



Subsea Wax Control –
Enabler for long-distance oil dominated tie-backs
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Subsea Wax Control – Enabler for long-distance oil dominated tie-backs

- Why longer tie-backs?
- Standardized, modular toolbox system
- Pre-conditioning to handle hydrates
- Wax Control System
- Qualification testing at Dusavik
- Conclusions

Enabling long tie-backs...



... replacing topside production

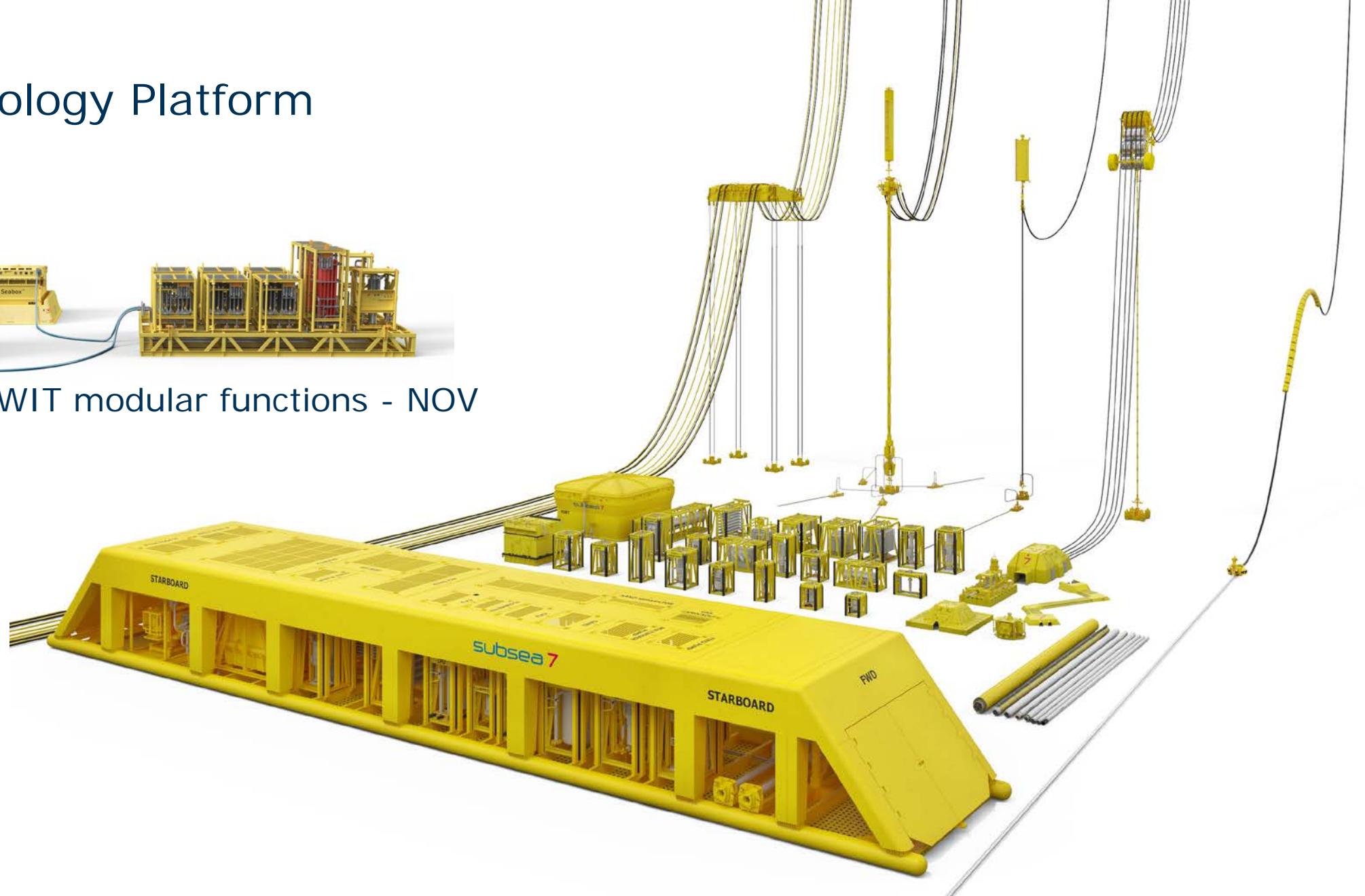
subsea 7

www.subsea7.com

