

CASE 1

Permanent tracers prove value in hot offshore well for Statoil

The Tyrihans Field offshore Norway is the largest field developed on the Norwegian Continental Shelf in recent years. It is a subsea development planned for 5 seabed templates hosting a total of 9 producers and 3 injectors. Maximizing the field production through these wells is a critical objective.

THE PRODUCING WELLS are long, horizontal wells. Field studies reveal that if lateral length can be optimized, it will have considerable positive economic effect. But extending the laterals is extremely costly. To put this in perspective, it was estimated that extending a lateral from 800m to 1800 m had the potential to add 600,000 m³ of oil, but the entire lateral had to be contributing production. Accordingly, a method was sought to monitor production to determine if the entire lateral was contributing, and further if water was coning to points along the laterals. Successful clean-up of the wells was essential, and a technique had to be implemented that could confirm a successful clean-up.

The solution was to replace sections of the pre-drilled liner with screen sections containing RESMAN tracer elements. Oil marking tracers were installed in the toe and the heel of the well (See Figure 2). Each tracer is unique so influx location can be determined. High temperature tracers with long life span were specially developed for Tyrihans so the tracers could

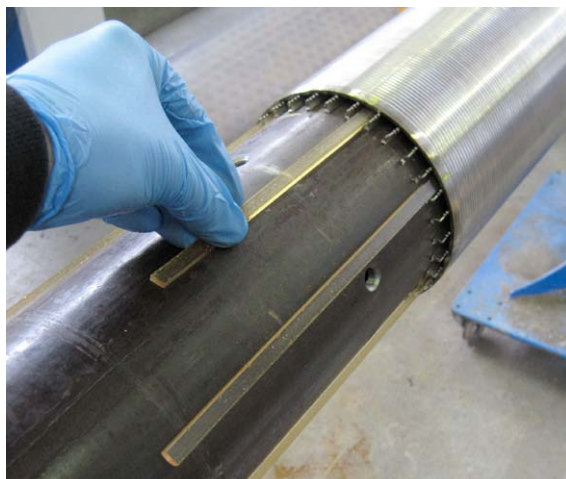
effectively monitor fluid inflow during cleanup and in the future through the long tieback to the production facility.

The chemical tracer solution was a complete success. The tracer response at the surface sampling point matched expected conditions for a complete well clean-up. Both “heel” and “toe” tracers indicated flow to be distributed across the entire production interval indicating there were no adverse effects from the oil-based drilling fluid or completion fluid.

In the future when water break-through occurs, analysis of produced water will detect which tracers are present which will allow determination of which part of the well water break-through has occurred.

More details on this application can be obtained in SPE paper 135070.

Figure 1: Tracer elements embedded in plastic strips are inserted into completion components before it is run into the well. The strips lie dormant until activated by oil or water.



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Figure 2: Chemical tracers were integrated into sand screens and deployed at two locations in the well. Fluids were sampled at surface and analyzed for tracer concentration. Results indicate toe and heel are flowing.

