Oil & gas (2) : Flow assurance

ADVANCED MODELLING & SIMULATION – AMS –

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APRIL 2018

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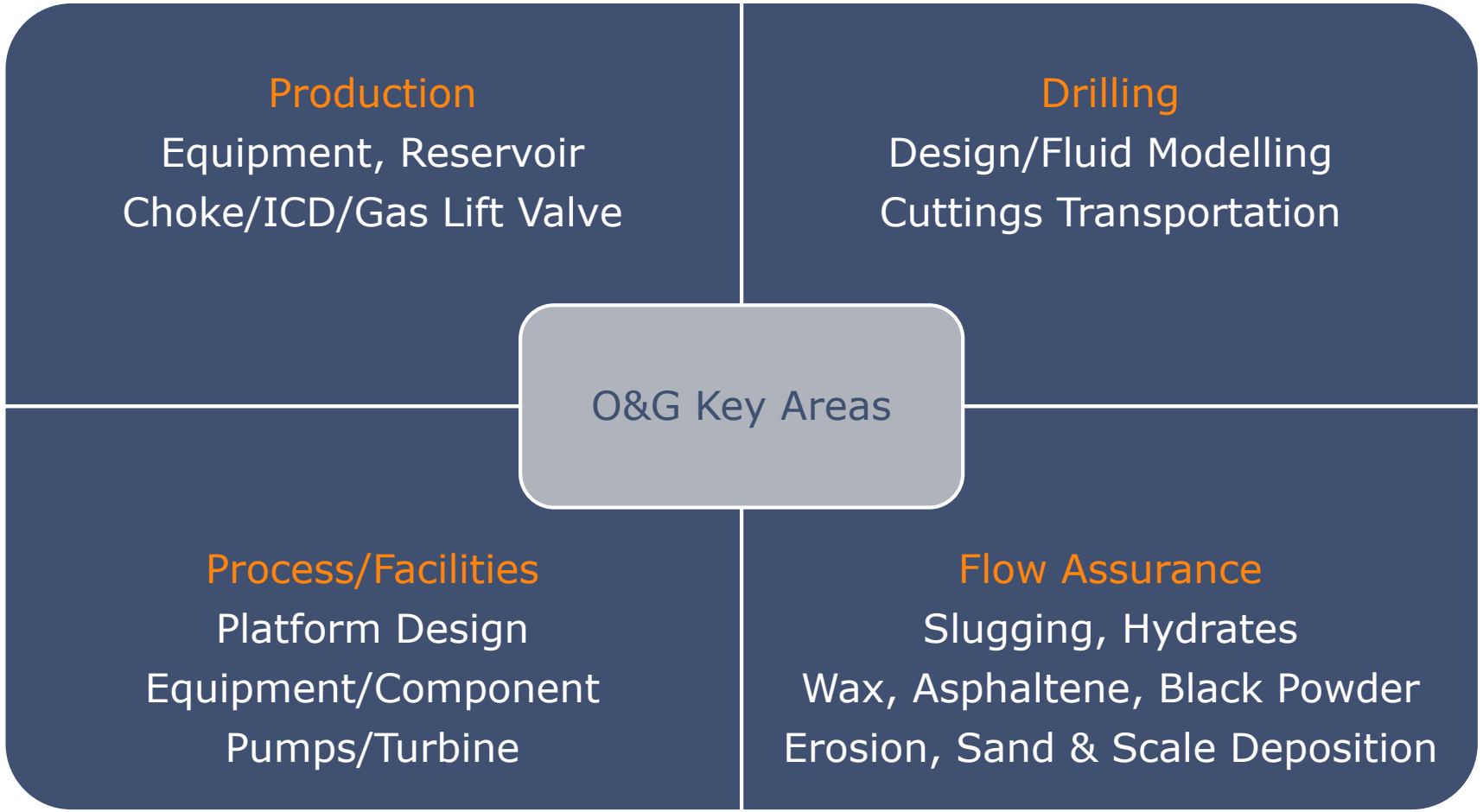
Typical O&G Application Areas requiring CFD/cmfd



