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Case study: Formation Evaluation

Location: Norwegian Continental Shelf

Aligned with United Nations Sustainable Development Goals: 12—Responsible consumption and production, 13—Climate action.

Lundin Norway Efficiently Samples Pure Oil in Fractured Basement Rock

Ora intelligent wireline formation testing platform acquires clean samples despite ultralow permeability, reducing operational time and carbon emissions by 74%

Rig Time:
Saved more than 72 hours (3 days)

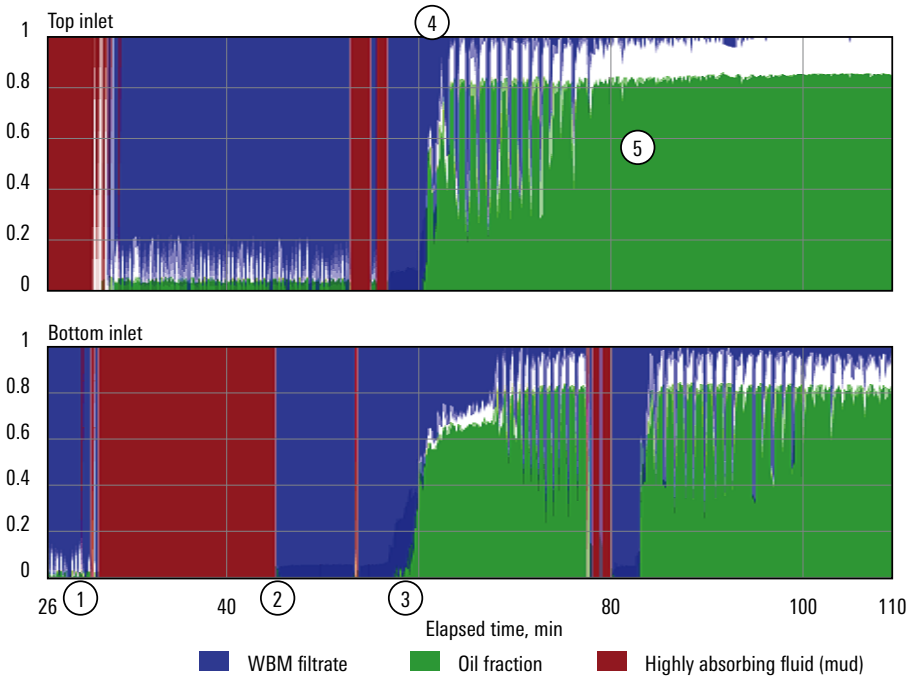
Emissions Reduction:
Reduced CO_2 emissions by 74% (420 metric tons of CO_2e)

By digitally integrating downhole automation, pumps with a wide dynamic range, and new dual-packer architecture, the Ora* intelligent wireline formation testing platform efficiently obtained pure oil samples in low-permeability fractured basement rock in less than 90 minutes on station.

Eliminate long station times and sample contamination

Extracting oil from basement rock is difficult and can take many hours before an acceptable level of contamination is achieved. Some fractures are present in Lundin Norway's targeted basement formation but are often of low conductivity. The matrix is mostly of low permeability.

A dual-packer wireline formation testing configuration is typically the toolstring of choice in this environment, but it is historically associated with long station times. Inflating the elements can take as much as 30–40 min. Then fluid contents of the borehole interval isolated between the packer elements has to be cleaned of mud and mud filtrate. Despite the resulting long station time, samples typically still have levels of immiscible contamination that significantly reduce the sample volume.

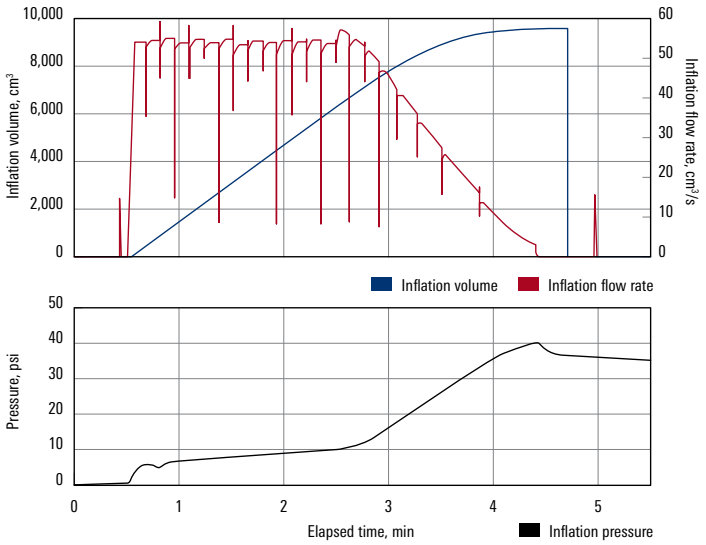


During sampling in water-based mud from the fractured basement formation, the interval is initially filled with mud. (1) After pretesting, cleanup pumping begins on flowline 2 from the bottom of the lower of the two dual inlets. (2) Filtrate appears from the bottom inlet. (3) Oil breaks though at the bottom inlet. At this point, the top inlet is in 100% oil. (4) When pumping starts on flowline 1 from the top inlet, oil is observed. (5) Pure oil flows on flowline 1 after the commingle valve is closed.

Deploy intelligent wireline formation testing platform

The new Ora wireline formation testing platform integrates high-flow-rate pumps and dual-packer architecture with downhole processing power and intertool communication that enable automation of entire workflows. This digital capability enables inflating the packer elements in as little time as 4 minutes, cutting the traditional inflation time by at least 85%. Once the interval is isolated, the pumps and dual-inlet configuration are highly effective at separating formation oil from immiscible mud filtrate, as validated by downhole fluid analysis.

Case study: Pure oil samples obtained while reducing carbon emissions, Norwegian Continental Shelf



Automatic inflation of the Ora platform's dual packer elements in the 8.5-in borehole started at 0.5-min station time at a rate of 55 cm³/s. At 2.7 min, the inflation pressure rose as the elements contacted the borehole wall. The pump rate was automatically ramped down to ease the elements against the formation. When the inflation pressure reached the user input of 400 psi, the pump stopped. While one flowline managed the inflation into the elements, the second flow line continuously equalized the interval pressure. In less than 5 min on station, the dual packer was ready for the first drawdown to be conducted.

Obtain pure fluid samples while reducing CO_2 emissions

Lundin Norway's deployment of the Ora platform with the dual-packer system was the first implementation worldwide of this configuration. Compared with the conventional wireline formation tester performance in a similar reservoir, the Ora platform saved more than 72 hours (3 days) of a deepwater semisubmersible rig, reducing CO_2 emissions by 74% (420 metric tons of CO_2e).

The platform acquired pure samples of oil with such a high level of efficiency that company representatives noted it will "definitely change the way we will approach formation testing in the future."

slb.com/Ora

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