

Keeping the flow flowing

Nontoxic paraffin removal agent helps return flow to a GoM pipeline slated for abandonment.

Jennifer Presley, Senior Editor, Production Technologies

There's little debate on how the oil and gas industry has benefitted greatly through the transfer of technologies from other industries like aviation and medicine to solve its big challenges. Beer brewing can now join the industry's list of tech transfer success stories.

That transfer is a natural fit as the two industries struggle with similar challenges in keeping their production lines free from blockages. However, removing any blockages that might form is not always as easy as pouring a liquid cleaner down the drain, especially when that blockage is in a subsea pipeline hundreds of feet below water.

There's now an environmentally friendly alternative to the traditional chemical and mechanical methods of well remediation. The roots can be traced back to the trial-and-error experimentation with solvents and oxidizing agents to develop solutions for the food and beer brewing industries to keep equipment like brass filtering plates and tanks clean.

That cleaning solution, with some additional tweaking in the laboratory, became WellRenew. In late 2015 a blocked Gulf of Mexico (GoM) pipeline was treated with WellRenew and is flowing crude once again. The nontoxic paraffin removal solution, developed by Lafayette, La.-based Ideal Energy Solutions, is not limited by the challenges that traditional paraffin and asphaltene management systems face, like low temperatures and long pipeline lengths.

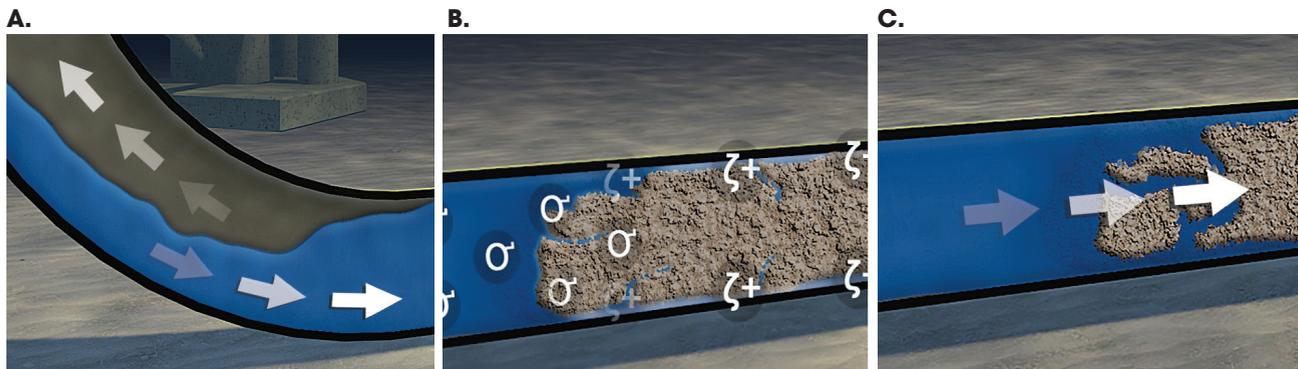
Blocking flow

The deposition of paraffin in flowlines and production equipment is one of the more difficult challenges an operator can encounter over the life of its wells. Buildup occurs inside the lines naturally during the flow of crude, with the paraffin forming into solid wax particles when the crude temperature falls below the cloud point.

"As paraffin, asphaltene, oil and formation deposits lay down in the line, it does so like rings in a tree trunk," said Charlie Talley, chief developmental chemist for Ideal Energy Solutions. "The biggest challenge that we had was in coming up with something that could actually lower the surface tension enough so that the material could go around the pipe's surface and we could push the plugs out of the pipe."

Typical remediation methods like line heating, warm solvent or hot oil treatments, and chemical wax inhibitors are limited in their effectiveness by low temperatures and pipeline length, making them unsuccessful in most cases. Where coiled tubing can be effective, its use can be limited by pipeline length and bends. Also, the mobilization and utilization of these tools is costly, and there are many risks associated with the process.

"Coiled tubing involves taking an entire coil unit on location, and depending on the length of the pipeline, the crew might actually have to go in from both sides," said Kevin Ayers, COO for Ideal Energy Solutions. "There's a lot of equipment involved, and it's very expensive. It also can be dangerous, which is another



A) The low surface tension of the cleaning solution (blue) allows it to penetrate the area between the deposit and pipe walls. **B)** Oxygen from the solution is released and neutralizes the zeta charge responsible for the stickiness associated with paraffin and asphaltenes. **C)** The cleaning solution reacts with a portion of the oil to create a simple soap lubricant. (Source: Ideal Energy Solutions)

advantage that WellRenew has because it's nonhazardous and has a minimal equipment spread."

Unblocking flow

The solution is based on three principles: surface tension, hydrophilic-lipophilic balance and controlled oxygen. The extremely low surface tension of the solution allows it to penetrate the area between the deposit and pipe walls and into any cracks or crevices present in the deposited material, Talley said.

"WellRenew works through a controlled oxygen release mechanism. We found that oxygen will neutralize the zeta charge that causes the stickiness of the paraffin plug," Talley said. "To get it around the pipe, you have to be able to lower the surface tension. We've come up with some very unique surface-active agents that can reduce the surface activity down to about 20 dynes."

This approach does not dissolve paraffin or asphaltenes but rather floats them and allows

them to be pumped. When hot solvents are used and appear to dissolve these materials, the solutions will gel again when cooled and become hard to remove.

"Many people in the industry think you can dissolve paraffin, but you can't. It's virtually nonreactive," Talley said. "The only thing that you can do is get it to the point where you can move and pump it. That's what WellRenew does."

Field results

A major operator in the GoM had performed multiple chemical and mechanical remediation treatments to reestablish flow in a 7.9-km (26,000-ft) 4-in. pipeline that connected two of its platforms with limited success. Before abandoning the line, the operator treated it with WellRenew. Limited flow returned to the line after 5 hours of treatment, with full flow returning to the line 75 hours into the treatment with the solution. 