

Clean-up on a Big Scale

A patented process using water and sonic resonance helps a Texas company clean years of scale deposits in heat exchanger tubes in an African oil field

By Carol Brzowski-Gardner

Years of scale build-up in gathering station heat exchangers had sharply reduced efficiency in Shell Gabon's Rabi Oil Field in Gabon, Africa. In seeking a solution, Shell Gabon, a part of the Royal Dutch/Shell Group, looked for a cleaning firm that could unplug the tubes and remove the scaling without using chemicals.

AIMM Technologies of LaMarque,

process, completing preparations and mechanical work on each gathering station in a 7-day window, according to Antone Belcher, operations manager.

"It was very tough to unplug the tubes and remove the scale," says Belcher. "We were able to re-open tubes that had been totally plugged off." The company restored the tubes to production specifications and passed Shell Gabon's inspection.

smaller test heat exchanger used as backup and for performing tests and gathering samples from production.

"As crude oil is pumped from the ground, the wells receive more than just the oil," Belcher explains. "They receive crude, natural gas, water, sand and dirt. Some of the gas is injected back into the ground, and the remaining gas is flared off.

Heat exchangers in the gathering stations operate at a given temperature to separate the oil and the natural gas. Next in the production scheme comes a central station, where the oil is separated from water.

"From there, the oil is piped to a terminal where it is sold to a company for refining and to make various products sold commercially," Belcher says.

TOUGH JOB

PROJECT:

Clean tubes in 9 large gathering station heat exchangers made inefficient by years of fouling

CUSTOMER:

Shell Gabon, Gabon, Africa

CONTRACTOR:

AIMM Technologies, LaMarque, Texas

EQUIPMENT:

Hydrokinetics patented cleaning technology

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**Antone Belcher
AIMM Technologies**

Texas, got the job done, thanks in part to its patented cleaning technology, Hydrokinetics, which uses water and sonic resonance to break the bond between fouling material and the tube or pipe wall.

Hydrokinetics helped AIMMTECH deliver effective cleaning in a streamlined

Where others failed

Shell Gabon located AIMM Technologies via the company's web site (www.aimmtechnologies.com) after another cleaning contractor failed to perform.

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AIMMTECH markets Hydrokinetics as a fast, effective and inherently safe process. The fouled tube is filled with an oscillating water stream. Once the water has broken through the clog and flow is achieved, a bullet is introduced in the tube, and the tube is then refilled with water.

Sonic resonance then is applied to the water column. The fouling and the tube material resonate at different frequencies, breaking the bond between them, allowing the fouling to be easily expelled out of the opposite end of the tube.

Years of buildup

While AIMMTECH has used Hydrokinetics successfully in many applications, the Gabon job was especially challenging, because fouling had built up on the tube walls for nearly 10 years.

AIMMTECH cleaned a total of nine heat exchangers on five gathering stations in the Rabi field, which includes about 200 wells. Each gathering station has one production heat exchanger and a

Calcium and wax

At the Rabi oil field, the heat exchangers had been fouled through long exposure to oil, water, gas and sand/dirt. Calcium and paraffin wax in the scale deposits made the cleaning especially difficult.

"Calcium scale forms when water is heated," says Belcher. "Paraffin wax occurs when equipment is not running within its operating parameters. In other words, if it gets too hot, calcium forms; if it gets too cold, paraffin wax forms. Scale in the heat exchanger tubes impedes the heat-transfer function. The goal is to operate the heat exchangers at the top end of the efficiency scale to remove or separate as much water as possible."

The scaling in the Rabi field exchangers was extremely hard and thick throughout all the units cleaned. The larger production exchangers consisted of more than 1,700 tubes, and smaller test exchangers contained more than 500 tubes.

No two heat exchangers were alike, as each gathering station produces different amounts of oil, natural gas and water each day. The scale hardness and the length of the tubes were factors that suggested a combination of methods needed to be considered.

"The amount of scale and the number of plugged tubes varied from section to section and exchanger to exchanger,"



Gathering station heat exchangers in an African oil field presented a big cleaning challenge for AIMM Technologies of LaMarque, Texas.



AIMMTECH used a patented Hydrokinetics process to clean heavily scaled heat exchanger tube bundles at Shell Gabon's Rabi oil field in Africa. The company completed the work to the customer's specification in a situation where conventional cleaning methods had failed.

says Belcher. "More of the problem areas were in the first (top) section of each exchanger."

Finding solutions

On most of the exchangers, the scale was too thick to allow the water nozzle used in Hydrokinetics to completely seat on the tube and maintain a seal while the tube was under pressure. AIMMTECH technicians worked diligently to find the most effective nozzles and the sizes and types of bullets that would most efficiently remove the scale.

AIMMTECH completed the entire project to specification and executed the work without incidents. "The working conditions and the on-site work locations were all well-maintained, and all necessary precautions were taken to ensure the safety of the field workers," says Belcher. ■