Open Technology Platform



Seabox & SWIT modular functions - NOV

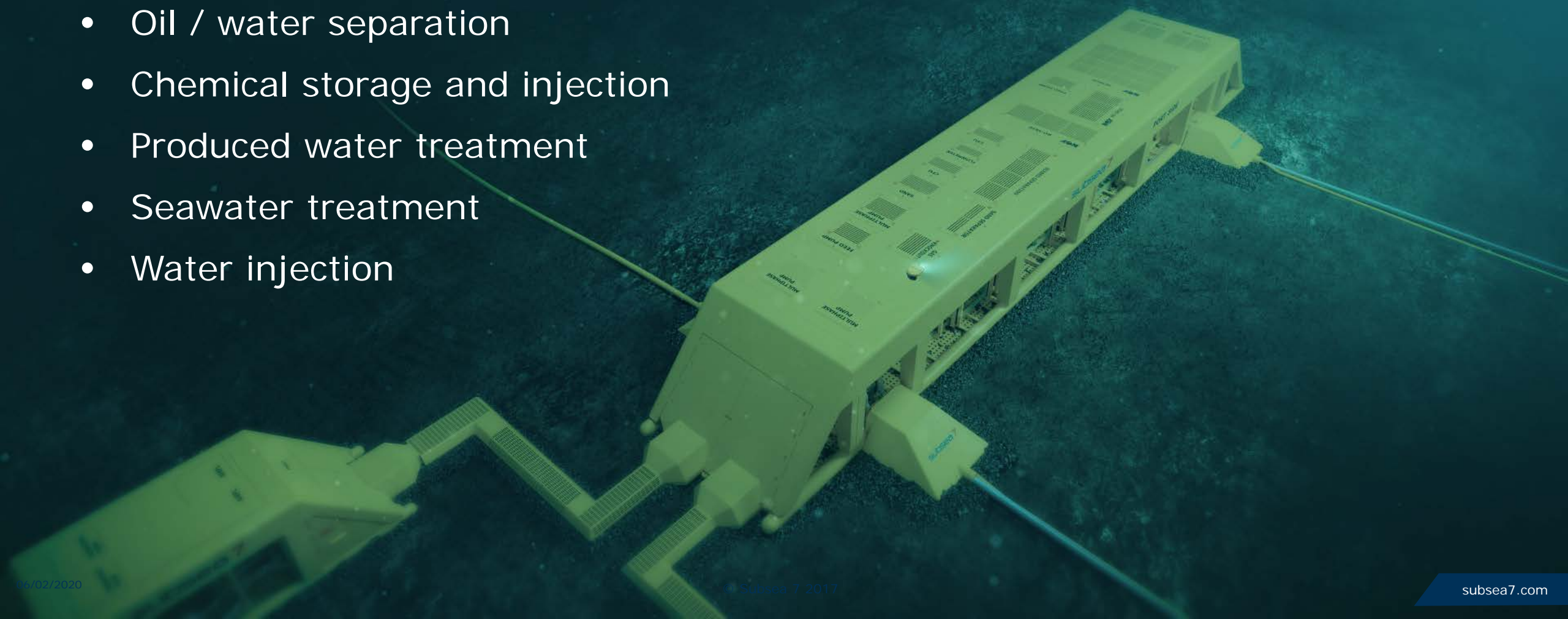


Mechanical Integration into a Towed Production System

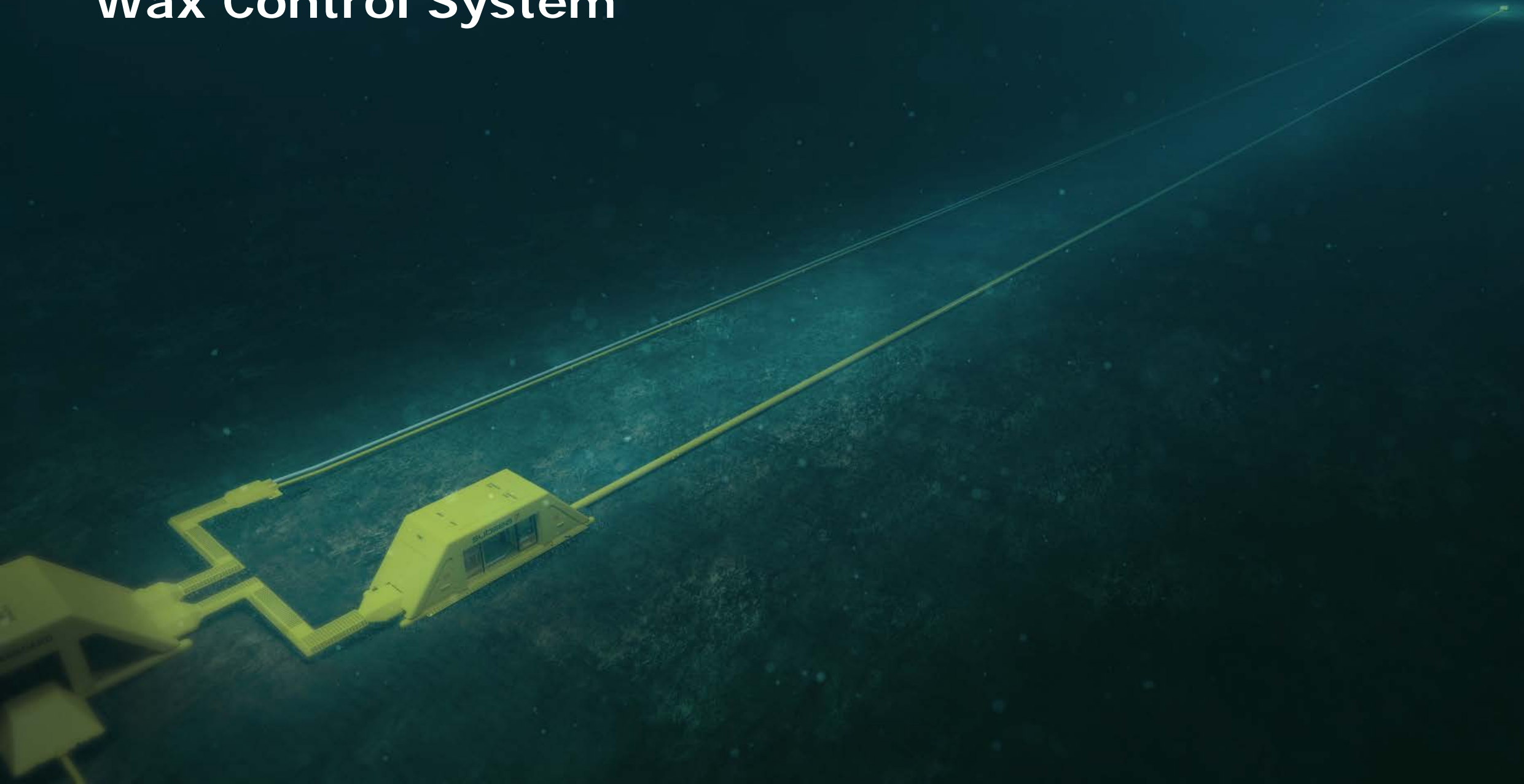


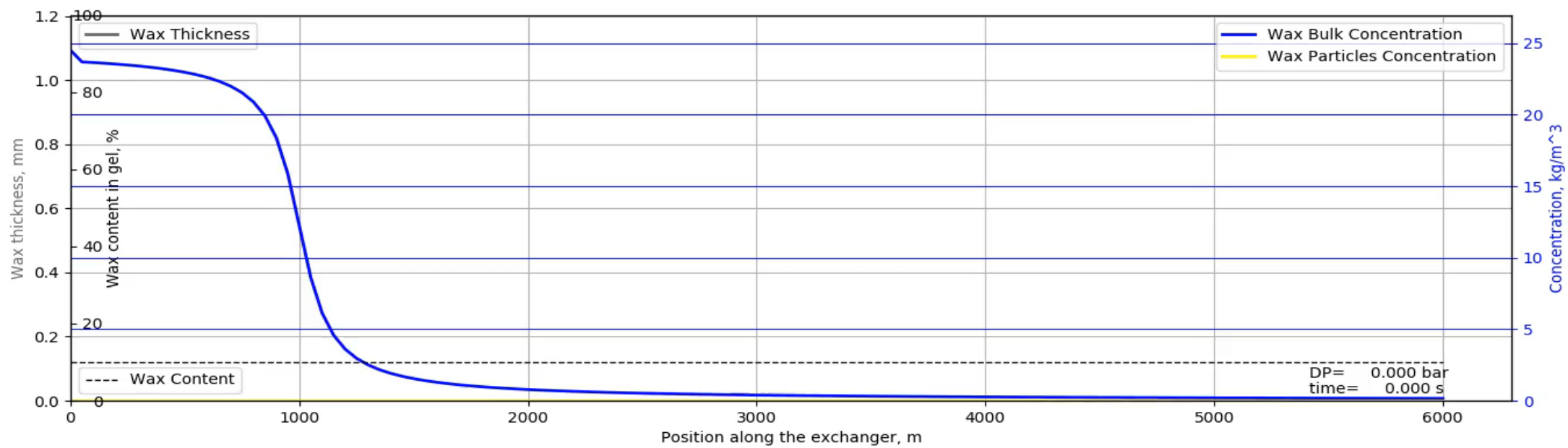
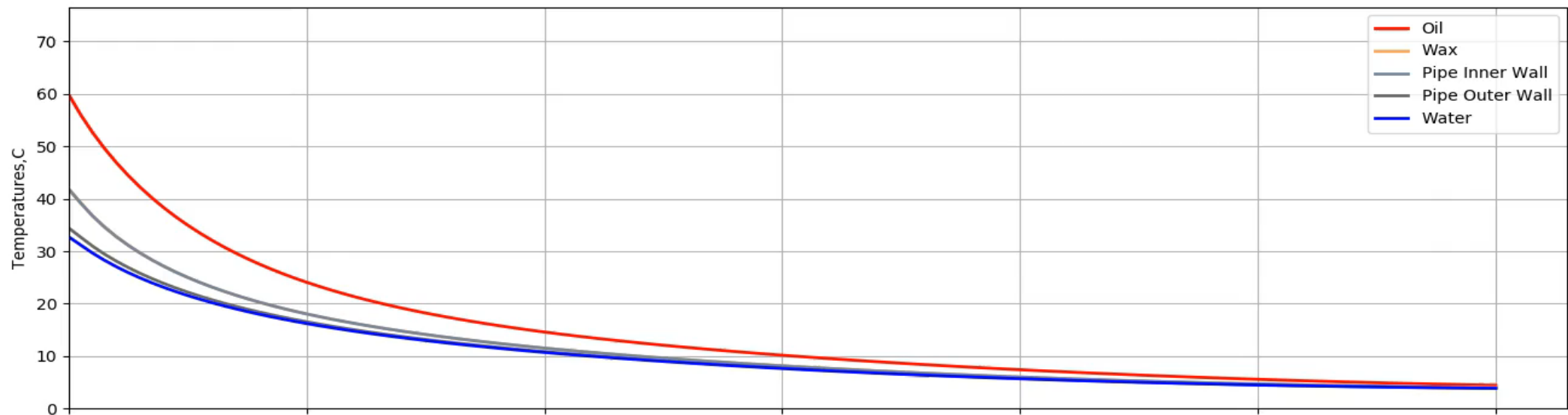
Pre-conditioning of Well Streams

- Gas / liquid separation
- Sand separation and accumulation
- Oil / water separation
- Chemical storage and injection
- Produced water treatment
- Seawater treatment
- Water injection

