

# **RX-05BD CASE HISTORY**

## **DE-WAXING OF A NORTH SEA FLOWLINE**



### ***Introduction***

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In May 2005, Roemex were approached by a major North Sea operator and were asked to recommend some candidate wax solvers suitable for de-waxing a North Sea Flowline.

The flowline in question was a 16km subsea tieback from a satellite field, which had five producing wells. Oil from the five wells was transported to the platform via a subsea manifold and two 6" pipelines. Riser A and Riser B carried the fluids topsides onto the processing facility.

Restrictive wax deposits within the flowline were reported back in 1999, however due to economic conditions at the time, de-waxing of the flowline was not viewed as a viable option. Since 1999, additional wells had been brought online and production logging tests (PLT) performed early in 2005 showed that the individual flow rates of each well were significantly higher than the total volume of fluids produced through the flowline, indicating that the flowline contained restrictive wax deposits. Due to the economic climate in 2005, de-waxing of the flowline was deemed a more viable option.

### ***Chemical Selection***

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Following intensive feasibility studies performed by the client, it was decided that chemical removal of the wax deposits would be the most cost effective method to adopt giving a relatively high chance of success with a moderate amount of risk.

After several months of methodology selection and extensive trials on various solvents, RX-05BD was selected as the chemical of choice for de-waxing the flowline due to its performance in laboratory tests, previous field experience and its environmental profile, which was significantly better than most wax dissolving products on the market.

Roemex together with the client then undertook an extensive amount of solvent compatibility testing, ensuring that RX-05BD would cause no compatibility issues with any material the solvent was likely to contact throughout the operation i.e. from the pumping materials used on the supply vessel to the solvents final destination at the refinery.

### ***Chemical Deployment Offshore***

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Roemex arranged for the solvent to be manufactured in one batch of 600m<sup>3</sup>, which was then transported to Aberdeen, in Isotanks, by road.

In the first of its kind in the North Sea, 600,000 litres of RX-05BD was then transported offshore in 26 x 20ft Isotanks and was pumped directly from the supply vessel up to the platform where the solvent was circulated round the Flowline (down Riser A and back Riser B) in order to remove restrictive wax deposits.

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Prior to bunkering and circulation of the solvent a radioactive tracer was inserted into the system to perform a 'time of flight'. This enabled the client to determine more accurately the degree and location of restriction within the flowline. The 'time of flight' indicated that the majority of wax deposition was within the last 4km of each flowline.

Throughout the operation, Roemex chemists were onboard the platform to perform sampling and analysis of the fluids to determine the level of wax removal and the optimum period for circulation. The circulation rate was not as high as anticipated with an average of  $0.6\text{m}^3/\text{min}$  being achieved. Two methods were used to determine the wax content in RX-05BD; viscometry and a specially developed solvent flash method, which proved to be very successful.



On completion of the circulation, the solvent was displaced to the process system with inhibited seawater and a gel pig was used to remove the final debris from the flowline and to enable the wells to be brought back online.

