

CFD/CMFD Simulation for Flow Assurance

Pöyry AMS has significant experience in dealing with various multiphase flow problems pertinent to oil & gas industry. In particular, advanced numerical methods and models have been developed to solve multiphase flow in relation to flow assurance

SITUATION TODAY

Digitalisation and new technologies are presenting huge opportunities to transform and modernise engineering - leading to better decision making, efficiency and cost savings.

Traditionally, in their search for innovative and safer solutions to complex issues, engineers relied upon a 'trial and error' approach. Further, analytical solutions and simplified models have proven partial successful only, pleading in favour of more complete multi-dimensional and transient approaches.

CLIENT ISSUES

- How can we stay ahead of the game ?
- How can we gain critical insight and upfront visibility ?
- What can we do to further optimise designs and decrease the margin of error ?

PÖYRY'S AMS SERVICE

Building on the latest digital techniques and CAE solutions, Pöyry's AMS service is enabled by the powerful fluid-flow (CFD/CMFD) simulation platform **TransAT**, which delivers accurate, multi-dimensional and

transient process predictions present in its key business sectors, including Oil & Gas.

Pöyry's AMS supports operators, engineering companies and equipment suppliers with technical studies and documentations within the Well & Petroleum Engineering discipline. We provide products and services that enable engineers to evaluate, complete and produce the energy at lower costs and reduced economic and environment risk related to flow assurance. Our experts offer cutting-edge consulting services, covering various segments in the petroleum engineering and flow assurance for maximized asset value.

KEY FEATURES - AMS SERVICE

- TransAT is highly flexible and can be tailored to your unique scenario and needs
- Intuitive user interface means that it is straightforward to model your scenario
- 3D outputs are high quality and visually engaging, explaining complex scenarios
- Supported by Pöyry's team of specialists who understand your specific challenges

KEY BENEFITS OF AMS

Better informed decisions - earlier on: by effectively modelling and simulating your initial feasibility study and proof of concept, you get vital upfront insight needed to support investment decisions.

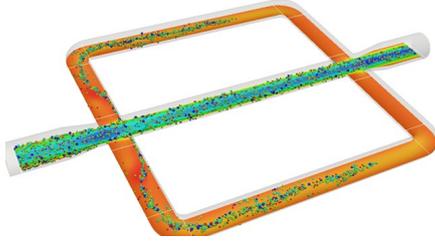
Maximise efficiency and reliability: by validating new ideas and improving designs, as well as retro-fitting existing operations. Overall confidence increases in the results of engineering studies.

Reduce risk, saving time and money: conduct virtual simulations of real life scenarios in less time and at a fraction of the cost of 'real' Laboratory experiments. Reduce margin of error and risks.

Flow Assurance issues: Even-Split or Mal-Distribution of phases, erosion by solid particles, subsea hydrates issues including plugging of conduits, slug formation and capture, black powder deposition in gas pipes, loss of buoyancy of floating oil rigs due to gas spill.



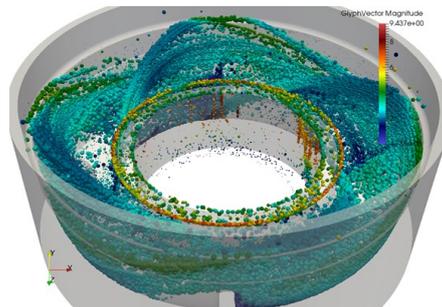
MAL-DISTRIBUTION IN MANIFOLDS



PARTICLE DISTRIBUTION IN A JUNCTION

Uneven Split or “Mal-Distribution” in manifolds cause equipment’s performance unbalance. Uneven split of phases can be observed in both production systems (flow risers), and surface operations (separation). TransAT can simulate multiphase-flow patterns and phase distributions in splits under various forms. It helps understand the roots of the phase split and propose remedies if required.

EROSION



PARTICULATE FLOW IN AN ESP PUMP

Solid particles affect the flow performance of gas pipelines and may lead to severe corrosion and degradation of the system. TransAT can help solve a multitude of similar issues like the erosion induced by different-sized particles induced by the particles-fluid-wall interactions inside rotating components.