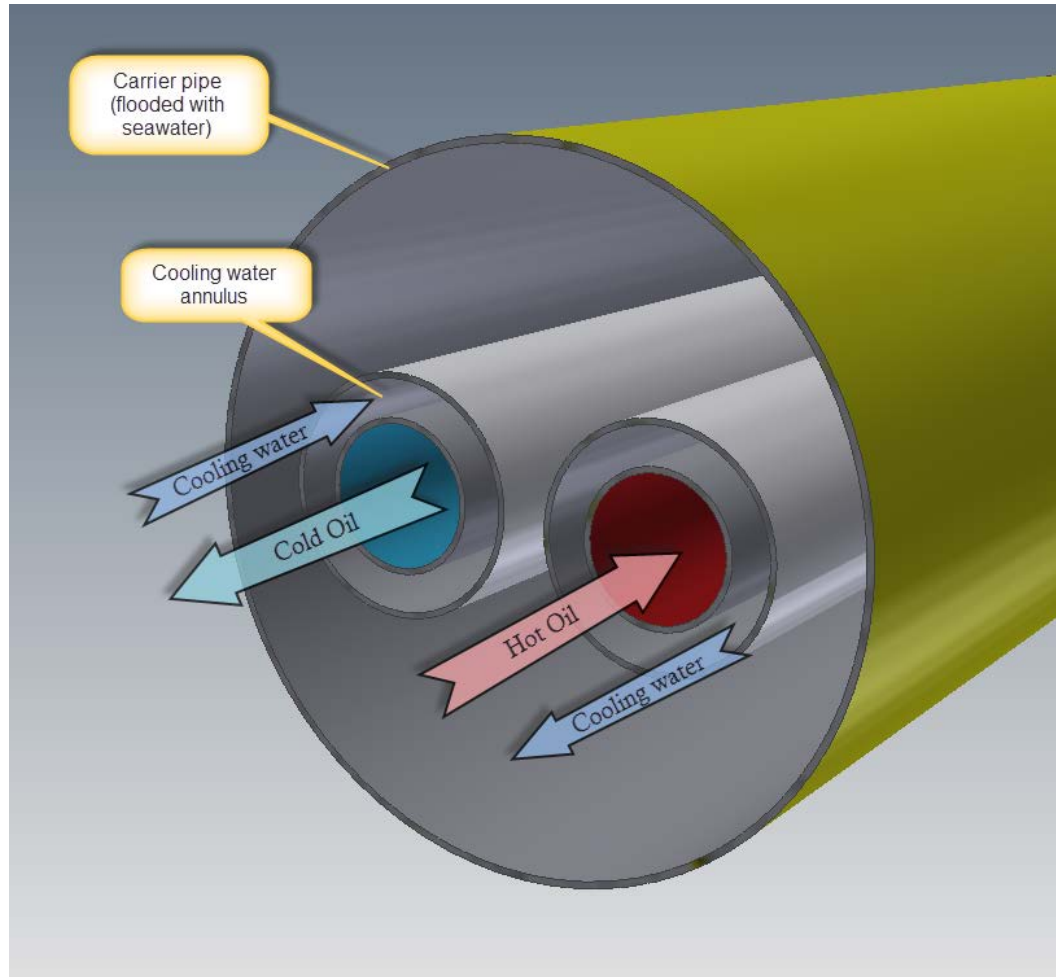


Wax Control System



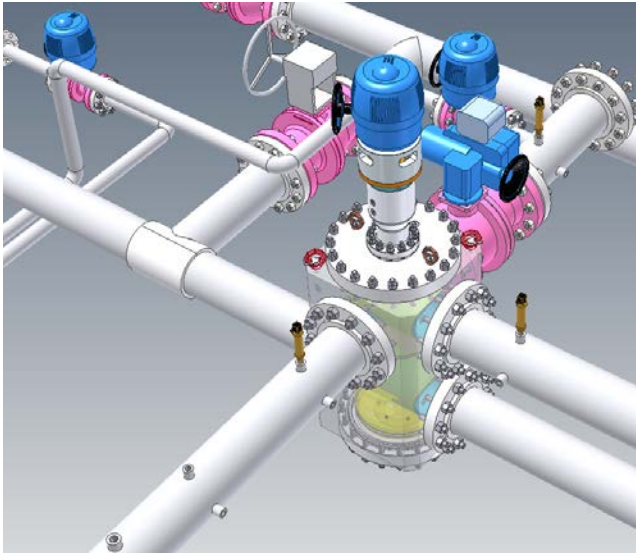


WCS – Pipeline Bundle with Pig Loop and Cooling Annulus

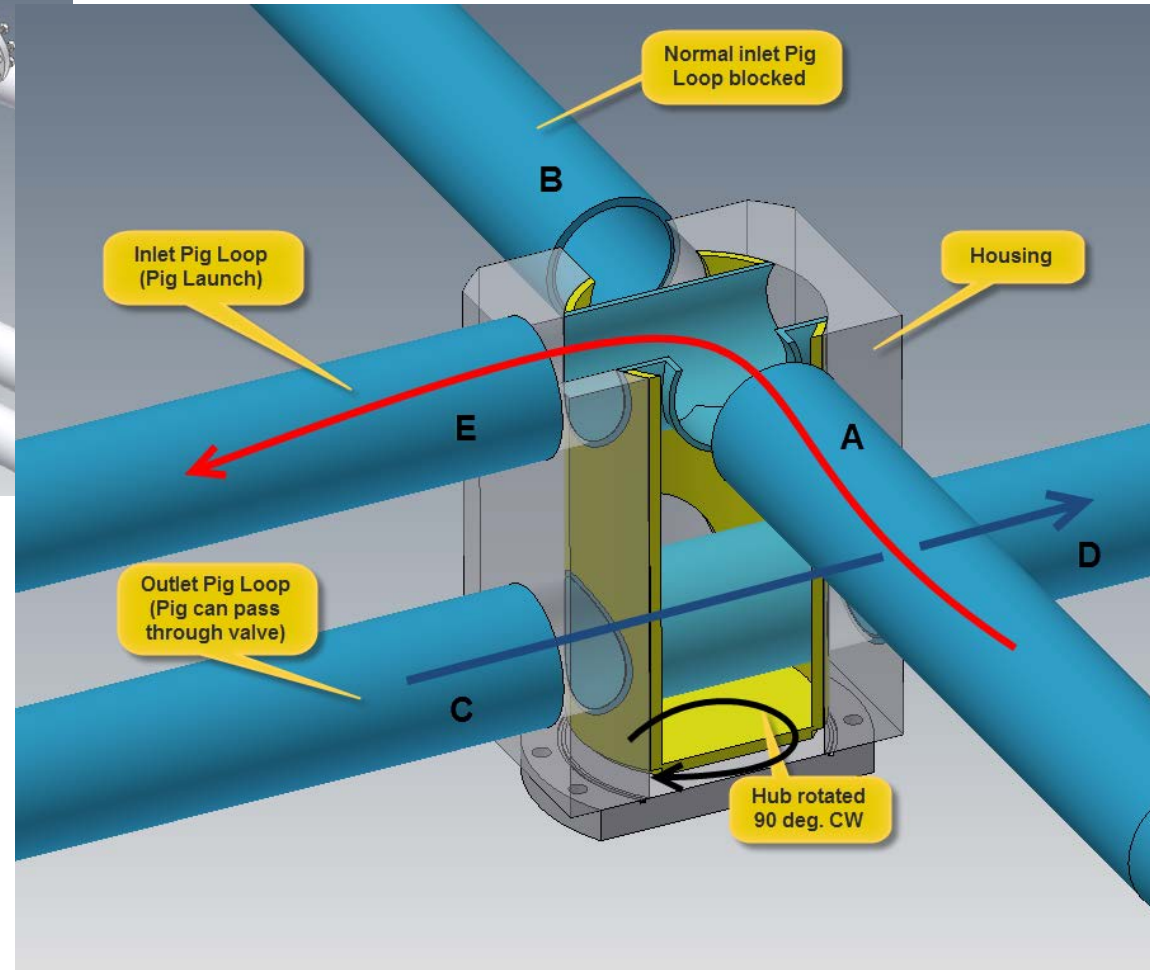


- Subsea Cooler to reduce temperature inside pipe to ambient seawater
- Seawater based cooling in annulus
- Cooling water flows counter current to the oil flow
- Wax will deposit on pipe wall below Wax Appearance Temperature
- Pig will continuously move around in the loop several times per day to scrape off wax and create a slurry inside
- Slurry will flow to export line

