INNOVATIVE AND NOVEL FLOW ASSURANCE WORKFLOW SAVES AN OPERATOR $16M CHEMICAL OPEX

HOLISTIC APPROACH

Coupling three fundamental principles - production chemistry & integrity, production engineering & operations, and production monitoring & optimization to combat complex and severe flow assurance issues.

CUSTOMER CHALLENGE

An independent operator manages a complex production system with several interconnected platforms at depths of 80 meters of water in the Caspian Sea. This system is connected to the Central Processing and Storage Facility located onshore via a network of more than 250km of infield flowlines connected in a daisy-chained configuration. Daily production operations are challenged by several flow assurance related issues such as high wax content produced oil with correspondingly high cloud and pour points, low reservoir temperatures, sand production, water production, complicated topography and rough seas. To manage and control the wax deposition challenge, the operator planned to use 500 ppm concentration pour point depressant (PPD).

HIGHLIGHTS

$16
MILLION
SAVED PER YEAR

OFFSHORE FIELD,
CASPIAN SEA

APPROACH

The flow assurance team conducted extensive sampling, laboratory analyses (Figure 1) and desktop studies to determine the tendency of the system to experience the risks of organic and/or inorganic solids deposition and accumulation. As outlined in Figure 1, these analyses demonstrated that the system is susceptible to severe wax precipitation and deposition at various locations due to the high wax appearance temperature (WAT) and pour point of the produced oil, low flow rates and low reservoir pressure. The wax precipitation and deposition appear to be more severe during the wintertime as the mudline temperature is much lower than the pour point temperature of the hydrocarbon fluid at this time of year.

In addition to the wax formation and deposition, corrosion was also identified as an area of concern due to the existence of water and CO2 in the produced multiphase flow stream. The analysis showed that the emulsion inversion point is around 40% water in the oil thereby reducing the risk of corrosion.

STRATUM
RESERVOIR

Concurrently, the team launched an extensive transient-modeling approach to develop a thorough understanding of flow dynamics and the expected flow regimes at various pressure and temperature conditions. In addition, the team also investigated the low points in the bathymetry of the subsea surfaces which are high likelihood locations for solids (wax, sand, etc.) accumulation.

Finally, the team integrated the results of laboratory production chemistry, production engineering & operations, and production monitoring & optimization protocols to combat complex and severe flow assurance issues. This coupled and holistic approach enabled the operator to continue production without any PPD injection.

FIELD RESULTS

Figure 2 is a testimonial of this novel approach showing insignificant amounts of debris from the pigging operation without the use of PPD injection. As shown, both pigging material volume and pigging frequency were reduced significantly. In addition, the back-pressure generated during pigging operations was reduced. Further, there was a reduction in the chemical handling logistics and the corresponding HSE issues associated with chemical injection operations. Overall, these factors contributed to extended pre-pigging flow periods and significantly reduced intervention for pigging operations and direct savings of USD 16 million per year.

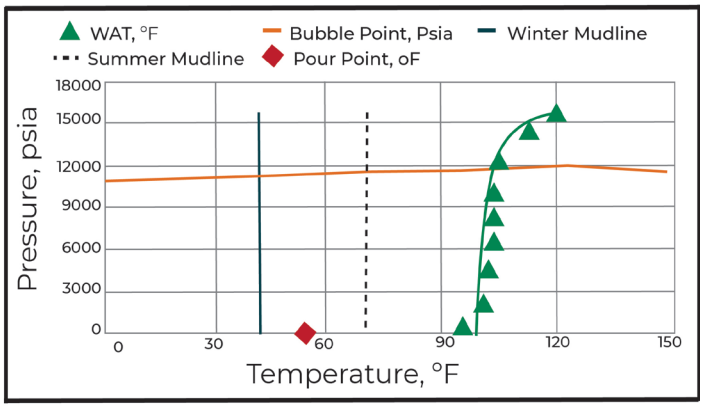

FIGURE 1: WAX DEPOSITION

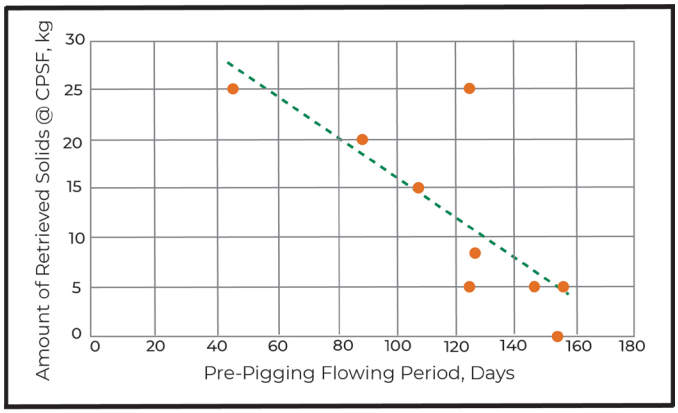

FIGURE 2: PIGGING SCHEDULE

CONTACT US

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