DEEP WATER

CASE STUDY

Operator in the Gulf of Mexico Successfully Inhibits High Molecular Weight Paraffin

USE OF MXUC 3-1388 PARAFFIN INHIBITOR ELIMINATES CATASTROPHIC SYSTEM FAILURE FOR THE OPERATOR.

GULF OF MEXICO

CHALLENGE

Subsea gas well through a six mile pipe-in-pipe insulated flowline experienced high paraffin content.

- No contingency for pigging of the flowline.
- WAT was 97°F (36°C) as determined by cross polarized microscopy (CPM).
- Establish effective flow assurance strategy.

SOLUTION

Collected chemical-free condensate samples and tested using OLGA® multiphase flow simulation software.

- Selected MXUC 3-1388 paraffin inhibitor, one of Multi-Chem's DeepSEAL® line of subsea qualified products.
- Product is certified for capillary application to 250°F (121°C).

RESULT

Use of product MXUC 3-1388 paraffin inhibitor significantly reduced HMW paraffin in the system.

- Customer was able to flow the well under various conditions without concern of paraffin related issues in the flowline.
- Eliminated catastrophic failure for the operator.

OVERVIEW

An operator in the deep water Gulf of Mexico developed a subsea gas well through a six mile pipe-in-pipe insulated flowline. The bottomhole pressure was in excess of 14,000 psi with a bottomhole temperature of 280°F (138°C). Initial evaluation of the reservoir indicated paraffin deposition was not expected to be a flow assurance issue.

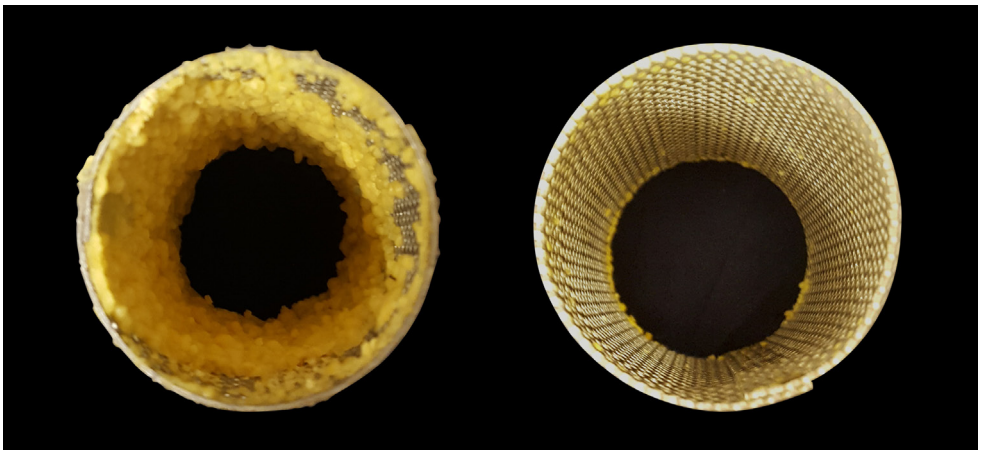
CHALLENGE

Upon first production it became clearly evident the condensate had much higher paraffin content than anticipated. An effective flow assurance strategy would require paraffin mitigation. There was no contingency for pigging of the flowline. The wax appearance temperature (WAT) of the oil was 97°F (36°C) as determined by cross polarized microscopy (CPM). The primary flow assurance concern was high molecular weight (HMW) paraffin deposition on the flowline wall.

SOLUTION

Multi-Chem collected chemical-free condensate samples and completed testing which led to the selection of MXUC 3-1388 paraffin inhibitor. The MXUC 3-1388 is part of Multi-Chem's DeepSEAL® line of subsea qualified products. The product is stable to 15,000 psi and has a viscosity less than 100 cP at 40°F (4°C). As part of the DeepSEAL service certification, it is also certified for capillary application to 250°F (121°C).

Figure 1



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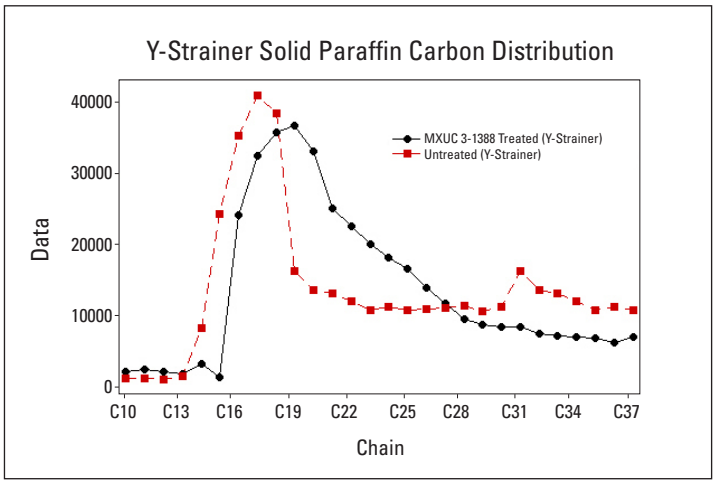
Through completed modeling using OLGA® multiphase flow simulation software, it was determined that the maximum differential temperature between the condensate and the pipe wall was 20°F (11°C) near the WAT. MXUC 3-1388 provided 65% inhibition when tested with a temperature differential of 20°F (11°C) relative to the determined WAT. The product was recommended to be injected via the chemical injection mandrel located just above the SCSSV about 6,000 ft. below the mud line. Temperature at the point of injection was estimated to be 220°F (104°C). Under normal operation the boarding temperature at the flowline riser was anticipated to be above the WAT of 97° (36°C) but in abnormal operation situations the condensate temperature could fall below the WAT in the flowline.

Figure 2



The best measure of performance was the Y-strainer located downstream of the low pressure separator meter run with a temperature of 80°F (27°C). Volume of paraffin deposition and carbon chain distribution of any deposited paraffin were collected with and without MXUC 3-1388 being applied for comparative purposes. With 3000 barrels of condensate passing through the meter run, the untreated oil showed significant deposition in the filter and the carbon chain distribution showed a much higher proportion of HMW paraffin typically associated with deposition and plugging. When 3000 barrels of condensate were passed through the meter run with 1000 PPM of MXUC 3-1388 little paraffin was contained in the Y-strainer and the carbon chain distribution of the paraffin collected showed a significant reduction in HMW paraffin.

Figure 1 shows Y-strainer without chemical (left) and with chemical being applied (right) and Figure 2 indicates the reduction in HMW paraffin recovered from the Y-strainer.

RESULT

Remedial options for paraffin in this system were limited with high costs and significant deferred production associated with mechanical or chemical cleaning. Failure would have been catastrophic for the operator. The customer was able to flow the well under various conditions without concern of paraffin related issues in the flowline.

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