Successful Clean-Out of Multi-Phase Export Pipeline from North Pacific Ocean to the Russian Shore

HALLIBURTON PIGGING CAMPAIGN USES INNERVUE™ PIPESUITE DIAGNOSTICS SERVICE FOR EFFICIENT WAX REMOVAL

OVERVIEW

An offshore rig owned and operated by a major operator near Sakhalin Island faced a complex clean-out of their multi-phase export pipeline due to a “stuck pig” incident – just 40 days after the Berkut platform began production. This incident was caused by a build-up of hydrates and wax during the very first operational pig run.

The extreme weather conditions in the North Pacific Ocean hindered pipeline access and limited the window of time for clean-out operations. But, the deposition problem required immediate remediation, as it was slowing the transportation of crude oil, gas and condensate to an onshore terminal for processing in eastern Russia. There was also a growing threat of further wax deposit build-up from an extended period of low pressure and reduced flow rate.

To help mitigate these challenging circumstances, Halliburton provided the following services:

- InnerVue™ PipeSuite diagnostics service to assess the deposit profile in the line
- Laboratory analysis on production fluid and deposit samples
- A FEED study to evaluate the different options to clean the pipeline
- A detailed engineering study for a “progressive” pigging campaign, including pig trials performed in the UK
- Support for the pipeline cleaning execution

PROJECT DETAILS

Central to the proposed project plan was the pigging campaign, utilizing multi-phase production fluid along with 18 different types of pigs specifically designed for wax removal. The InnerVue PipeSuite service, which includes Halliburton’s proprietary survey technology, was executed several times – both before cleaning and in the middle of cleaning – from either side of the pipeline to profile the deposit thickness (the total volume of deposit was estimated at 577 m³). These measurements, along with results from various engineering studies conducted and chemical trials performed by Multi-Chem, a Halliburton
Service (i.e., on produced oil and solid debris), helped guide the actual clean-out strategy. The following succession of pigs was driven by different medium, as well as chemical flushing with surfactant:

» Foam pigs to prove communication
» More aggressive foam pigs to start removing wax
» Borefinder pigs to ensure the transition between foam pigs and bi-directional pigs
» Bi-Directional pigs with bypass to remove wax

The project was closely monitored and managed by experienced Halliburton engineers, whose detailed pre-engineering and preparations ensured ‘right-first-time’ execution of the clean-out process. The unique combination of technology tools, procedures and oversight effectively controlled cost, resources and logistics that exceeded customer expectations and successfully restored the pipeline to full production.

PROJECT HIGHLIGHTS

Key to the project’s success was the ongoing monitoring of the pipeline remediation progress via Halliburton’s InnerVue PipeSuite service, which supported decision-making throughout the pigging campaign, by providing the confidence needed before moving to a more aggressive pig. Additionally, the mobilization of Halliburton personnel and equipment to both onshore and offshore locations enabled an effective end-to-end cleaning operation. And finally, 14 highly efficient pig runs and retrievals were made in accordance with carefully engineered procedures, including tracking methods for documenting results, before transferring operations back to the operator. This technology and approach to pipeline clean-out can be easily applied/adapted to other locations facing similar challenges.

“I would like to take this opportunity to thank you for safe and controlled execution of the InnerVue PipeSuite service project. I have had nothing but positive feedback on the work efforts of Halliburton. You have shown a high level of professionalism, commitment and proactive support to making sure it all went according to plan in the field.”

– Facilities Surveillance & Reliability Supervisor