Static Mixer Assessment
Laboratory Testing

MEAS-6-16, PR-015-17604
February 7, 2019
Outline

- Objective
- Testing Approach
- Current Status
- Path Forward and Project Schedule
Objective

- Determine the mixing and stratification effects of different static mixer designs to ensure that effective mixing of the fluid streams is occurring.

- Determine acceptable distances between the static mixer and the sampling point.
Testing Approach

- Initiated a testing effort to study the mixing capabilities of two different static mixers and sampling locations
- Using a steady stream of oil with predefined water content

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RANGE/VALUE</th>
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<tbody>
<tr>
<td>Number of Static Mixers</td>
<td>Two</td>
</tr>
<tr>
<td>Nominal Line Size</td>
<td>10-inch, Sch. 40</td>
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<tr>
<td>Bulk Liquid Velocity</td>
<td>0.5 m/s</td>
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<tr>
<td>Oil Viscosity</td>
<td>3±2 cSt, 400±100cSt</td>
</tr>
<tr>
<td>Water Cut (WC)</td>
<td>1±0.1% and 10±1%</td>
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<tr>
<td>Water Injection Point</td>
<td>3D upstream of the static mixer inlet flange; injection at the bottom of the pipe</td>
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<tr>
<td>Number of Sample Points for the Multitube Probe</td>
<td>Three (1.1D, 5D, and 7D)</td>
</tr>
<tr>
<td>Elevations of Sample Points</td>
<td>• ¼D from the top of the pipe</td>
</tr>
<tr>
<td></td>
<td>• Centerline</td>
</tr>
<tr>
<td></td>
<td>• ¼D from the bottom of the pipe</td>
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</table>
Current Status

- Finished testing with the two static mixers with high viscosity oil 3±2 cSt with the 1% and 10% water cut.

- The final report for the low viscosity testing was revised and submitted to PRIME in January, 2019.

- Currently procuring items for testing the static mixers with the high-viscosity oil (400±100 cSt) at SwRI’s High-Viscosity Flow Loop (HVFL) facility using a single-pass (once-through) mode.

- Anticipated test start in July 2019
Path Forward

Based on lessons learned from previous test attempt, SwRI will be:

- Purchasing additional high-viscosity fluid to ensure sample collection can be accomplished based on the flow rate and amount of total fluid in use.

- Purchasing a larger discharge tank for the test fluids.

- Adding a valve to flow line to increase back pressure allowing adequate sample collection in the allotted flow time.

- Removing the needle values on the sample lines. There is still a ball valve for fluid control for sample collection, but the needle valve was preventing an adequate sample from being drawn in the time available when used with the high viscosity oil.
Project Schedule - Key dates

- Approximate Test Schedule
  July 1-9 – Experimental setup
  July 10-24 – Testing
  July 29 - Samples sent to analysis lab.

- Reporting:
  October 4 – Submit draft final report
  December 2 – Submit final report