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THE ATOLI SENSOR : AN ON-LINE ANALYSER FOR HYDRATE RISK ASSESSMENT FOR UNDERGROUND GAS STORAGE

Myriam Darbouret, Thomas Valin, Didier Frot, Olivier Delpoux, Corinne Sagnard, Anne Sinquin

IFP Energies Nouvelles, France

Abstract

Underground salt cavities provide large capacities of gas storage. Nevertheless, as they are created with the help of water injection in salt domes, brine remains at the bottom and on the wall of the cavity. As a consequence, even if dry gas is initially injected in these cavities, wet gas is withdrawn of the storage period. The amount of water contained in the gas that is withdrawn is not constant and is unknown. The withdrawal of this wet gas stored occurs during winter, with low ambient temperatures that induces a risk of gas hydrate crystallization that can plug the lines. To avoid the hydrate risk the gas flow rate withdrawal may be lowered and/or THI (Thermodynamic Hydrate Inhibitor) may be injected. These gas hydrate prevention methods impact the economics of the storage plant. Indeed, as the water content of the withdrawn gas is unknown, conservative rules are applied both on the flow rate and the THI dose rate injected. To help with the optimization of the withdrawal, IFPEN is developing a sensor capable to assess hydrate risk in real-time, directly in the gas flow. It is designed to be installed in a pipe under pressure, and will deliver a temperature margin between the actual operating conditions and the hydrate appearance optimizing the need for remediation to real dangerous zone. The operating principle of this sensor is based on the cooling of a fluid element until reaching the temperature of dew point and/or hydrates appearance using an optical device. The difference between this temperature and the actual one in the pipe is used to give the safety margin. The main benefits of this sensor is that it can discriminate liquid water condensation and hydrate formation in real-time, on line without depressurization before measurement and without gas release into the atmosphere. The determination of the safety margin will allow to greatly optimize both the withdrawal gas flow rate and the injection of THI and the economics of the storage plants will be accordingly improved. This paper describes the proof of concept (TRL3) that has been carried out so far and the next steps (TRL4) to increase the readiness to market of this sensor.

Key words: Caverns for Gas Storage, Gas withdrawal, hydrate formation risk, alarm sensor, THI injection optimization