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Experimental Study of Oil Pipeline Leak Processes

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Author(s)

Agbakwuru Ahamefula Jasper, Gudmestad Tobias Ove, Bilstad Torleiv

ABSTRACT

This work provides a description of oil leak/spill processes from containment such as pipeline. Understanding of such processes is important in order to adequately estimate oil spills and to justify an appropriate emergency action for minimizing spills. Internal diameters of pipes used in the study are within 4 inches. Leaks are simulated from plastic pipeline oil containment fitted with valves. The leak response with time when upstream and downstream valves are operated is studied. Within the internal diameters of pipelines considered in the tests, two ranges of leak characteristics are evident; the "holding range" and the "flowing range" characteristics. The consequences of these characteristics in the oil industry operations have been discussed. The work suggests a spill estimation method based on this knowledge. Furthermore, in order to minimise spill in event of pipeline failure, it is observed that the optimum action on pipeline operational valves, is the immediate closure of upstream valve, followed by the downstream valve, nearly simultaneously. Future work will extend the test to larger diameter pipelines to attempt developing a mathematical approach for estimating limits of the "holding range" characteristics of pipelines given appropriate parameters and in-field test.

KEYWORDS

Oil Spill; Oil Leak; Pipeline; Downstream Valve; Upstream Valve; Early Leak Event

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