SUBSEA HYDRATES ISSUES



METHANE HYDRATES IN PIPES

Plugging of flow-lines by hydrates in subsea conditions may be disastrous for flow assurance. A hydrate plug in a production line may indeed immobilize the production for weeks until it finally melts down. Detailed simulation could anticipate or even prevent the formation of hydrates, or design strategies to ensure restarting after a long shutdown due to hydrate blockage. TransAT is now capable to predict the formation of hydrates and subsequent pipe plugging. The model has been used to predict hydrate induced plugging in prototypical robot-controlled canopies used to collect subsea spilled oil.

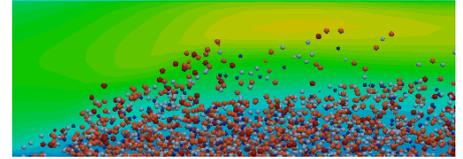
SLUG FORMATION / CATCHER

Slug flow causes pipes integrity issues and instabilities in separators. Detailed CMFD studies using interface tracking not only help determine global parameters such as slug speed and intermittency, but it also answers critical issues such as the flow transition and onset of sealing thus preventing costly production disruptions caused by slugging. The model has been used to assess the performance of various slug catchers.

BLACK POWDER IN GAS PIPELINES

Solid particles affect the flow performance of gas pipelines and may lead to severe corrosion and degradation of the pipe integrity. Black powder for instance is known to harm the valves and metering installations, disrupt flow assurance, and may lead to accidental releases of toxic materials in the atmosphere caused by pipe rupture.

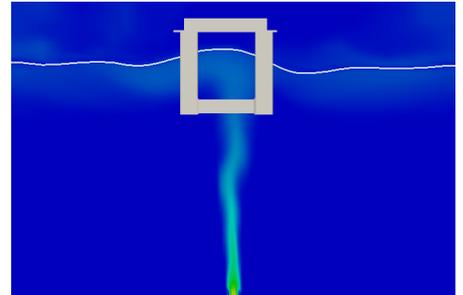
The models built-in TransAT account for the physical mechanisms in play, including particle-fluid/turbulence interactions, particle-wall-particle interactions, particle settling and packing, agglomeration, etc. Simulation outcome include determining critical flow velocity for powder build up and removal, and thus helps prevent costly production disruptions caused by black powder slugging.



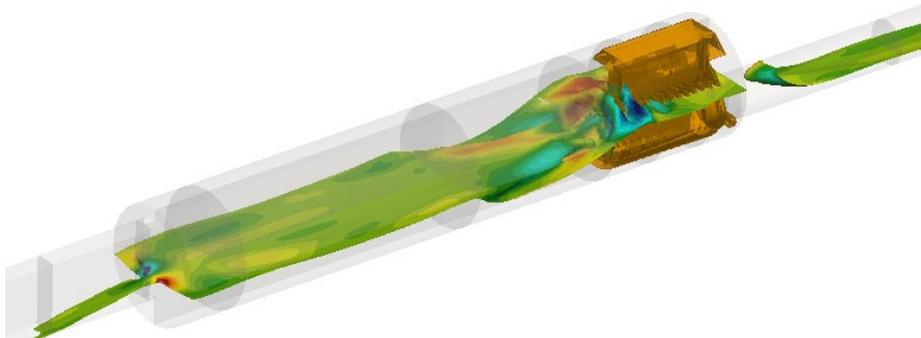
BLACK POWDER TRANSPORT IN A PIPE

FLOATING PLATFORMS

In the event of subsea gas spill, the released methane raises to the sea surface and reduces the density of the mixture, which may cause FPSO’s and Floating Oil Platform rigs (floaters) to lose buoyancy and can sink (e.g. 1982, Ocean Ranger semi-submersible sank in Canadian waters). TransAT can predict such scenarios, where mixture of air, water and methane are solved together with the floating platform considered as a rigid body interacting with sea surface.



LOSS OF BUOYANCY DUE TO GAS SPILL



FREE-SURFACE FLOW IN A SLUG CATCHER

TRANSAT CFD/CMFD PLATFORM

TransAT is a versatile fluid-flow simulation platform (CFD) using the Immersed Surfaces Technology for multi-dimensional meshing. The platform is best suitable for multiphase flows using tailored predictive techniques and models for complex physics. TransAT can be used in the energy, industry and infrastructure sectors.

TransAT Website: www.transat-cfd.com

Contact us today:

ams@poyry.com or www.poyry.com/ams

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