International Oil Spill Remediation: The Numerical Simulation of an in-situ Subsea Separator, Part II

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Oil majors have broadened their horizon for deep-sea exploration with efforts to preserve global stability. Subsea catastrophes emerge at unforeseen times, thus an effective, temporary solution is essential. This experiment was aimed at refining and testing the capabilities of the simulated subsea wellhead separation device. Simulations were constructed on the novel design for a multitude of steady-state and transient operations. The Red Sea, Santos Basin, and North Sea were selected as geographical locations for their expected potential in crude oil extraction over a 10-20 year period. Calculated fluid properties provided a thorough set of data. The whole spectrum from the separation of subsea collection of crude oil over the leaking wellhead to the transportation from the wellhead separation device through the marine flex-hose into a surface vessel was monitored and analyzed to determine leakage under upset conditions. The Parametric Study involved altering the Gas-Oil-Ratio (GOR) from 50-33-17 (Water-Oil-Gas) to also include 40-40-20 and 30-60-10. The Marine Breakaway Coupling Study (MBC) determined the leakage in the collection process during MBC separation by adjusting petal closure timings. Pressure levels were monitored to determine if maximum surge spikes exceeded component design pressures. Results showed that Shutdown Simulations provided critical data in the event of mechanical failures. In conclusion, laminar flow was achieved to facilitate the separation, enabling transmission of separate oil-gas flow streams. The undisputed need for sustaining the environment has been a prevalent issue for a multitude of parties, and the implementation of this simulated device can solve this detrimental problem.

Awards Won:
First Award of $5,000
Consortium for Ocean Leadership: First Award of $3,000