The Role of Interfacial Chemistry to Unlock Long Subsea Gas-Condensate Tiebacks

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Safe, reliable and efficient production from offshore gas-condensate reservoirs is the critical path to achieving rapid emission reduction targets worldwide, by unlocking large-scale LNG and hydrogen export. However, the cost, complexity, and safety considerations involved with new offshore facilities can constrain the viability of many assets, which are often between 200 and 300 km from the nearest shoreline. Long subsea tieback systems connecting these offshore assets to the shoreline represent an enabling approach, introducing either subsea compression or separation technologies to achieve such extreme distances; to ensure such systems maintain efficient production and do not introduce unacceptable safety risks, engineers must now consider the probability and severity of pipeline fouling -- from both clathrate hydrates and hydrocarbon waxes -- in the transient multiphase simulation tools that are deployed during both design and operating phases of a project. This presentation will highlight the new kinetic growth behavior and transport phenomena associated with subsea tieback fouling, through a combination of bench-top and flowloop studies. In particular, recent investigations have demonstrated the viability of surface active chemicals to support a risk management strategies, including the use of kinetic hydrate inhibitors and anti-agglomerants, that enable long-distance subsea tiebacks and exclude the requirement for continuous thermodynamic inhibition. As a consequence, design and online management simulators must evolve to consider the presence of these interfacially-active species, alongside the dependence of multiple interfacial tensions throughout the system on surfactant concentration.