Measurement of anisotropic properties of coal under triaxial stress condition

Project background and objectives

Coal shows highly anisotropic material and flow properties under confined stress conditions. In coal seam gas (CSG) reservoirs, these properties play a vital role in altering the permeability that affects the reservoir production. The objectives of the project are:

1. Evaluate factors affecting coal permeability
2. Measure coal’s anisotropic geomechanical properties
3. Develop an anisotropic geomechanical permeability model.

Key features of triaxial stress permeameter

1. Mimic CSG reservoir conditions for up to ~1400 m depth (around 135 bar pressure).
2. Independent stress control in longitudinal and transverse directions.
3. Load cell and pressure transducers for accurate stress measurement.
4. Multipoint high precision fibre optics based strain sensor.
5. Simultaneous measurement of permeability and stress-strain data.
6. Cubical sample used to easily reorient in x, y, and z directions.

Expected outcomes

1. Direct laboratory capability to measure the directional geomechanical character of coal.
2. Experimental determination of stress-strain tensors and relaxation times.
3. Anisotropic permeability evolution in coal by experiment and simulation.
4. The results will better inform the physics of reservoir models, and provide coal character parameters to be used within them.

Acknowledgement and References

This research has been supported with industry funding via The University of Queensland Centre for Coal Seam Gas.