First Full-Scale, Land-Drilling Waste-Injection Project Successfully Initiated in Western Siberia

“This first on-land, waste-injection project in Russia is a big achievement. It demonstrates that drilling operations in environmentally sensitive areas are possible under “zero-discharge” regulations. This means that oil companies can explore the oilfields in Western Siberia economically, even when there are strict environmental regulations.”

Drilling Operations Superintendent

**The Situation**
The southern part of the Priobskoe field is located in Western Siberia on the floodplain of the Irtysh River in an environmentally sensitive area. Cuttings discharge and liquid-waste spills on the surface are completely prohibited.

Until now, the exploration and full development of fields like this one were major challenges for oil and gas companies working in Russia. All drilling wastes including cuttings, used muds, wash and waste waters, etc., had to be transported away from environmentally sensitive areas, such as flood plains, to locations officially designated for waste disposal.

The major cost came from transporting huge amounts of drilling wastes generated from multiple rigs. In addition, spring and fall weather make transportation all but impossible because the winter roads disappear, the rivers flood and ice floes abound.

**The Solution**
This problem was solved by “Gazpromneft-Khantos” (a joint venture of Gazprom), using waste-injection technology provided by M-I SWACO.

Waste Injection (WI) is a relatively new disposal method in Russia. The first time it was successfully implemented in Russia was in 2004 on Sakhalin Island offshore projects. Since then, until October of 2008, WI has been used only in Sakhalin Island offshore fields on several platforms. Many oil companies have wanted to use it in mainland Russia, but until October 2008, they were concerned with legislation issues. WI had never been tried on land rigs, and because of this it was considered a new, untried approach in managing drilling wastes.

Gazpromneft-Khantos, however, made an agreement with M-I SWACO for two Front-End Engineering Design (FEED) studies for waste injection. The targets of these studies were:
Summary (continued)

- To identify suitable injection formations in the Priobskoe and Zimnee fields and determine their disposal capacity. Both fields are situated in the environmentally sensitive area where surface cuttings discharge is prohibited.
- To maintain contact with Trofimuk Oil and Gas Geophysics and Geology Research Institute and support it with needed technical materials that will help Gazpromneft-Khantos obtain its license for waste injection and its license for handling hazardous materials.
- To estimate the equipment needed for waste injection and injector-well construction.

FEED Studies were successfully completed. Suitable formations were defined for injection in each field, with additional capacity to accommodate the waste from future drilling activities.

The process of drafting the waste-injection agreement began while M-I SWACO continued to provide Trofimuk Oil and Gas Geophysics and Geology Research Institute with the technical information for licensing, designing, manufacturing, delivering and maintaining the WI equipment at the client’s location. The layout of the centralized WI facility is shown below.

1 – Cuttings-receiving pits – 140 m³ (879 bbl) each
2 – Hopper and cuttings-feeding system
3 – Slurrification system
4 – Water tank – 50 m³ (314 bbl)
5 – High-pressure pump
6 – Used-mud tanks - 40 m³ (251 bbl) each

On 15 October 2008, all WI equipment was installed along with the client’s equipment such as the winterized enclosure, tanks for liquid wastes, temporary cuttings-storage pits, heaters, etc. The injectivity test showed very good results, aligned with the initial FEED study model.

On 16 October, the first batch of slurry was successfully injected. From this date to the present, waste-injection operations have been successful.
THE RESULTS

- M-I SWACO waste-injection technology allowed development in the environmentally sensitive southern part of the Priobskoe field.
- The M-I SWACO geomechanical studies allowed safe, high-volume waste disposal.
- The operators disposed of 889,937 bbl of cuttings, used mud and other waste liquids, with zero discharge to the environment.
- Waste injection technology was acknowledged as the most economically effective for this ecologically sensitive area of Western Siberia.
- In December 2008 M-I SWACO waste injection technology in the Priobskoe field was recognized as "The Best Ecological Project for 2008" by the Ministry of Natural Resources, Russian Federation.
- Other oil companies in the Russian Federation are actively interested in this promising M-I SWACO technology.

The Results

M-I SWACO has successfully injected more than 889,000 bbl of waste (cuttings, used mud, contaminated rainwater and other waste liquids) with no safety or environmental incidents, allowing the operator to stay within the field-development schedule.

The injection rate of 55,621 bbl per month made this project one of the most intensive WI projects of 2009 worldwide.

The table below illustrates a total volume of waste injected for the whole period of waste-injection:

<table>
<thead>
<tr>
<th>Waste Streams</th>
<th>Volumes Injected (bbl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slurry</td>
<td>810,425</td>
</tr>
<tr>
<td>Water / viscous pills</td>
<td>43,881</td>
</tr>
<tr>
<td>Waste liquid</td>
<td>35,631</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>889,937</strong></td>
</tr>
</tbody>
</table>

A key factor to the project’s success was the excellent communication and cooperation between M-I SWACO and the operators’ teams in managing the risks involved and timely implementation of lessons learned.

Summary

Cuttings reinjection of drill cuttings and used mud was recognized by all the operators as the most cost-effective, environmentally acceptable and long-term disposal solution for cuttings and liquid waste streams in such a remote and environmentally sensitive area as the southern part of the Priobskoe field.

Questions? We’ll be glad to answer them.

If you’d like to know more about waste-injection technology and how it’s performing for our other customers, please call the M-I SWACO office nearest you.