WCS - Flow directional Valve (FDV)

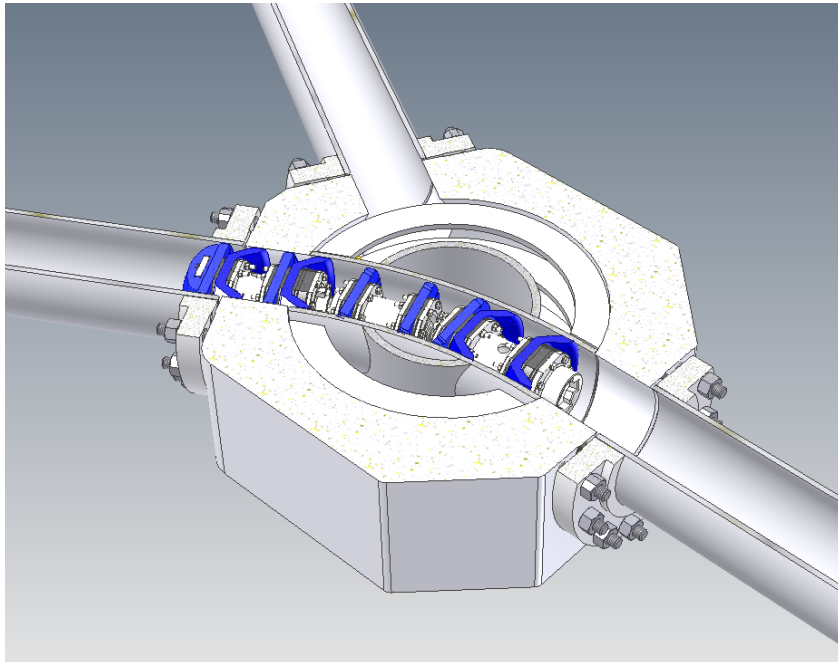
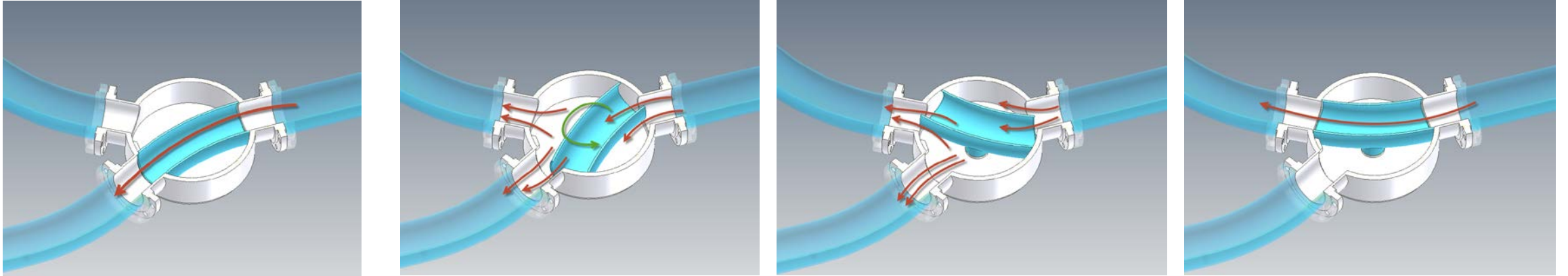


FDV in test loop



- Directs inlet and outlet flow (ref. P&ID above)
- Piggable outlet
- Actuated each time pig is bypassed
- Some leak is acceptable

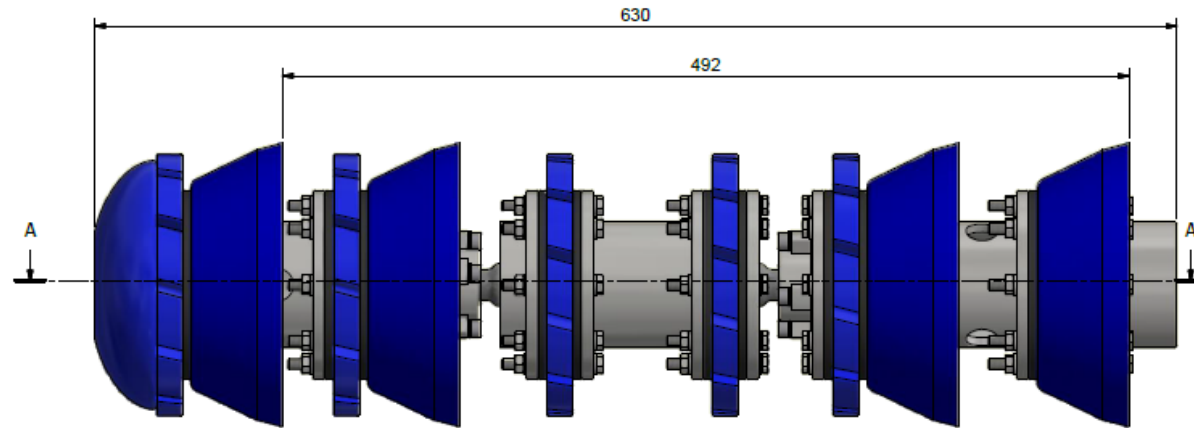
WCS-Pig Diverter



Pig Diverter in test loop

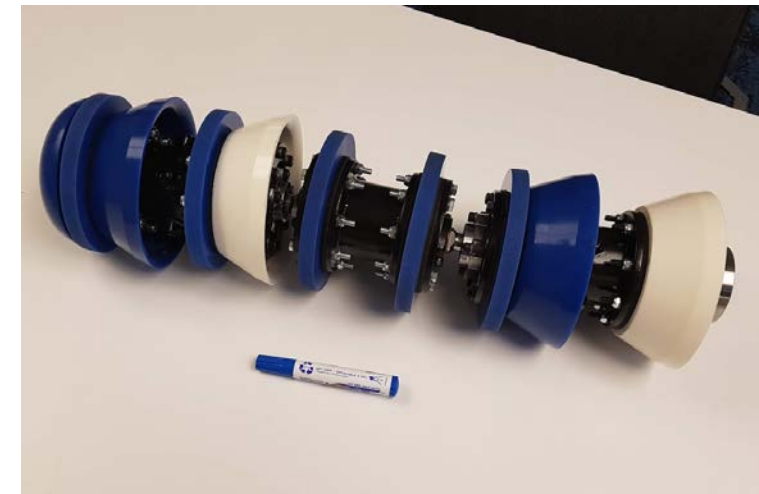
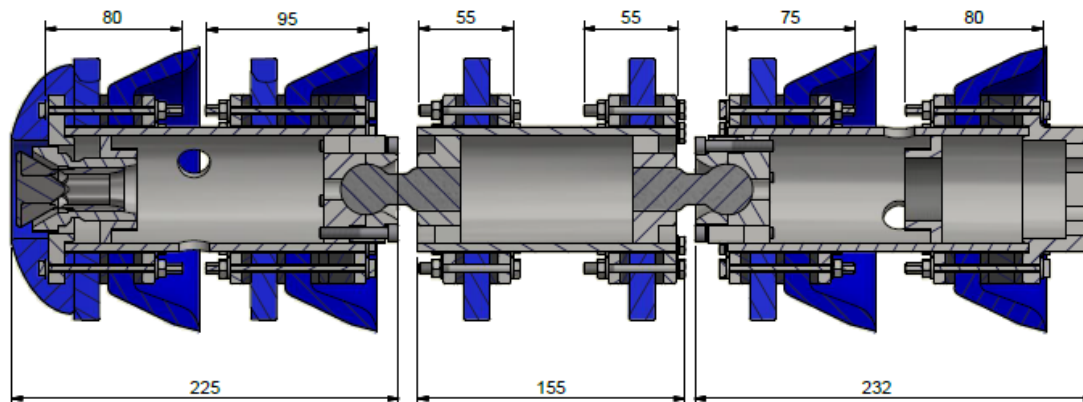
- Divert pig out of loop
- Smooth bend
- Seal off export outlet during pig launch (replace 2 off ball valves)
- Oil flow never blocked during operation
- Some leak is acceptable

