

ENERGY
ENVIRONMENT
ECONOMY

DIRECT ELECTRICAL HEATING FLOW ASSURANCE TOOL

At Wärtsilä, we are passionate about optimising lifecycle value by offering precisely what each of our customers need. We can deliver on this promise because we provide integrated solutions, products and services for every phase of oil and gas exploration, production, transportation and refining worldwide – both onshore and offshore.

Even though this brochure is just a beginning to learn why we are involved in bringing more than 5 million barrels per day to the market, which is more than 6% of the total world oil production, it still demonstrates how we are able to customise our comprehensive offering in order to give customers a crucial competitive edge. Whatever the conditions, we deliver world-class efficiency, fuel flexibility and environmentally sound solutions.

In subsea flow lines, water content in the line can form ice-like structures called hydrate plugs. Wax appearance in flow lines is also a common flow assurance issue. Hydrates and wax appearance can reduce or stop oil production for weeks; therefore preventing the formation of these in pipelines is of major importance to the oil and gas industry. The traditional method for avoiding wax formations is by using chemicals.

Direct Electric Heating (DEH) is based on using the thermally insulated flow line as part of the electric circuit, and allowing the electrical losses to heat and keep the pipeline and its content above the critical temperatures. This is a cost efficient and environmentally sustainable flow assurance method that replaces the use of chemicals. DEH will also increase the process plant efficiency after planned or unplanned production stops.

With the DEH system, asset owners are able to:

- Remove or reduce storage and delivery requirements of anti-freeze chemical and infrastructure/piping
- Enable single flow lines without circulation possibilities
- Enable marginal fields, or fields with heavy or waxy oil, to be profitable even if DEH is required continuously
- Extend the lifetime of the field by managing water cuts during tail production
- Improve process plant efficiency through increased arrival temperature and remove/minimize the requirements for removal of solvents during start-up
- Reduce CAPEX and OPEX.

EXPERT SUPPORT FROM FEED TO START-UP

The Wärtsilä DEH solution includes:

- FEED studies
- Power system analysis
- Topside system design to meet subsea power requirements
- Customized topside package
- Project execution
- Pre-commissioning/commissioning and start-up assistance.

PROVEN TECHNOLOGY

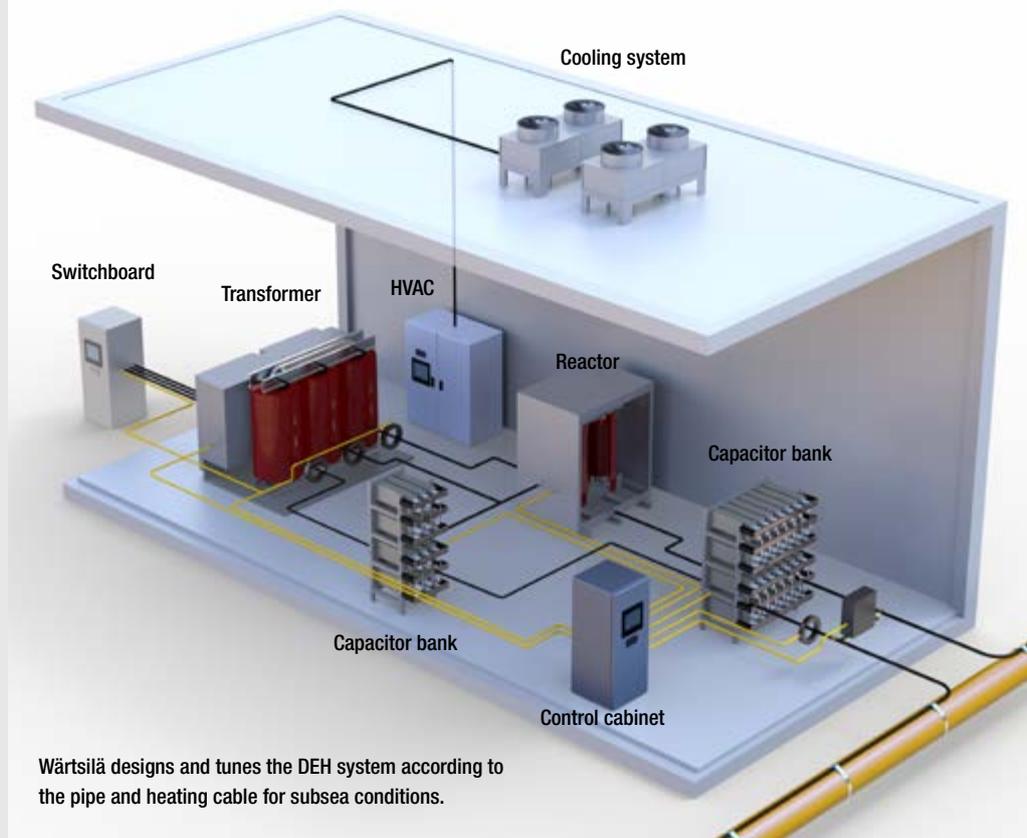
Today, DEH is a mature technology that has been in use since year 2000. Wärtsilä DEH is also being used in West African installations. Wärtsilä has participated in the development of Wärtsilä DEH since the nineties, and today undertakes the design and supply of the complete topside Wärtsilä DEH package.

