Direct Electrical Heating
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Direct electrical heating (DEH) is a flow assurance technology developed to safeguard the well stream through the pipeline to the platform. The pipe is heated by running alternating current through the steel in the pipe. Nexans pioneered the development of this technology in cooperation with Statoil and SINTEF more than 20 years ago, and has been the worldwide leader in DEH systems ever since.

DEH allows continuous operation of the production system and can be turned on when required.

Proven technology
Direct Electrical Heating has successfully been installed at a number of fields in the Norwegian Sea.
The DEH system comprises DEH riser cable, Armoured Feeder Cable, DEH Piggyback Cable with Integrated Protection System (IPS), and associated mechanical accessories.

The challenge
Modern oil installations typically have multiple wells tied back to a single floating structure, strategically located near the wells.
The oil/gas exits the well at high temperature and high pressure, and must be kept warm in its natural form to prevent hydrates or wax from clogging up the pipeline. Pipelines are therefore thermally insulated to ensure flow during normal production.
There can be many kilometres between the well and the platform, leading to heat loss in the oil/gas. In the event of production shutdown, the product in the pipeline will cool over time. This can lead to the formation of wax or hydrate plugs when the temperature drops below a critical level. This will in effect render the pipeline useless.

The Solution

Direct Electrical Heating System
Direct electrical heating (DEH) is a complete technical solution for heating pipelines, eliminating the problems associated with plug formation.

DEH Riser Cable
The Riser Cable supplies power from the platform down to the sea bed. It can be designed for one or more systems and may include hydraulic tubes and signal cables. The cable is designed, produced and tested by Nexans.

Armoured Feeder Cable
The Armoured Feeder Cable connects the DEH Riser Cable to the pipeline and to the Piggyback Cable. The cable contains two conductors, one connected to the pipeline at the platform end and the other connected to the piggyback cable.

DEH Piggyback Cable
The DEH Piggyback Cable conducts current from the platform end to the well. At the well, the Piggyback Cable is connected to the pipeline and the current returns to the platform end through the steel in the pipeline in parallel with the sea water. The Piggyback Cable is strapped tightly to the pipeline to achieve maximum effect and it has an integrated fibre-optic system for continuous monitoring along the entire length.

Integrated Protection System (IPS)
The IPS surrounds the piggyback cable and protects it from external loads, such as trawl boards and abrasion.
Pioneer work in DEH development
Nexans began the development of DEH in partnership with their partners in the early 1990s. Our extensive experience in cables and equipment for the energy industry provided a basis for our system expertise.

- Through participation in technical qualification work and in the development of all systems in operation in the North Sea, Nexans has developed cables and equipment for DEH based on the special demands the technology imposes.

- The cables in a DEH system are operated in a different way than a traditional subsea cable used for power transmission. The DEH cables are subject to cyclical operation and high operating temperatures. This involves new challenges in terms of the lifetime of the insulation system. Moreover, the cable that runs along the pipeline cannot have metal screening or armouring because this reduces the efficiency of the pipe-heating system.

- There are large mechanical loads on the cable, for example from trawling and pipe movements.

- The DEH system produces a certain electrical current in the water and this must be taken into account when planning adjacent equipment, both in terms of corrosion and effects on signal cables.

- Nexans’ long experience of umbilical- and offshore cables has formed the basis for more than 15 years of development focused particularly on DEH. Cables and components are subject to different loads during installation and operation than conventional offshore products. All design, testing and production is carried out by Nexans.

References

<table>
<thead>
<tr>
<th>Project</th>
<th>Year of Installation</th>
<th>Pipeline</th>
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<tbody>
<tr>
<td>Åsgard</td>
<td>2000</td>
<td>10” 13%Cr, 6 off, 6-8.5 km</td>
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<tr>
<td>Huldra</td>
<td>2001</td>
<td>8” 13%Cr, 16 km</td>
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<tr>
<td>Kristin</td>
<td>2004</td>
<td>10” 13%Cr, 6 off, 6-6.7 km</td>
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<tr>
<td>Urd</td>
<td>2005</td>
<td>12.5” Carbon steel with Clad, 9 km</td>
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<tr>
<td>Ormen Lange</td>
<td>2006*</td>
<td>30” Carbon, 2 off, 20 km</td>
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<tr>
<td>Tyrhians</td>
<td>2007/8</td>
<td>16 and 18” Carbon steel with Clad, 42 km</td>
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<tr>
<td>Morvin</td>
<td>2008/9</td>
<td>10.5” 13%Cr, 20 km</td>
</tr>
<tr>
<td>Alve</td>
<td>2008</td>
<td>12” Carbon steel with Clad, 16 km</td>
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<tr>
<td>Skarv</td>
<td>2010/11</td>
<td>12” Carbon with Clad, 13 km</td>
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<tr>
<td>Skuld</td>
<td>2012</td>
<td>12/14” Carbon with Clad, 25 km (approx)</td>
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Nexans Norway AS is a leading supplier of power, telecommunications, installations and heating cables in Norway, and is among the world’s leading manufacturers of offshore control cables and high-voltage submarine cables. The company’s head office is in Oslo, and it has manufacturing plants at Rognan, Namsos, Langhus, Karmøy and Halden. The company has approx. 1,360 employees.

More information on www.nexans.no.