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Bridging the Gap Between Reservoir and Sample; Reducing Asset Development Risk by using Down-Hole Mercury Trapping and Non-Reactive Sampler for Trace Component Sampling

Abstract

Accurate mercury and hydrogen sulphide measurements are essential for facilities design. Existing sampling methods are flawed in that they are not guaranteed to preserve the full quantity of reactive trace components present in a hydrocarbon sample. Subsequent incomplete measurements can have significant cost and HSE impact.

A novel down-hole sample capture and preservation of reactive components system is presented, enabling quicker, definitive identification of risks to plant integrity, worker and environmental exposures and sales value.

A selection of materials and coatings were tested for their inertness in relation to both mercury and hydrogen sulphide, in a variety of fluids (gas, oil, water and multiphase). All materials also had to be suitable for use in anticipated down-hole conditions.

The available literature was reviewed, and a mercury capturing system was designed and tested in a variety of fluids.

Once materials and designs had been selected, prototypes were tested using both certified calibration materials and samples spiked with known amounts of mercury.

The selected material and coating combination, when constructed in a chamber free from lubricants, O-rings and pistons, was shown to result in minimal sulphur component loss over an extended period, and to sufficiently delay the loss of mercury to allow it to be captured at reservoir concentrations.

Hydrogen sulphide concentrations were maintained in the tools for an extended period of time, allowing for the retrieval to surface of bottom-hole samplers, resulting in surface concentrations representative of those down-hole.

Mercury was successfully captured at down-hole conditions, preventing the impact of temperature and pressure changes at surface. Once at surface the mercury can be quantified without any losses associated with traditional sample handling.

Earlier identification of the presence of these species, along with accurate quantification, will aid facility design, such as whether removal facilities are required to meet sales specifications, and prevent harm to workers and the environment through unconsidered emissions of toxic components during production.

This paper presents a data collection process enhancing the quality of information essential for field development and maintenance planning and introduces a novel sampling approach that is capable of capturing representative down-hole samples for trace analysis of mercury and sulphur species, without losses experienced using existing techniques. The tool can be used within traditional sampling systems.