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## Subsea Through Tubing Rotary Drilling

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### Abstract

The subsea Through Tubing Rotary Drilling (TTRD) is in principle a concept to construct new drainage points by utilising as much of the existing well path as possible, thus saving a significant amount of time and cost. A new fit for purpose system for subsea TTRD consisting of a small size (7") combined BOP/LRP solution, incorporating a surface BOP solution and a high pressure (HP) riser, will be delivered to Statoil in the 2<sup>nd</sup> quarter of 2007.

This technology is applicable for all wells where the production from the "mother bore" has declined to a level where the option is to shut in the well and re-drill to a new target. Furthermore, Statoil is currently funding the development of through-tubing multilateral systems, which will enable TTRD-sidetracks in producing wells and production from the two bores simultaneously. Traditionally a sidetrack has been done by pulling tubing and parts of the 9 5/8" (and possibly the 13 3/8") casing string(s), prior to a side track. By drilling the side track "through tubing" the cost will be significantly reduced.

The cost for a new well can be in the order of 40 - 50 million US \$ when the subsea well slot is readily available, and even up to 70<sup>+</sup> million US \$ when a new well slot must be installed subsea. Utilising TTRD technology we envisage new drainage points to a cost in the order of 10 million US \$. With a step change of this magnitude, the assets will be able to produce much more of the remaining oil from the reservoirs, hence increase the oil recovery.

### Background

Statoil has to date performed 20 Through Tubing Drilling operations and all have achieved the technical goals. The two TTRD operations already performed on sub sea templates, through marine riser, were the world's first to be performed from floating mobile drilling units. The experience and know

how obtained by these activities has been systematically used in order to evaluate the potential for the TTRD technology in the future.

Statoil has identified "low cost drainage points" in sub sea fields as a major contributor to reach the ambition of 55% recovery from our sub sea fields on an average basis. From our platform fields we see that the recovery increases significantly with the number of drainage points constructed and well interventions performed. The same effect has not clearly been seen or realised in sub sea fields.

Due to the high cost related to sub sea operations, Statoil has looked at novel and much more cost effective ways to construct the drainage points. One of these concepts is a new subsea Through Tubing Rotary Drilling (TTRD) concept. As can be seen from figure 1 the potential in TTRD operations subsea appears to be significant in terms of cost per drainage point.

#### Additional Drainage Point - Alternative TTRD

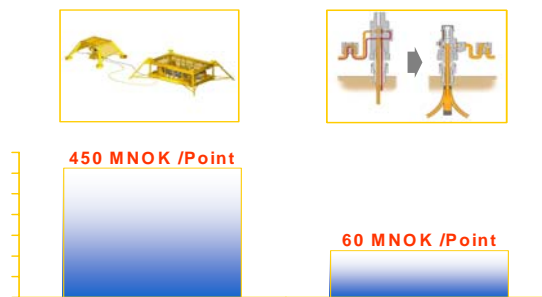


Figure 1: The TTRD potential

**Note:** The figure for a new well has risen substantially the last couple of years due to the extensively high rig rates.

In addition to the pure technical aspect with respect to commercializing a highly efficient solution for subsea TTRD operations, Statoil foresee that establishing a team specialised in this type of operation will achieve much more effective operations and consequently cut cost significantly. Figure 2 illustrates the effect of continuous improvement of the learning curve related to the number of operations. It should be noted that Figures 2 and 3 are purely "drawing board" evaluations. However experiences from relevant operations are to a large extent built into the calculations.