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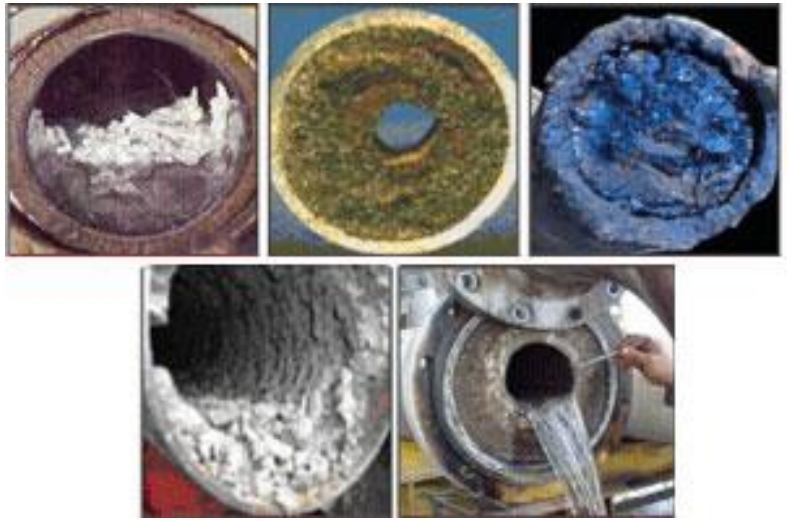
2- Flow Assurance

The Challenges:

— Companies face several production challenges in designing and operating long multiphase flow pipeline systems.



Typical consequences:

— Interrupted production (due o solids deposition & subsequent blockage formations in pipelines)
— Risk of accidents & asset damages
— If unmanaged, high costs threaten company's profits and legal issues.

Benefits of using CFD/CMFD:

— Understand better production systems
— Ability to predict its behavior and prevent flow assurance issues.

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Mal-distribution of phases in manifolds

- Uneven Split “Mal-Distribution” In manifolds causing equipment’s performance unbalance.
- Phase distribution and solids transport control Carry-Over & Carry-Under.

Why CMFD?

- Can simulate flow patterns and phase distributions in manifolds and splits
- Help understand solid particle preferential concentration and distribution in the conduits.

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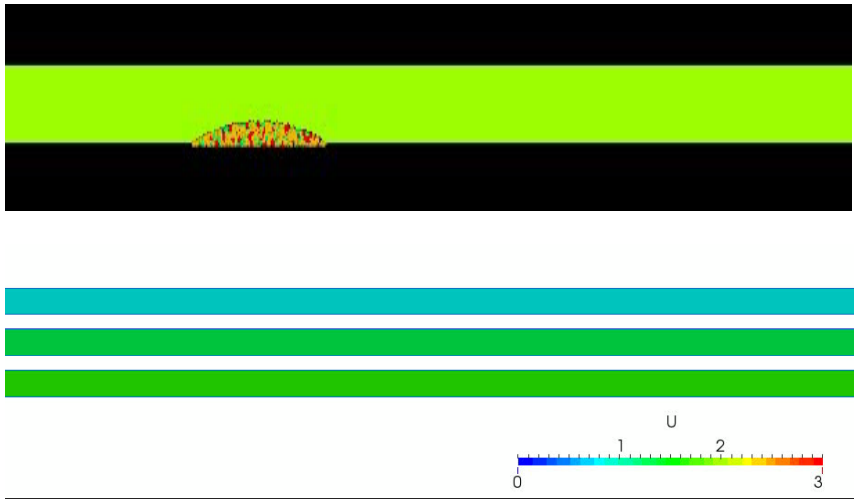
Black powder in gas pipelines

- Black powder causes blockage of gas pipelines, interrupting the flow assurance, and may lead to accidental releases of toxic materials in the atmosphere.

Why CMFD?

- Simulate flow details, including critical/threshold flow velocity for powder build up and removal,
- Intervene where simplified 1D models fail to predict,
- Help prevent costly production disruptions with black powder slugging & pipe blocking.