Wax Control System – Qualification of long life pig

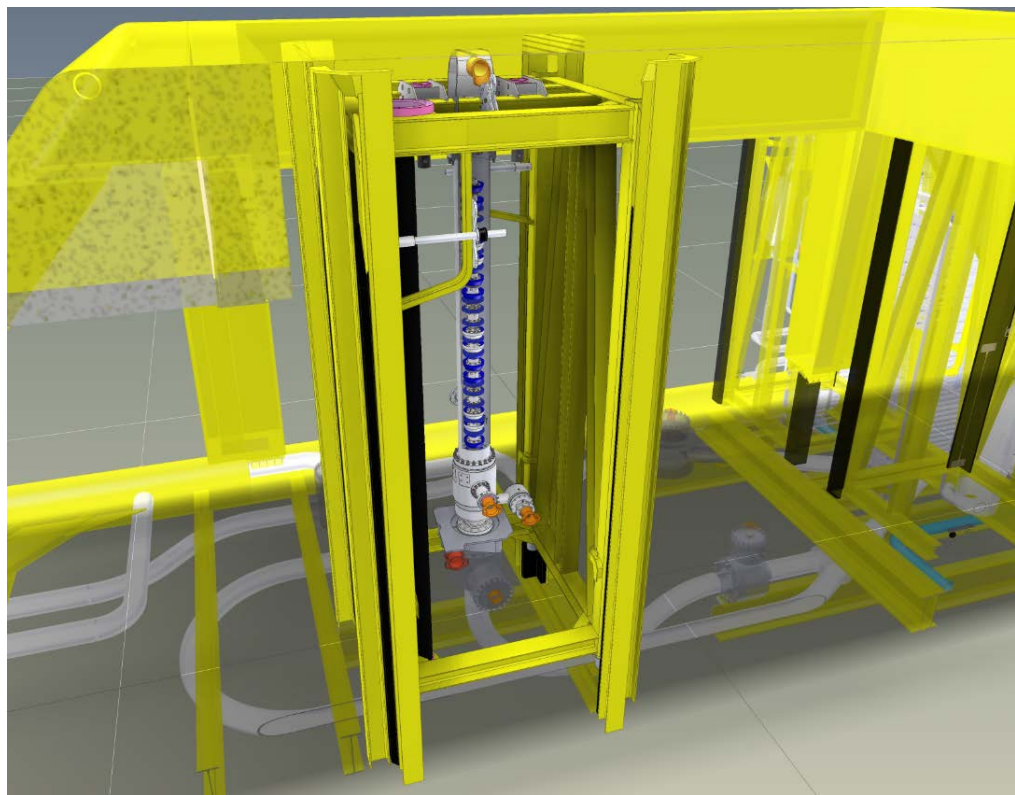


- Articulated /flexible joints
- Fixed guide plates
- Bypass to flush away wax
- Low weight in oil
- Designed for long lifetime
- Approx length = 3 x pipe ID
- IK Norway supplier

