

Purpose, Challenges and Successes Related to Non-Brine Displacement Natural Gas Liquid Storage Caverns in Sarnia, Ontario, Canada

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Abstract

Plains Midstream Canada (Plains) operates several dozen natural gas liquids (NGL) storage caverns in Alberta, Saskatchewan and Ontario, Canada.

In Sarnia, Ontario, Plains operates several caverns that fall into the category of non-brine displacement salt caverns. These caverns store NGLs which are received via pipeline and recovered using electric submersible pumps (ESPs). This type of cavern is necessary to accommodate the facility's design, and complements the surface infrastructure. There are also the traditional brine displacement caverns present at the Sarnia facility.

The operation of these caverns presents a challenge on several fronts. These caverns are subject to very different operating pressures, flow rates and geotechnical considerations when compared to a typical brine displacement liquids storage cavern. These non-brine displacement caverns must also meet standards and regulations that have been developed for either brine displacement or natural gas storage caverns, neither of which fully addresses the unique conditions associated with non-brine displacement caverns in natural gas liquids storage service.

Since acquiring these assets in 2012, Plains has performed a number of tests, inspections, and studies to evaluate the caverns' performance, reliability, and integrity. Plains has been able to demonstrate improvements in operation, establish a risk profile and geomechanical evaluation, and improve the way the caverns fit within the standards and regulatory framework. This paper presents an overview of these activities, as well as the construction and historical operation of these caverns.

Key words: Cavern Design, Cavern Operation, Ontario, Canada, Mechanical Integrity, Michigan Basin, Well Design, Drilling and Completion

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