

New "engineer app" rescues flexible pipes

New Norwegian technology detects weaknesses in flexible pipes.

When flexible pipelines were introduced to the oil industry, suppliers promised that you could just "Get it and forget it." In other words, it was supposed to be virtually maintenance-free equipment which would last for many years.

Real world experience turned out to be another story. However, the wear and tear that actually occurred has inspired the development of a predictive maintenance solution. This means collecting and analyzing operational data and using it to predict the need for repairs and replacements. The practical goal is to avoid replacing costly parts before it is needed.

Shell has been the guinea pig for Flextrack, a system resulting from the collaboration between the subsea service company 4Subsea in Asker and the IT company Puzzlepart in Oslo. The solution estimates and monitors the life expectancy of flexible pipes. Flexible pipes are used to transport oil and gas between subsea installations and floating production units.

OVERVIEW MISSING

During the last five years, Shell has piloted the Norwegian solution in the Draugen oil field, where there are 60 flexible risers and flowlines in use.

"The problem was that we had an inadequate overview of the condition of the flexibles," explains senior subsea engineer Arild Nybø with Shell. Like all other companies, Shell experienced that flexible lines did not last as expected because they were subject to continuous loads from pressure variations, extreme temperatures, internal fluids and conditions on the seabed.

"We collect operational data, but they are captured by different systems that do not always communicate so well together," says Nybø to TU.

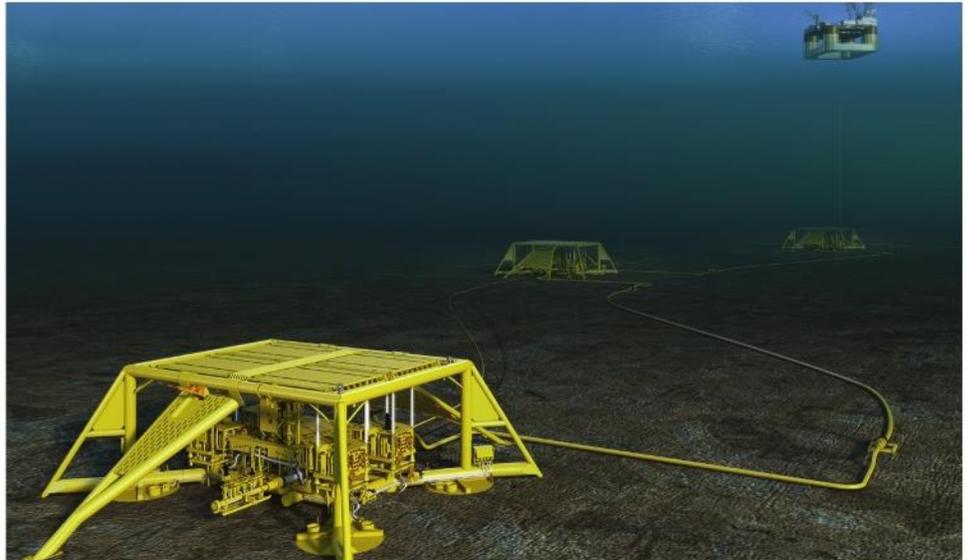
Shell held a tender competition to obtain an overview of the data and assessment of the condition and life expectancy of the risers and flowlines. The two small companies secured the contract in a category of solutions called "integrity management".

"What we do is collect all operational data in order to analyze it, both through standardized analysis programs and our own more customized solutions," explains project manager Øyvind Tveit in 4Subsea.

One of the headaches has been to maintain continuity in the measurement data for a flexible line. The sensors that detect pressure and temperature are mounted on each subsea installation or "template." However, the same flexible line can be used in several of these templates. When a flexible line is disconnected from one template and attached to another, the chain of measurement data is broken.

"In this solution we have gathered these separate data series together to get the full history and see what the riser or flowline is exposed to during its lifetime. Then we calculate the life expectancy of each riser," says Tveit. If the riser is damaged or exposed to high temperatures, the consequences can be calculated.

"Previously, these kinds of assessments were based on gut feeling and often led to replacing equipment more often than needed," says the project manager.



Analysis: Wear on the flexible pipe offshore has been difficult to determine, but two specialist companies, in collaboration with Shell have developed an analysis tool that calculates remaining service life. The image is an illustration of a typical installation from the Vega field. PHOTO: STATOIL

BUILT-IN EXPERTISE

The solution makes use of the standard collaboration tool SharePoint, already widely used in the offshore sector.

"We developed Flextrack as an app in SharePoint so that it would be easier for Shell's engineers to use, since they are familiar with the user interface," says Puzzlepart's project manager Andreas Eide. Everyone can contribute with data, reports and documentation, which are fed into Flextrack.

The engineers cannot press a button to get a life expectancy calculation, and there is no alarm if an emergency situation arises in a riser.

However, it they ask for a condition assessment the solution runs a number of analyses - some by itself and many under the direction of 4 Subsea. "The answer" comes up in the app.

"In this solution we have access to technical information and expertise when we need it, since the engineering expertise is built right into the system," says Nybø

DATA IN THE CLOUD

Sensors, documentation and video footage from inspections result in large amounts of data to be collected and processed. To avoid expensive purchases of server capacity, the data is stored in the cloud-based solution Azure from Microsoft.

"So capacity and costs can be adjusted as needed," says Eide. •

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"THIS IS NEXT GENERATION IO"

Flextrack is an example of the next generation of integrated operations in the oil and gas industry, according to experts.

"Here we use real-time data with mathematical models to predict trends in the condition of the equipment. These are issues we are spending a lot of effort on these days," says Professor Bjarne Foss at NTNU. He is the program manager at the Center for Integrated Operations.

One of his specialties is production optimization where real-time data, mathematical models and optimization are integrated to increase production and thus better utilize the capacity of existing production equipment.

Until now, IO has managed to exploit traditional IT tools such as monitoring production using real-time data and communicating with video between sea and land. The next step is to connect the flow of real-time information with mathematical models and optimization. In this way, the precision and quality of the decision support tools should be improved for operators and engineers.

Foss likes the fact that the Flextrack solution is integrated in SharePoint and stores its data in the cloud.

"We prefer to use familiar technology that has been proven effective and robust in other areas," says the professor to TU. **EZ**