

Measure Very Low Water Cuts Continuously at the Wellsite

Case study: PhaseSampler and PhaseWatcher installation provides accurate water-cut measurements for TCO without venting noxious gases

Challenge

Measure water cuts of less than 1% from 10 production wells in the Tengiz and Korolev fields without venting dangerous gas to the atmosphere.

Solution

Install a combination of PhaseWatcher[†] fixed multiphase well production monitoring equipment with specifically designed PhaseSampler* multiphase sampling equipment.

Results

Tested 10 wells with very low water cuts in 23 days; by not venting gases, avoided safety incidents in produced gas with 14% H₂S and 3% CO₂ content.

Two obstacles: low water cuts and noxious gases

It has traditionally been very difficult to accurately measure water-cut levels of less than 1% with multiphase meter technology. The challenge was increased in the Tengizchevroil (TCO) fields because of their 70% gas volume fraction and because the sour crude had to be sampled and measured without releasing H₂S and CO₂ into the atmosphere.

Two Schlumberger technologies applied

To gain a better understanding of well performance and to improve reservoir management, TCO relied heavily on PhaseWatcher monitoring equipment in its Tengiz and Korolev sour crude fields in western Kazakhstan.

The PhaseSampler system, installed downstream of the venturi section of the PhaseWatcher production monitoring equipment, enabled collection of oil, gas, and water samples directly from the PhaseWatcher equipment at line conditions, and it enabled measurement of water cut during production testing.



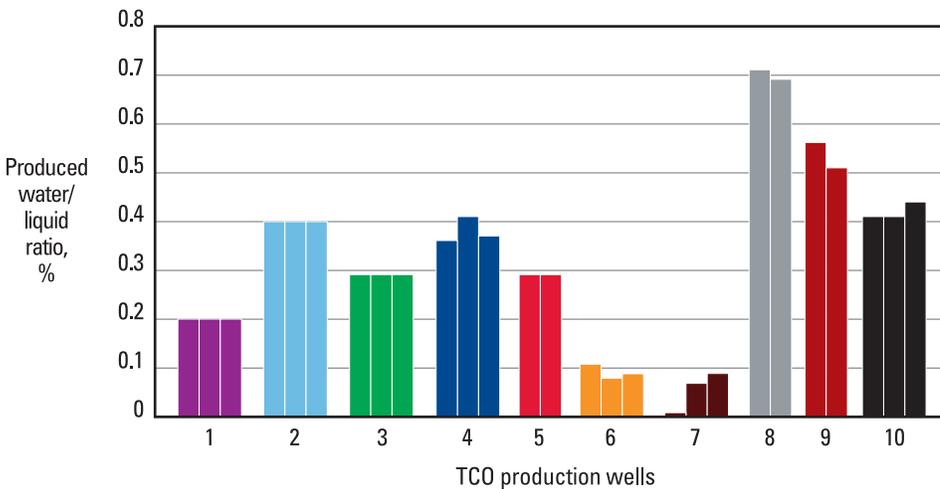
Experienced Schlumberger personnel working with PhaseSampler multiphase sampling equipment.

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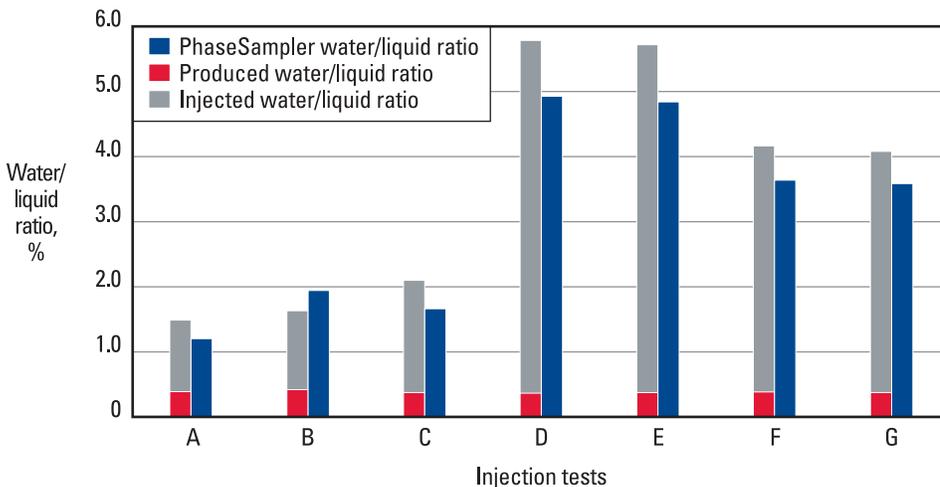
Ten wells tested and all objectives met

The PhaseSampler multiphase sampling system repeatedly provided reliable measurements of water in the production streams of the wells in the Tengiz and Korolev fields, even though the water cut was less than 1% based on oil volume at standard conditions. Test conditions included an oil gravity of 47 degree API, a temperature range of 65 to 85 degC [149 to 185 degF], a pressure range of 7 to 9 MPa [1,015 to 1,305 psi], and a gas volume fraction (GVF) of 60% to 80%.

To verify the accuracy and repeatability of the PhaseSampler measurements, TCO injected predetermined quantities of water into the flowline of one of the wells and measured the water/liquid ratios recorded by the PhaseSampler system. The data comparison demonstrated the validity of the PhaseSampler measurements; the maximum difference between the volume of water injected and the water volume measured by the PhaseSampler system was 0.77%.



Multiple PhaseSampler water-cut measurements were made at 10 different wells to demonstrate repeatability.



PhaseSampler measurements of injected water.

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