OPTIMISING AN EXTENSION TO AN EXISTING NORTH SEA ASSET

Abstract

This study was carried out for a UK based oil company operating in the North Sea wishing to extend one of its existing subsea production systems. The case study shows how as flowline systems grow they can become as much of a restriction to flow as the wells or reservoir. Therefore, detailed evaluation of the overall deliverability is best achieved using an integrated reservoir model coupled to a representative well, flowline and riser network model. Such evaluations are now commonplace using the latest Life of Field simulation tools.

The System

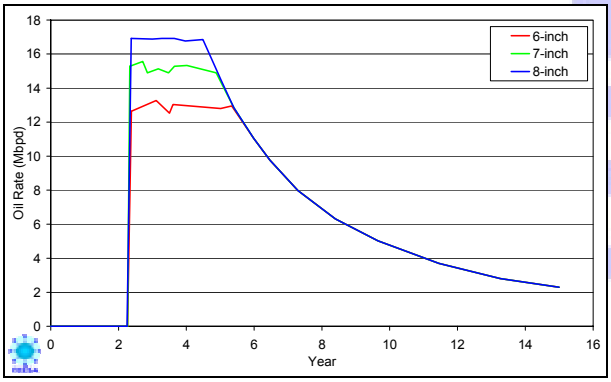
The Client was already operating a subsea development consisting of five wells and a twin pipeline system. Additional reserves had been discovered and appraised to the North and West of the existing infrastructure and the Client was interested in evaluating tie-back options for these reserves.

Life of Field simulations were performed to establish the size of the new pipeline infrastructure, the requirements for gas lift injection and the potential for *backing-out* of the existing wells.

The study also investigated the thermal characteristics of the pipeline system focusing on the insulation requirements of the planned extension pipeline necessary for avoiding wax deposition and hydrate formation. In addition, the implications of routing through single and dual pipelines was also addressed.

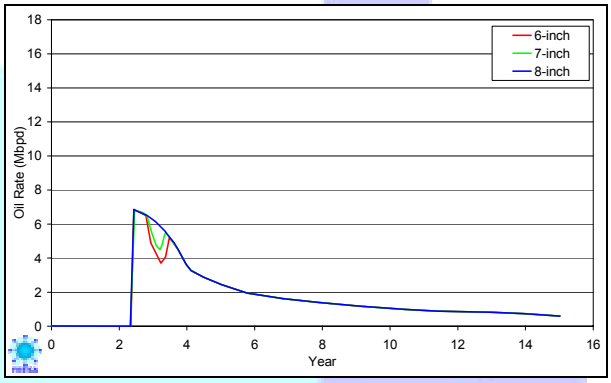
The planned extension included two new wells drilled in different reservoir compartments with different productivities and artificial lift requirements. The results for Well 1 are shown in Figure 1:

Figure 1 Production from Well 1



The curves are for a range of flexible pipe IDs and show that significant additional production is achieved during plateau by increasing from a 6-inch to an 8-inch. The corresponding chart for Well 2 is shown in Figure 2:

Figure 2 Production from Well 2



The results show that Well 2 suffers from lost production due to back-out by the other more prolific well. For the target profile to be met, it would be necessary to install an 8-inch ID flexible.

The anticipated increased carbon dioxide levels of the fluids from the new production wells raised concerns about the existing system's ability to cope with increase carbonic acid corrosion rates. To address this, the results from the Life of Field simulations were used as the basis of a detailed corrosion study. Using the thermal hydraulic results and the expected corrosion inhibitor availability (effectiveness), the corrosion rates were calculated and integrated to provide estimates of the cumulative metal loss (expressed as millimetres of pipe wall thickness) at different locations throughout the production system. The results of this analysis were then used to formulate an improved chemical and corrosion management strategy.

Conclusion

This case study shows that Life of Field simulation using Integrated Reservoir Models offers a powerful technique for verifying the deliverability of production systems under a wide variety of development scenarios. Moreover, use of these techniques provides valuable insight into various Flow Assurance problems including solids deposition and corrosion damage.