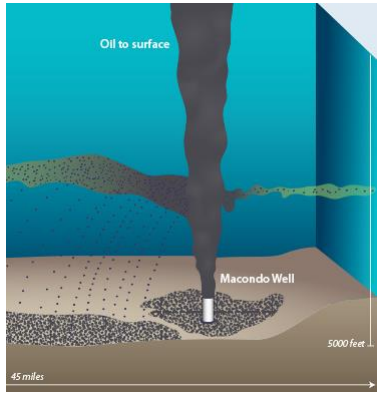


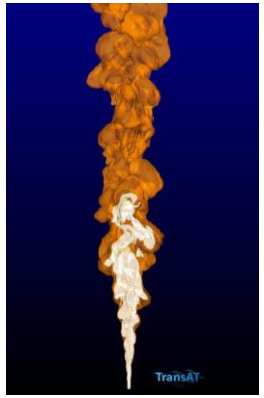
Subsea oil blow out

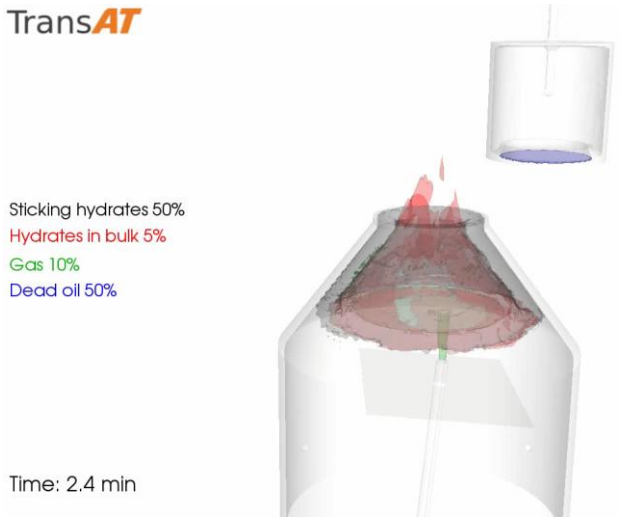
- A subsea oil spill can cause irreversible environmental damages, with high costs ($ billions) and litigation issues.

Why CMFD?

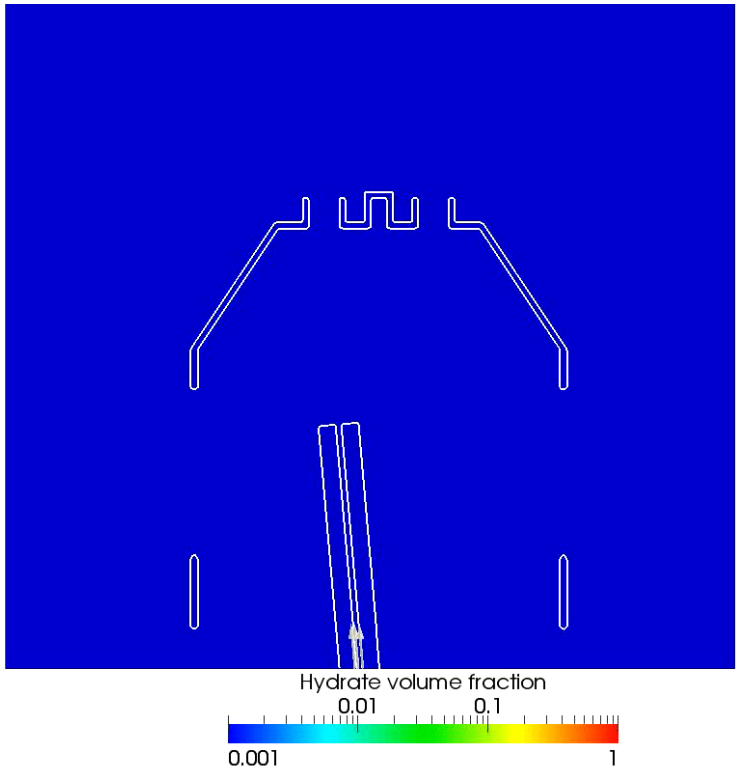
- Lesson learnt from BP spill → efforts to create a safety passive containment system
- Understand the complex subsea flow behaviour near spill
- Screen simple passive safety containment systems
- Optimize the design (incl. chem. Inhibitors injection) and robot deployment of containment.



