

February 2023 – Established Technology for New Applications in Evolving Energy

For CSEE's first in-person Technical Lunch & Learn in almost 3 years, the keynote speaker was Robert Hawkes, VP – Operations at Pressure Diagnostics Ltd., a Calgary based energy consulting firm. His presentation was titled "How Merging Tried and True Technologies of the 80's Helps with Evolving Energy Development Today". With CSEE's continued messaging of evolving energy and the overall energy transition narrative, this talk exemplified how physics and engineering from the traditional energy industry can still be applied and in fact, are critical in understanding the basic concepts within the development of new energy sources of today and tomorrow.

To set the stage, the speaker provided a historical overview of how the reservoir engineering analytical methods and data collection efforts have evolved over time in an effort to keep up with the advancements in the energy industry over the past 20 years. With the shift to horizontal wells and multi-stage hydraulic fracturing, many in the industry discounted the validity and application of traditional well testing techniques to arrive at reasonable answers & solutions in a practical time frame. Although traditional flow and buildup type tests became less & less popular, other methodologies already existing in the analytical tool box were quickly re-deployed / adapted to fit the need. For example, slug / impulse testing from the 1980's, perforation inflow diagnostic tests, and fracture injection & falloff tests (re-termed DFIT or Diagnostic Fracture Injection Testing) all became more prevalent and acceptable modes of evaluation techniques for critical reservoir parameters. In addition, research indicates that the pressure derivative concept introduced by Bourdet in the early 1980's to identify wellbore & reservoir flow regimes can be enhanced with the examination of the primary pressure derivative (PPD) to not only affirm valid pressure responses (data quality), but also for certain flow regime identification for fracture related data (i.e. far-field extension and fracture closure pressures) and to illustrate the formation of fracture complexities. This type of work has also been instrumental in attaining more definitive and consistent post-failure initial shut-in pressure (ISIP) data that is critical in the design of subsequent horizontal well completions.

Robert then walked the audience through several case histories to demonstrate how these traditional testing techniques have been utilized recently in various evolving energy projects, including geomechanical pumped storage projects (Geoenergy), hydrogen extraction from & CO₂ storage in coal reservoirs, hydrogen storage in salt caverns (including cap rock integrity flowback testing using DFITs), and evaluation of high-permeability Helium reservoirs (in conjunction with conventional closed chamber drill stem testing technology), to name a few. A key concept or recommendation that the speaker repeated a number of times during the session was the importance / need for geomechanical work to better understand the rock fabric prior to conducting the above-mentioned field work.