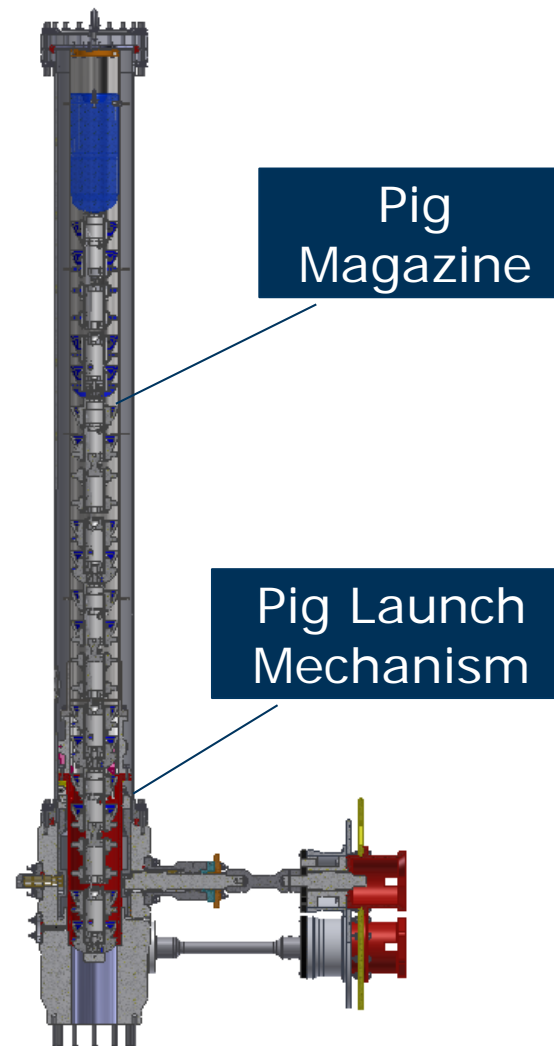
Section A-A



Automated Multiple Pig Launcher - AMPL



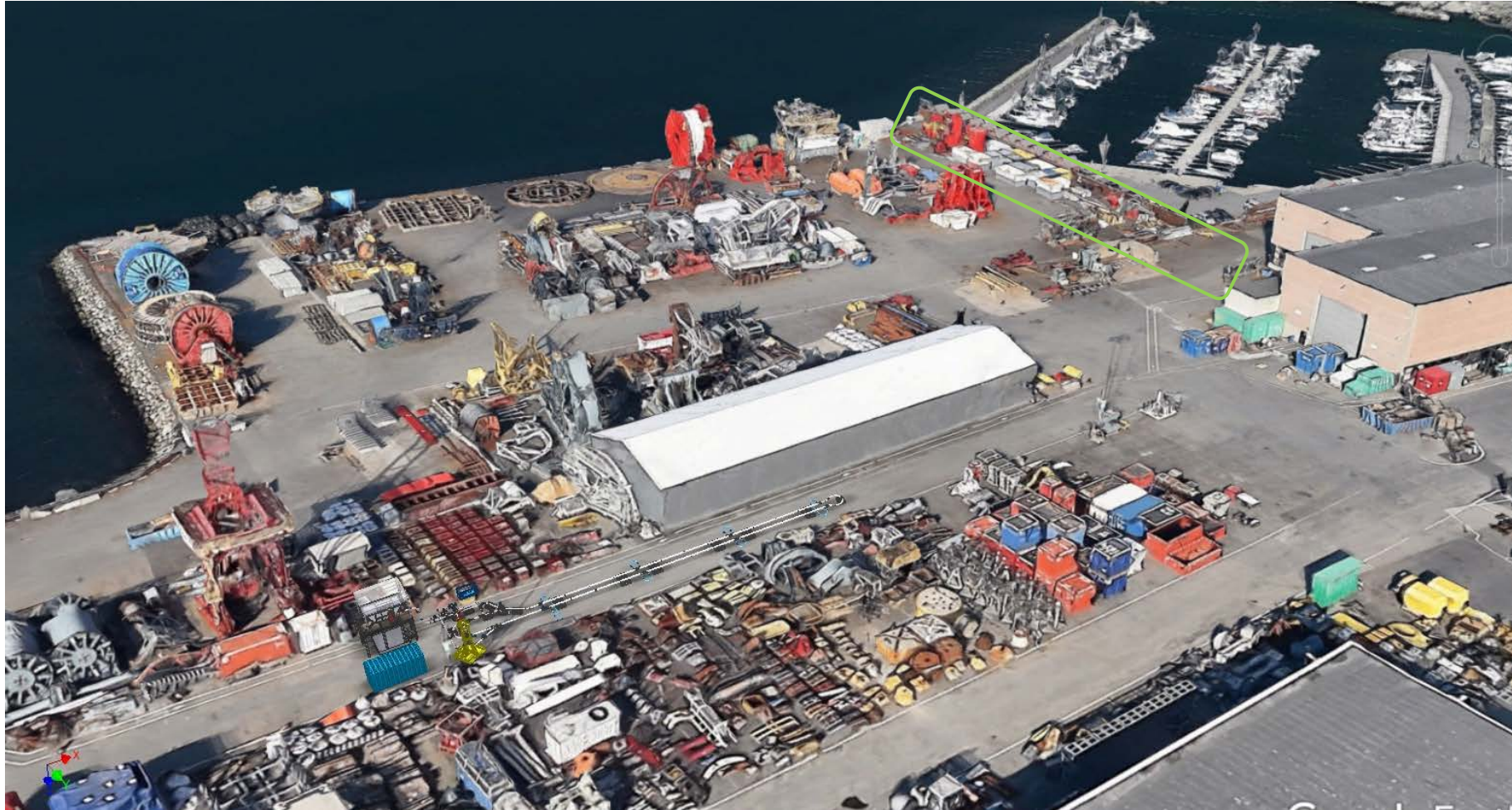
AMPL with 4 pigs in magazine



- Sufficient pig storage capacity
- Module based in TIF
- Simplified kick mechanism
- Pig Launch Mechanism can be used on larger capacity pig magazine

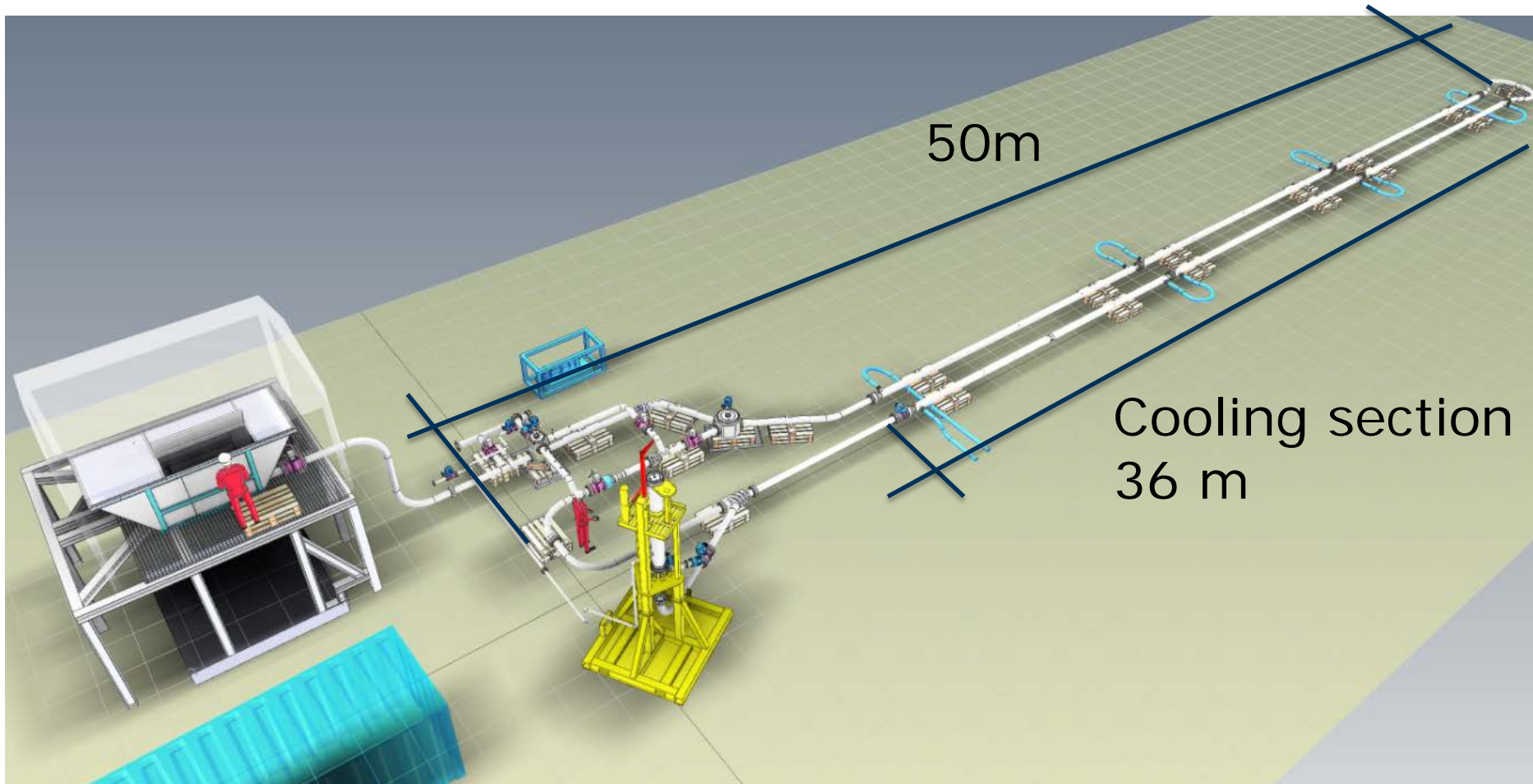
AMPL with one kick line

WCS Qualification Rig Test Site



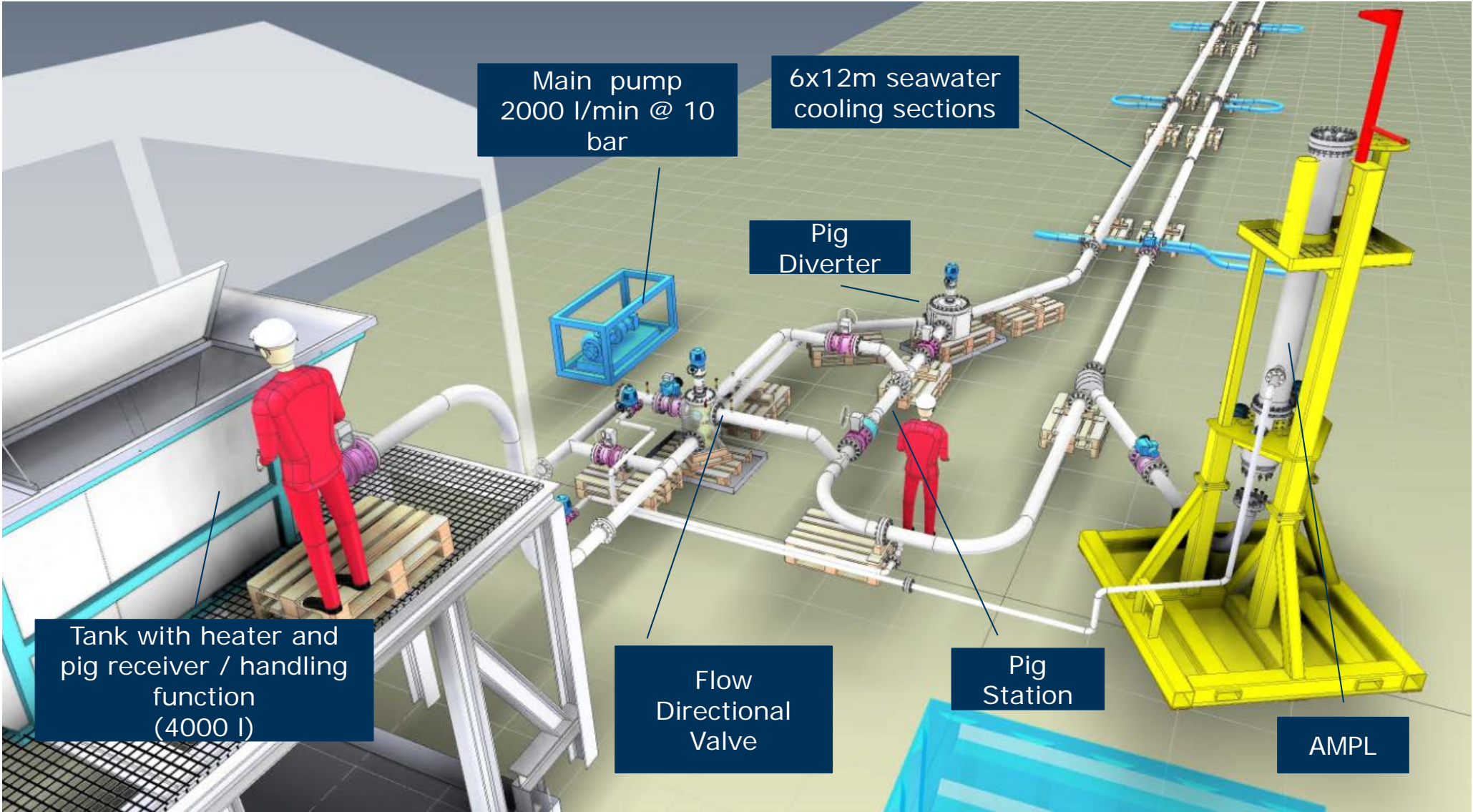
- Skilled personell with suitable know-how
- Equipment at the base, HPU, structures, etc.
- Close to Stavanger/ Forus
- Assembly of equipment finished in sept 2019
- Pre-test with water in Sept/oct 2019
- Main test with hot/ cold oil and wax from mid january 2020
- Completed by Easter

