holds an NSERC/Energi Simulation Industrial Research Chair in Reservoir Geomechanics. Prior to joining the University in 1997, Rick co-founded a reservoir surveillance company called PROMORE Engineering and after joining the University, was engaged as Executive VP of Opsens Solutions, a company providing fiber-optic and non-fiber monitoring solutions to the SAGD and CO<sub>2</sub> Storage world. At the University of Alberta, he has established the Reservoir Geomechanics Research Group, working primarily in the area of subsurface processes related to current and future energy processes and to support the research group, has established four unique GeolInnovation Environments, which includes 3D printing of rocks, high temperature/pressure reservoir geomechanical testing capability and a geotechnical beam centrifuge. Rick has over 20 years' experience in CCUS projects, is currently working with PTRC and SaskPower in the Aquistore Project, is pursuing the integration of CO<sub>2</sub> storage and geothermal opportunities and is involved with several other international CCS initiatives. In addition to research at the University of Alberta, Dr. Chalaturnyk has also founded GeoVer Inc., a reservoir geomechanics consulting company focussing on the development and deployment of advanced reservoir geomechanics surveillance technologies.