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First successful surveys in hydrogen

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Abstract

Until autumn 2021 no survey has ever been carried out with direct contact to hydrogen in any of the world's existing hydrogen caverns (UK and USA). Typically, the only cavern survey work carried out was logging in brine-filled inner strings or sonar survey of caverns completely flooded with brine. Various projects and research activities on the storage of hydrogen are currently underway. Therefore, the surveys carried out in the context of the tests on the Zuidwending ZWA8A cavern belonging to N.V. Nederlandse Gasunie represent the first real-world use of borehole tools in a hydrogen-filled borehole.

For the first time sonar tools were run directly into a borehole filled with hydrogen in September 2021. Of course, extensive preliminary investigations had been carried out on the suitability of the materials used. The entire pressure control equipment was tested at Hartmann Valves, before the surveys.

The materials from which the sonar tools (SoMIT-tool and standard sonar tool) are made had been found to be suitable in advance.

The main results of the SoMIT test are:

- The tool's full functionality in hydrogen is demonstrated. The method can also be used in hydrogen.
- The coupling of the emitted sonar signal to the medium hydrogen is better than to nitrogen. With the optimal frequencies investigated in advance the achievable ranges are longer and the attenuation of the emitted sonar signal is lower than in nitrogen.

The main results of the BSF2 sonar tool test can be summarized as follows:

- The sonar tool is fully functional in hydrogen. Transducer technology adapted to hydrogen could be used successfully.
- The speed of sound (measured with the BSF2 speed of sound measuring module) is significantly higher than in nitrogen or natural gas.
- The dew point was measured, allowing moisture content to be recalculated.
- Compared with natural gas, different measurement frequencies could be utilized.
- For sonar surveys in hydrogen, extremely long ranges were achieved and the results, which had already been determined with the SoMIT tool, were confirmed.

After the measurements, both the tools used and test samples of the wireline cable were examined in detail. In the case of the survey cable, the focus of the investigations is, inter alia, on possible structural changes and the impacts on ductility. The tools were completely dismantled and all components examined for possible impacts or damage.

In conclusion, with its survey tool technology SOCON is very well positioned to meet the challenges for MITs and sonar surveys in hydrogen-filled boreholes and caverns. The first results have shown that the chosen technology is the right one.