WCS Qualification Rig – Layout with main items

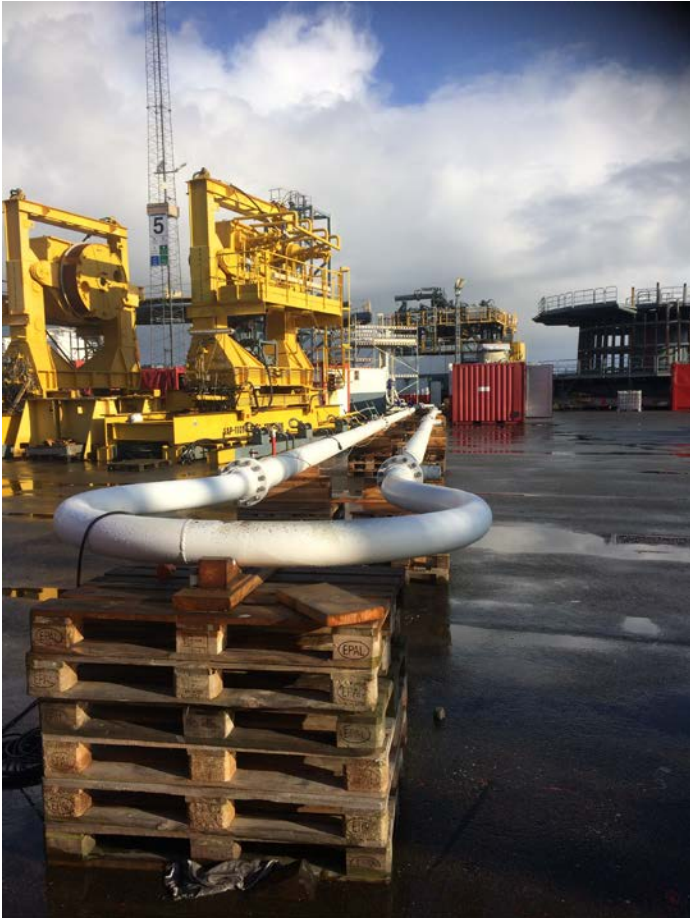


- ~120 m 6 inch pipe
- Flow velocity:
~2 m/sec
- Hot or cold oil with wax added (10%)
- Cooling water pump
1500-2000 l/min
@ 5 bar (not shown)
- Variety of ball valves,
manually or actuator
operated via control-
system

WCS Qualification Rig – Main items



WCS Qualification Rig at Dusavik



WROV Remote Piloting & Onshore Control Centre

Increase efficiency and optimize operations

Our innovative Remote Piloting and Automated Control Technology (RPACT) enables full ROV piloting via virtual connection technologies such as vessel-to-vessel radio frequency (RF), satellite/Internet, or subsea optical link.



Autonomous Inspection Vehicle

Our AIV is the most advanced, fully autonomous, hovering vehicle in the market capable of unmanned autonomous inspection of pipelines, umbilicals & risers and subsea structures.



3000m

Rated hover
capable infield
inspection vehicle

25%

reduction in
inspection costs

24

Hour endurance,
40km round trip

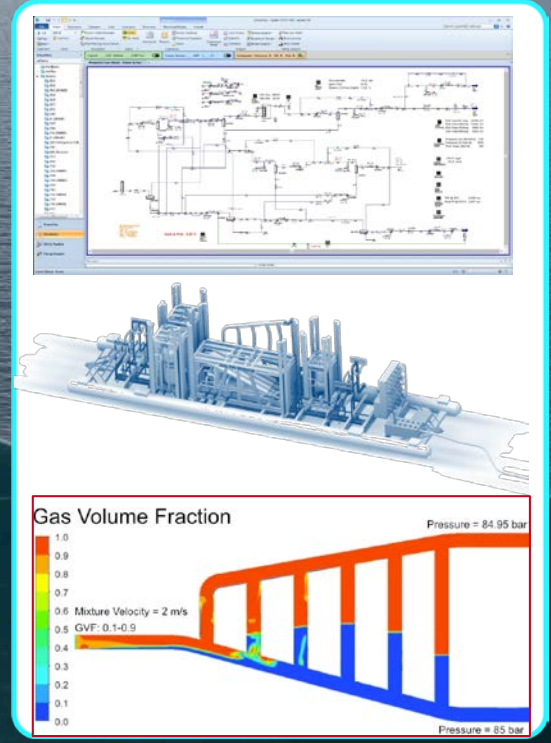
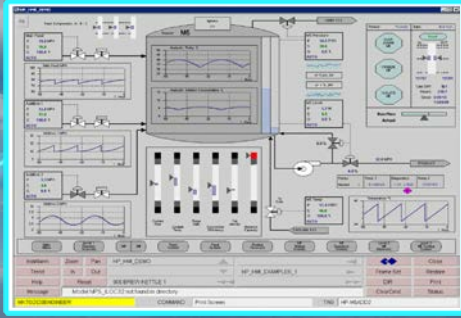
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Inspections carried
out within a single
18 hour period

