First integrated PIPESIM + Symmetry + MySep application in Kazakhstan enables digital optimization of the production and process systems

Bagdat Baidilda
Akimzhan Lukpanov
About KazGerMunay

Founded in 1988
Largest oil producer in the region

The “Digital Oilfield Project” developed in cooperation with Schlumberger in 2019

- 730+ Total staff
- 53% ORI
- 6 Oil and gas fields
- 3 Mn tons Peak oil production
Problem Definition

To identify potential bottlenecks associated with increased produced water in Year 2025

To propose the retrofit options for the oil/water separators to improve performance

To calculate the capacity of the separators at maximum water cut

Jan-Apr 2020 - Model all three facilities in Symmetry based on plant data

May-June 2020 - Identify bottlenecks & propose solutions

Aug-Sep 2020 - Integrate PIPESIM & Symmetry

Sep-Oct 2021 - Integrate MySep & Symmetry

May-June 2022 - Finalise Separator Upgrades
Methodology

Create the most advanced fluid characterization technology for the hydrocarbon industry from reservoir to facilities

Unify fluids simulation technology within Schlumberger
Results – MYSEP & Symmetry Integration

<table>
<thead>
<tr>
<th>Performance Measures</th>
<th>Base Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure drop across the vessel (mbar)</td>
<td>38</td>
</tr>
<tr>
<td>Oil in water removal d100 (micron)</td>
<td>104</td>
</tr>
<tr>
<td>Oil in water carryunder (liter/hr)</td>
<td>1230</td>
</tr>
<tr>
<td>Oil in water concentration (% v/v)</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Well Fluids

Bend

Baffle

Pack Coalescer

String Type Demister

Gas + mist

Weir

Water

Oil

Schlumberger Digital Forum 2022, 19-22 September, Lucerne, Switzerland
As built

1369 liters/day
Oil in water

$\approx 845$
Loss/day

$\approx 0.270^{\text{MM}}$
Annual loss

Results

From PIPESIM

Oil in water

Loss/day

Annual loss

Oil Recovery

0.97 m$^3$/hr

Oil Recovery

0.2 m$^3$/hr

Oil Recovery

0.057 m$^3$/hr

Oil in water

Loss/day

Annual loss

Oil Recovery

0.97 m$^3$/hr

Oil Recovery

0.2 m$^3$/hr

Oil Recovery

0.057 m$^3$/hr

Schlumberger Digital Forum 2022, 19-22 September,
Lucerne, Switzerland
## Results – MYSEP & Symmetry Integration

### Well Fluids
- **Vane Type**
- **Baffles**
- **Pack Coalescer**
- **Weir**
- **Mesh Pad**

### Gas + mist

### Water

### Oil

**As built**
- Bend
- Pack length - 750 mm
- String Type

**Retrofit**
- Vane Type
- #baffle-1
- Pack length - 2000 mm
- Mesh Pad

**Performance Measures**

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Optimized Case 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure drop (mbar)</td>
<td>38</td>
<td>14</td>
</tr>
<tr>
<td>Oil in water removal d100 (micron)</td>
<td>104</td>
<td>42</td>
</tr>
<tr>
<td>Oil in water carryunder (liter/hr)</td>
<td>1230</td>
<td>120</td>
</tr>
<tr>
<td>Oil in water concentration (% v/v)</td>
<td>0.74</td>
<td>0.07</td>
</tr>
</tbody>
</table>

**Schlumberger Digital Forum 2022, 19-22 September, Lucerne, Switzerland**

8
Conclusions from the Project

- The MySep model is able to accurately represent the present-day operation of the separator.
- The proposed modifications are expected to allow for management of increased produced water.
- The MySep model can be modified by the Client to utilise the model serve as a predictive tool for future scenarios.
- Integrated modeling maintains asset integrity.
- The proposed modifications extend field life and enable Client to achieve their production objectives.
- Integrated modeling is essential to avoid un-planned shut-down.
- Integrated modeling helps to optimize operations to meet business targets.
Benefits Analysis

Retrofitting the separator

- **3 months** Payback period
- **$250,000** saved during the first year
- Eliminating the need in additional tank
- Better decision making on future investments
- Integrated view of the facility
- Achieving production objectives
- Improved oil recovery = more profit $

Eliminating the need in additional tank
Full management and execution of technical work and associated deliverables

- Attended site visit and collected DCS data
- Data collection

- Modelled Plant Operations in Symmetry
- Modelling

- Integration of PIPESIM, and Symmetry and MySep
- Integration

- Site interfacing
- Daily discussions with field operators

- Analysis
  - Identify Bottlenecks
  - Propose Solutions
  - Prepare technical presentation

- Project deliverables
  - Final report
  - Presentation
Q&A Session