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COMPUTATIONAL STATISTICAL MONITORING OF HYDROCARBON TRANSPORTATION LINES

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Summary: Safety and reliability of hydrocarbon transportation lines around the world represents a critical aspect for industry, operators and population. Lines failures caused by external agents, corrosion, inadequate designs, among others, generate impacts on population, environment, infrastructure and economy, besides it may be catastrophically. Therefore, it is essential to constantly monitor operating conditions and hydraulic lines to faults and thus to take measures to mitigate the failure.

"Real-Time Transient Model" (RTTM) is recognized as one of the most comprehensive most accurate and sophisticated methods to detect failures. This method is based on the numerical solution of the system of equations that describe the phenomenological mass transport, momentum and energy in pipelines, coupled with the thermodynamic behavior of fluids flowing inside. An RTTM makes it possible to calculate mass flow, pressure, density and temperature at every point along the pipeline in real-time with the help of mathematical algorithms. A disadvantage of an RTTM method is its high computational cost. The successful application in oil transport systems depends heavily on numerical solution strategy as hardware used for this task.

To solve the mentioned drawback, the goal of this work is to develop a tool that engages statistical analysis based on Principal Components Analysis (PCA) and phenomenological simulation based on RTTM to infer the hydraulic behavior of flow lines, fault detection and estimation of fluid integrity discharges to the environment.