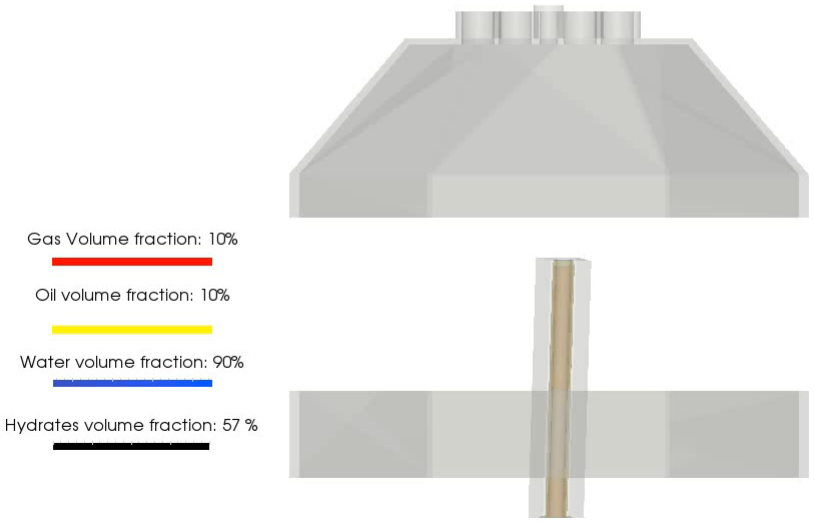


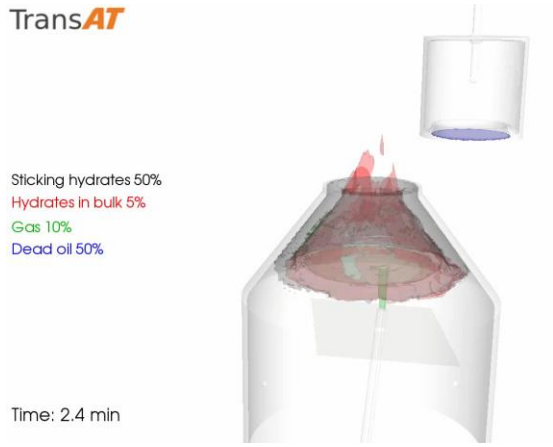


Capping the Macondo well

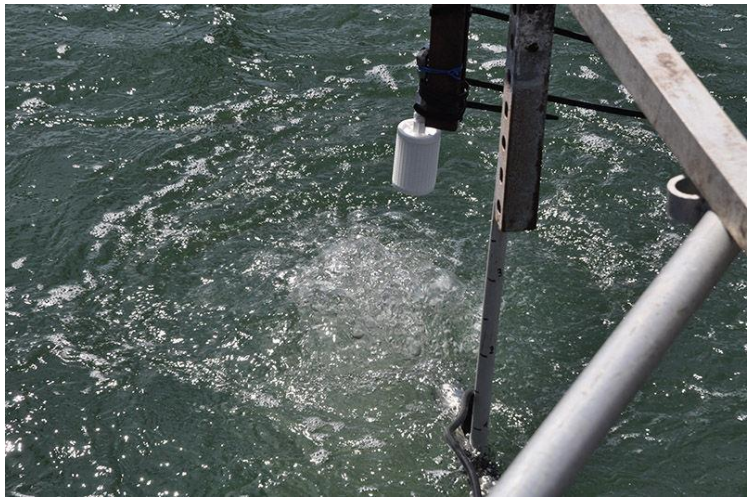


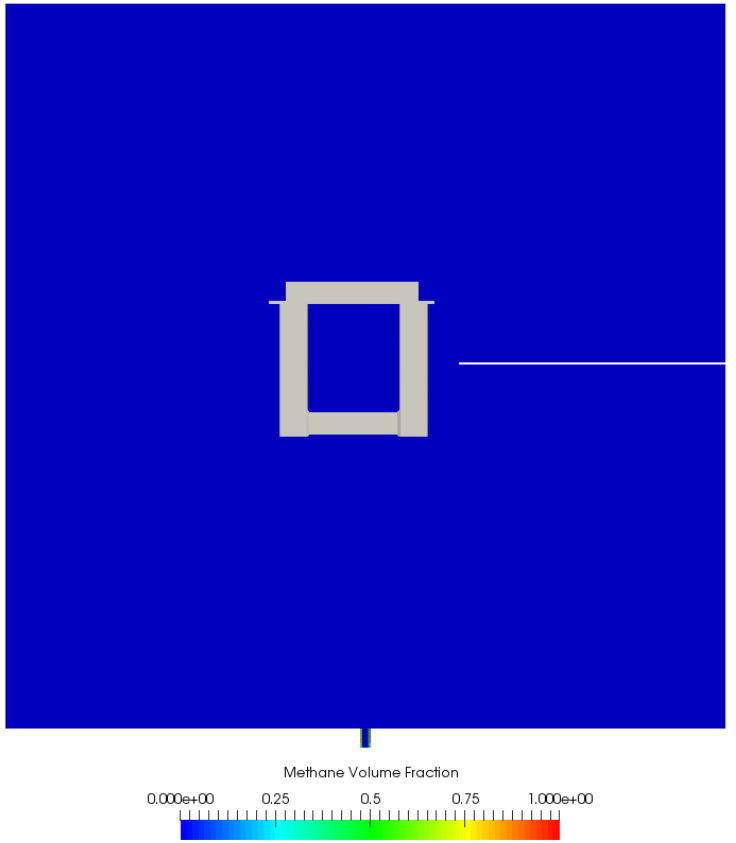
Hydrate Plugging of an under-design dome





Loss of buoyancy under floating platforms





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