REFERENCES

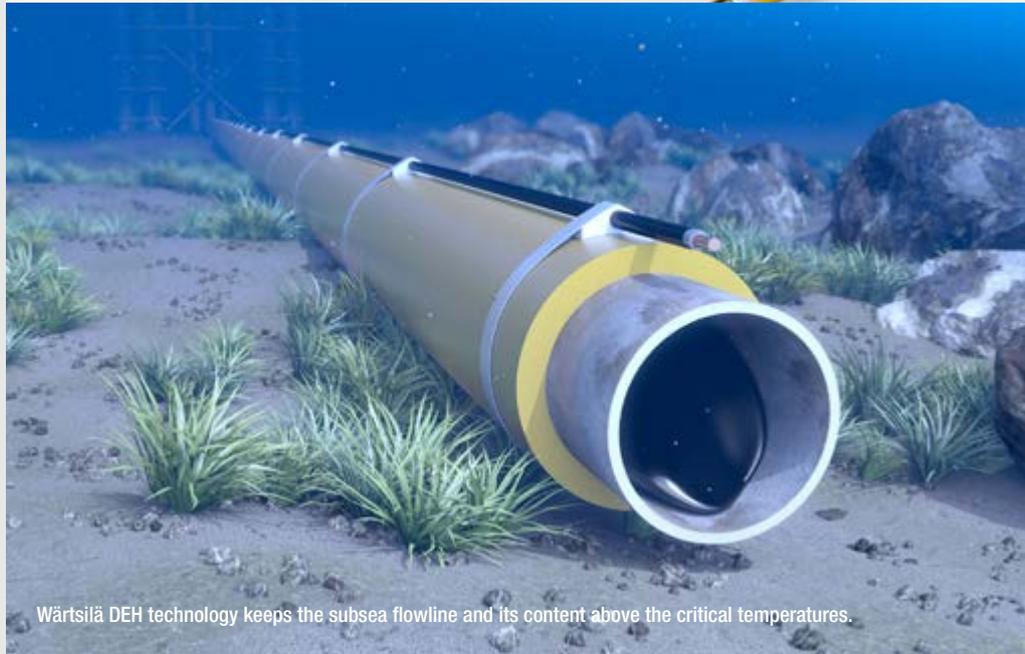
Wärtsilä has delivered 21 out of the 24 topside DEH systems installed in the world. The power ranges from 1 MW to 11 MW for pipelines, 4 km to 42 km:

- Åsgard platform, 6 pipelines (Statoil, Norway)
- Huldra platform, 1 pipeline (Statoil, Norway)
- Kristin platform, 6 pipelines (Statoil, Norway)
- Norne FPSO, 2 pipelines (URD and ALVE) (Statoil Norway)
- Kristin platform Tyrihans field, (Statoil Norway) 1 pipeline of 42 km, >10MW

Wärtsilä DEH is also being used in West African installations.



Wärtsilä designs and tunes the DEH system according to the pipe and heating cable for subsea conditions.



Wärtsilä DEH technology keeps the subsea flowline and its content above the critical temperatures.

MAIN DATA

Typical current range	~ 700A up to 1600A from topside (depends on project specific requirements)
Typical voltage range	~ 2–3 kV up to 26kV (depends on the length of the pipeline equipped with DEH)
Typical power range	~ 1000–12000kW
Typical pipe length	~ 4–50 km (DEH for longer pipelines is under development)