Optimized in silico sour gas processing for offshore deepwater gas technology applications in the Eastern Mediterranean region.

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Abstract

Growing global demand for natural gas (NG) and the depletion of easily accessible hydrocarbons reserves have necessitated the exploration and development of more challenging targets, such as deep water offshore sour gas fields[1]. Sour gas field is defined as gas containing hydrogen sulfide (H_2S) levels above 4 parts per million of volume (ppmv), while a gas that includes significant concentrations of H_2S and/or CO_2 is referred to as acid gas and poses significant challenges for extraction and processing[2,3]. These challenges are underscored by strict regulations due to its toxicity and subsequently, health risks associated with both offshore and onshore processing[4]. While the industry has a solid record of managing sour gas on land, offshore processing introduces unique hurdles. Decisions to process gas offshore are influenced by several factors, including the reservoir's location, water depth, H_2S concentration and the intended targeted gas flow rates. The industry's experience with offshore sour gas developments, especially when applying floating gas processing facilities including floating liquified natural gas facilities (FLNG) is limited due to health and safety concerns (HSE), space constraints, managing elemental sulphur and other by-products at sea, and higher costs compared to onshore operations. Project aims to advance knowledge on sour gas processing technologies suitable for offshore environments and it will explore how offshore conditions at Field Production Facilities affect pollution dispersion in the surrounding areas, impacting both facility staff and nearby communities. The project will leverage state-of-the-art software for optimizing NG desulfurization, employing Aspen Plus for process flow diagram (PFD) and Comsol Multiphysics for Computational Fluid Dynamics (CFD) simulations to study the dispersion of pollutants in air and seawater. These simulations will help understand how underwater current variability affects effluent dispersion. By integrating NG desulfurization process optimization with dispersion simulations, the project aims to create a comprehensive, user-friendly tool. It seeks to enhance technical knowledge on offshore sour gas processing, considering environmental regulations and industry specifics, and to educate stakeholders including operators, technology providers, contractors, and regulatory bodies. This comprehensive approach aims to address the environmental and operational challenges of sour gas processing, promoting safer and more efficient offshore operations.

KEYWORDS: Sour gas, legislation limits, modeling, process flow diagram, computational fluid dynamics

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