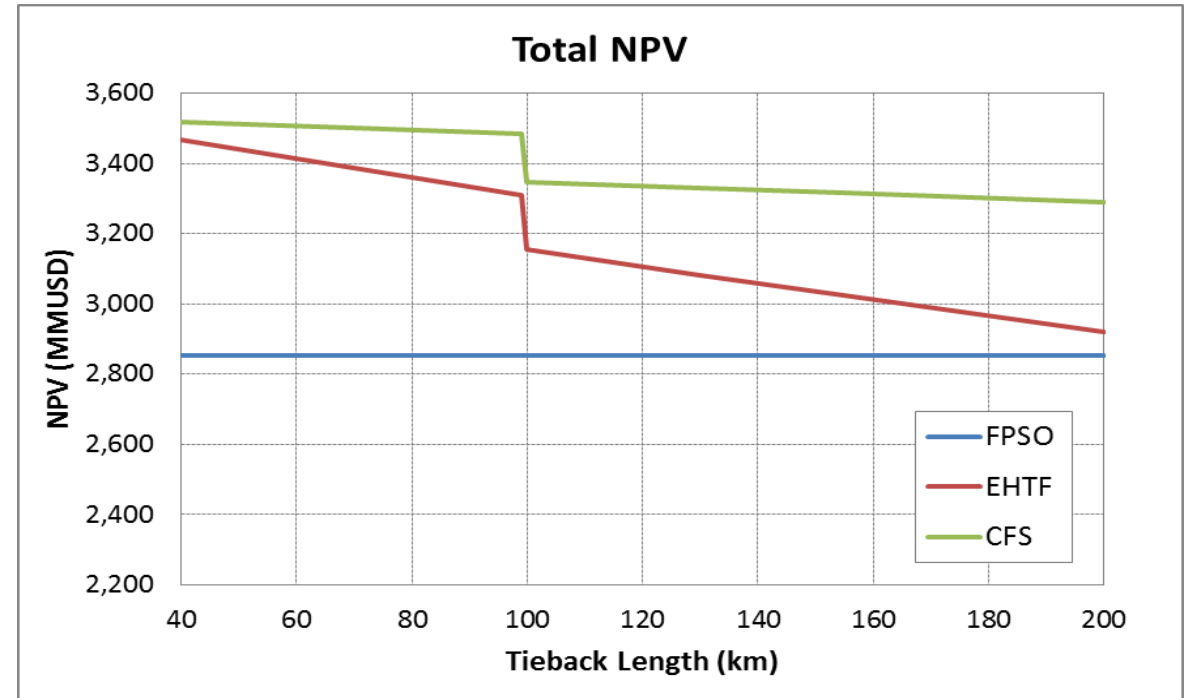
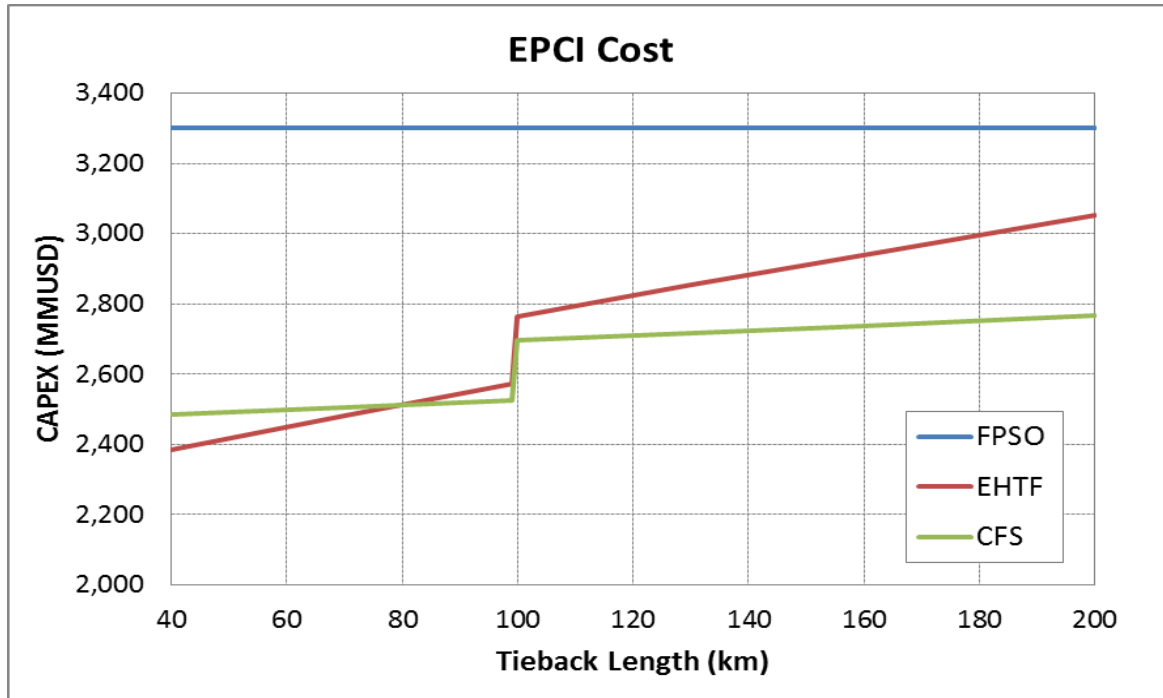
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offshore trials
completed (TRL 5)

Pre-conditioning and Wax Control

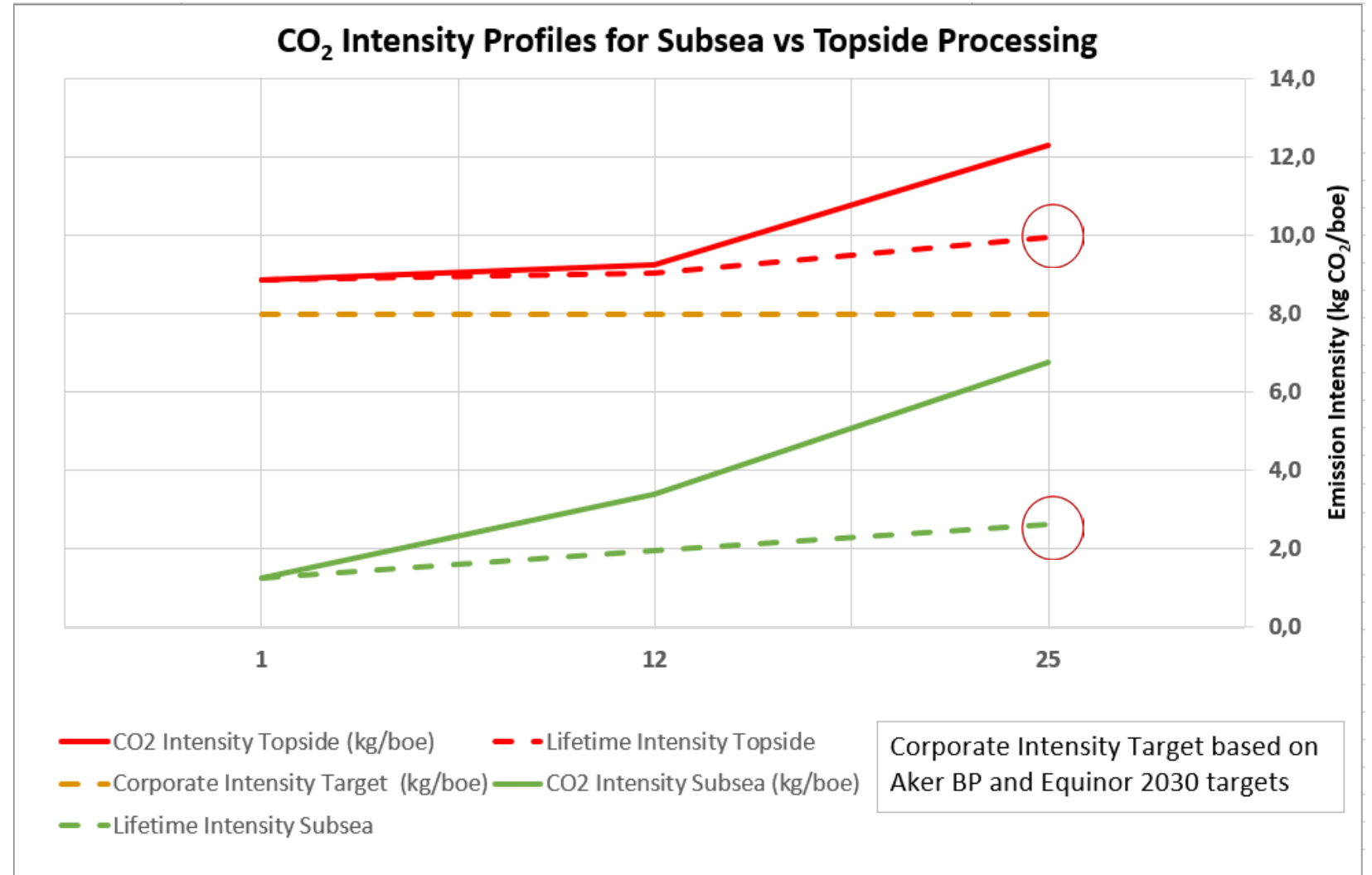


Economics of remote field developments > 50 km



Making Significant Environmental Impact

- Largely reduced amounts of chemicals
- Cleaner produced water
- Production rates at 60' 30' and 15' bbls / day
- Typical platform power consumption used (50MW).
- Water Injection for IOR started mid life.
- Lifetime intensity calculated on bbls produced and CO₂ averaged over time
- CO₂ emissions based upon electrical load



THANK YOU



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