PROSERNAT : SmartSulf™ acquisition (France Supplement OTC 2015)

Interview : Jeremy Beckman, PenWell

End of 2014, PROSERNAT has expanded its range of process technologies for the oil and gas sector through the acquisition of a German company named ITS Reaktortechnik GmbH, which was the owner of a sulphur recovery technology developed by Linde in the 80"s, and originally commercialized as Clinsulf®, then DegSulf™ and finally SmartSulf™ technology. To date, the latter's SmartSulf™ process has been employed mainly in upstream and downstream applications onshore, including very recently a refinery operated by Pemex in Mexico. However, Prosernat sees a great potential for development of offshore reservoirs with high levels of acidic gas, where the handling of H_2S has always been a real issue for the operating companies.

The process is designed to treat hydrogen sulfide (H_2S) in direct oxidation mode for conversion to sulfur. According to Vincent Simonneau, PROSERNAT's Sulfur Business Development Manager, SmartSulf™ can recover up to 99% of the sulfur content, and thanks to its free of flame concept, the equipment can be incorporated into the process facilities of an offshore production platform – hitherto sulfur recovery has been close to impossible offshore. SmartSulf™ can be used even on a barge because it has a very small area requirement and tolerates fluctuations due to waves. SmartSulf™ could be used to treat up to 20 MMSCFD of Feed Gas or Amine Acid Gas in one train, and produce commercial grade sulfur which would be stored on the platform for subsequent offloading to a barge.
SmartSulf™ continuously removes the reaction heat generated by the Claus reaction directly in the catalyst bed rather than in a downstream heat exchanger. This maintains a fix temperature throughout the catalyst bed close to the optimum for the chemical equilibrium, resulting in much higher sulfur recovery rates, PROSERNAT claims. The heat exchanger comprises thermoplates with large clearances – space in between the plates is filled with catalyst leading to efficient temperature control.
Feed gas containing a concentration of H_2S up to 15% is mixed with a stoichiometric deficiency of air from an air blower. The gas mixture is heated and enters the catalytic reactor, which contains two catalyst beds. In the upper bed the catalyst converts one-third of the H_2S to elemental sulfur, some SO_2 and water (H_2O). The residual H_2S and the SO_2 react in the lower bed to form elemental sulfur, according to the Claus reaction:

$$2\ H_2S + SO_2 \Leftrightarrow 3/x\ S_x + 2\ H_2O$$

x = 2,4,6,8 indicates the different sulfur modifications

The lower bed's heat exchanger cools the process gas at the outlet to a temperature slightly above the sulfur dew point. This shifts the chemical equilibrium toward more sulfur formation, thereby maximizing sulfur recovery efficiency, PROSERNAT claims. Process gas exiting the reactor enters a sulfur condenser where the gas is cooled and liquid sulfur formed is separated from the gas. If the H_2S content of the feed gas leads to reaction temperature which would become too high, a recycle blower can therefore be installed, sending part of the product gas from the reactor outlet back to the pre-heater, with the residual gas sent to the consumer as product gas.

A second identical SmartSulf™ reactor added downstream can use the thermoplate exchanger to operate at a lower temperature, leading to further optimization of conditions for the Claus reactor and a higher sulfur recovery rate, although this entails more complex configurations.

- How PROSERNAT plans to develop the technology – will you do this in France, or at the existing facilities in Germany?
    - Basically, PROSERNAT can propose any kind of scope of work, form basic engineering + License + Reactor supply (based on German manufacturing) up to the supply of the complete modular solution with full mechanical and process guarantee.
- What would be the typical footprint of a SmartSulf™ treatment unit on an offshore installation, and would the design vary if the installation were floating rather than fixed?
    - A typical footprint would be 3m Lenght x 6 m width by 6 m height.
    - Since the reaction takes place into gas phase there is no sizing effect of floating rather than fixed applications. Also, thanks to the thermoplates design of the reactors, the catalyst is held into place in the reactor even in wave conditions.
- What is the theoretical gas-handling limit of the process offshore?
    - up to 20 MMSCFD