

Optimizing the desulfurization of Natural Gas using Aspen Plus

The SUGARS project is part of the “PhD in Industry” Program that received funding by the Research and Innovation Foundation, Cyprus (RIF) and is a collaboration of the Cyprus Hydrocarbons Company (CHC) with the Cyprus University of Technology (CUT), Department of Chemical Engineering. The project started on the 1st of October 2023, and it will be completed by the 30th of September 2026, over a period of 36 months. Our ultimate aim is to provide refined technical solutions for the development of remote deep water offshore moderate sour gas fields.

Methods and Procedures:

We apply technology screening techniques to select the most appropriate sour gas treatment technology based on the reservoir’s gas characteristics and consider offshore and onshore development scenarios. The work includes the design and validation of processing models, using Aspen Plus, to analyse and optimize the design and operation of the selected technology while operating within the limits of the applicable environmental regulations. Technology performance is assessed in terms of technology sizing and energy requirements over the range of gas flow rates and compositions.

Results and Conclusions:

The sour gas processing model was developed and compared, for validation, with available literature for similar applications. This work also presents the complete results for the low to high gas flow rates and enables interactions with the industry and academia for further support. The optimization of the offshore water scrubber technology may include several advantages including minimized footprint with manageable energy requirements while generating by-products that can be disposed of offshore while complying with very strict environmental regulations. The results of this work support the use of the technology for gas flow rates between 200-1400 MMscfd and H₂S concentrations up to 400 ppmv. Sensitivity analysis on the parameters impacting the performance of the absorber shows that apart from the critical parameters such as gas flow rate and the volume of the seawater, small variations, in the range of 10%, of the seawater temperature may impact significantly operational efficiency. Similar changes to the influx seawater pH shows negligible impact.

Novelty of the approach:

The industry provides many solutions for onshore processing; however, offshore sulphur management retains additional challenges, e.g., sour gas at large quantities, and space limitations. This work presents the technical thinking leading to offshore gas processing technology evaluation considering reservoir characteristics in combination with offshore conditions and a broader range of scenarios. The existing literature covers academic and industry cases highlighting the need for technical solutions for cases of higher sour gas flow rates.

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