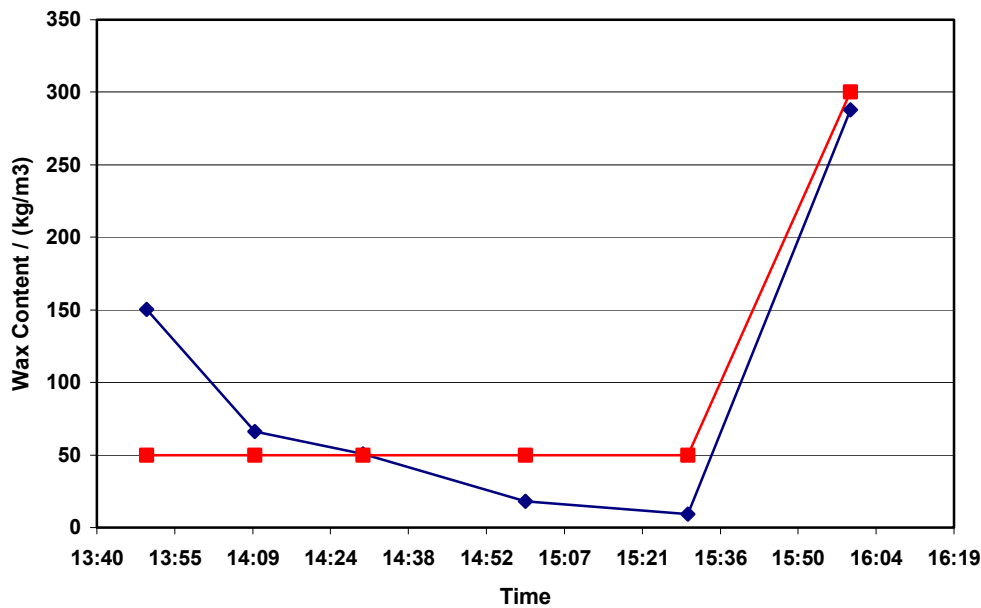
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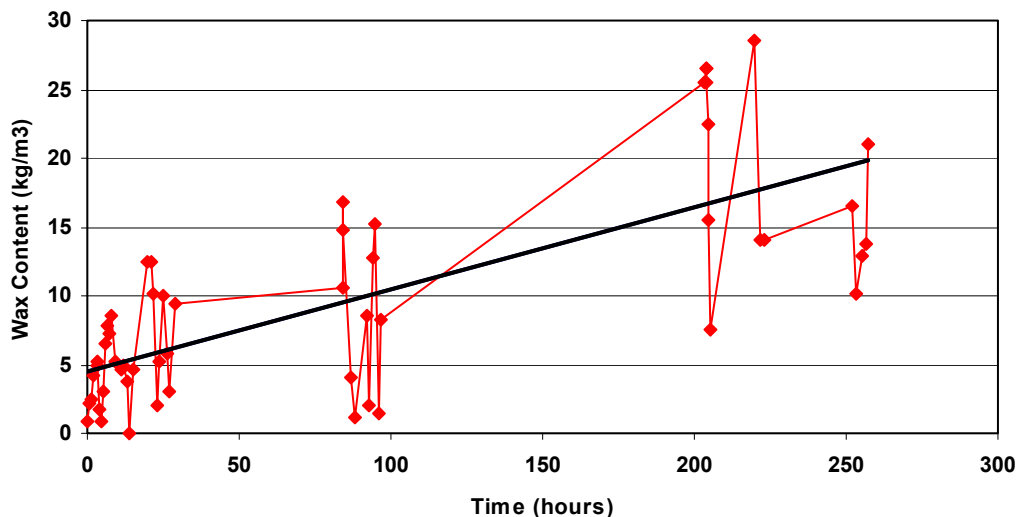


### Results

Unfortunately bunkering had to be stopped after approximately 140m<sup>3</sup> of solvent had been pumped down Riser A. This solvent therefore sat in the flowline for a considerable length of time before operations resumed. This initial soak period saw very high wax returns with one sample showing as high as 300kg/m<sup>3</sup> of dissolved wax in RX-05BD (Graph 1). The remainder of the flushing program saw wax returns of between 1kg/m<sup>3</sup> and 28kg/m<sup>3</sup> of dissolved wax in RX-05BD (Graph 2).



GRAPH 1: Initial Wax Returns from the Flowline after the soak period



GRAPH 2: Wax Content in RX-05BD obtained throughout the remainder of the circulation period (excluding the initial high wax returns)

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In the near future it is hoped that a second 'time of flight' will be performed which should calculate more accurately the volume of wax removed from the flowline.

### ***Conclusions***

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On start up of production, the client saw the following:

1. A decrease in back pressure between the topsides and subsea chokes
2. An increase in velocity through the flowline
3. An increase in arrival temperature of the fluids at the platform (obvious benefits in terms of wax control)

The operator has seen an increase in production throughput of  $> 400\text{m}^3$  per day. In today's climate this represented a significant financial benefit to the client with the job paying for itself in approximately 40 days.

The removal of restrictive wax deposits and rendering the flowline hydrocarbon free also allowed the tie in of two new chemical injection lines. These new chemical injection lines are now being used to deliver wax inhibitor to the fluids.