Pigging Optimization with OLGA Simulator Saves more than USD 2 Million, Western Desert, Egypt

Khalda Petroleum selects cost-effective alternative to using heat stations for wax management on Ptah Field trunkline

**CHALLENGE**

Determine a cost-effective solution to prevent plugging of a 6- to 8-in trunkline in the Ptah Field due to wax precipitation leading to deposition.

**SOLUTION**

- Evaluate wax mitigation with an optimized pigging schedule against wax-prevention method with heating stations.
- Use the OLGA* dynamic multiphase flow simulator to determine the optimal pigging speed and frequency to not exceed the maximum allowed wax depositional thickness in the trunkline.

**RESULTS**

- Reduced annual operating costs by more than USD 2 million.
- Eliminated annual rental costs of two heating stations.
- Defined optimal pigging frequency to prevent plugging.
- Decreased the cost of wax mitigation to significantly lower than wax prevention with heating stations.

**Select cost-effective method to manage wax buildup in trunkline**

The Ptah Field, located in the Faghur Basin of Egypt’s Western Desert, produces approximately 10,000 bbl/d of stock-tank oil. Since production began in 2015, the Khalda Petroleum Company has experienced issues with wax precipitation leading to deposition in some of its pipelines. In the winter of 2017, the company’s flow assurance engineers observed an increase in the pressure drop for a 6- to 8-in trunkline connecting production from the Ptah Field to Khalda Petroleum’s processing facility in the Um Baraka (UMB) area. It was determined that wax precipitation was leading to deposition in the pipeline, which was proved through modeling.

To manage the wax buildup in the pipeline, the company used wax inhibitor chemicals, but ultimately decided that chemicals alone would not be a sustainable long-term solution. Therefore, the company chose to evaluate two options: wax mitigation with pigging and wax prevention with heating stations. Khalda Petroleum selected Schlumberger software to provide a solution that would be both cost effective and meet its long-term flow assurance objectives for the trunkline.

**Input**

- Fluid compositions
- PVT measurements
  - Viscosity
  - Wax characterization
  - Wax content
  - Cloud point and wax appearance temperature at ambient line conditions

**PVT Simulator**

**Tuning (Regression)**

- Updated component properties
- Updated wax model parameters

**Result**

- Equation-of-state characterization (compositional) model
- Matched wax model

Fluid characterization performed by the Schlumberger and Khalda Petroleum teams for integration with the OLGA simulator to model wax deposition in the trunkline.

“Using the OLGA simulator has been crucial to study different options to manage the wax deposition in Ptah-UMB trunkline. This helped us to make the right decision with USD 2 million of saved annual opex.”

Mohamed Gad Allah Mahmoud
Surface Engineering Assistant General Manager
Khalda Petroleum Company
**CASE STUDY:** Khalda Petroleum saves more than USD 2 million with optimized pigging solution, Egypt

Comparison of pipeline heating and pigging for Ptah Field trunkline created using the OLGA simulator. These simulation graphs represent how an optimal pigging schedule removes wax buildup with similar effectiveness to heating stations.

### Evaluate an optimized wax mitigation solution

Fluid characterization was performed by the Schlumberger and Khalda Petroleum teams with a KBC Multiflash PVT simulator to model the precipitation of wax at flowing conditions of pressure and temperature. The fluid characterization was integrated with the OLGA simulator to model wax deposition in the pipeline, enabling the teams to match the field observations of pressure, temperature, wax depositional thickness, and wax amount in kilograms.

Once modeling of the current conditions in the trunkline was complete, pigging of the network was simulated with the OLGA simulator to investigate the optimal pigging schedule. From the simulation, the Schlumberger team optimized the pigging schedule for the summer and winter to keep the deposition layer thickness below the maximum allowed. This optimization not only reduced the amount of wax inhibitor chemicals that Khalda Petroleum needed to inject into the trunkline, but it also revealed significant cost savings by eliminating the need for heating stations.

### Reduced operating costs

Khalda Petroleum selected the optimized pigging schedule determined with the OLGA simulator over using heating stations for wax prevention. This approach will save the company more than USD 2 million per year in 2018 by eliminating the rental cost of the heating stations and the amount of wax inhibitor chemicals needed for the trunkline.

With the success of the OLGA simulator for the Ptah Field, Khalda Petroleum is using the simulator to evaluate wax management solutions for its other fields in the region to reduce operating costs and mitigate deferred production.