6-in. Low Pressure Large-Diameter Pipeline

This facility operates with gas/oil/water and has been designed to study low liquid loading effects on multiphase flow phenomenon in horizontal and/or near horizontal pipelines with large pipe diameters.

Key Specifications

Fluids

Gas: Air  
Water: Tap Water  
Oil: Mineral Oil

Operating Conditions

- Maximum Pressure: 30 psig  
- Temperature: Ambient  
- Gas Flow Rate: 0 to 1.5 MMSCFD (Superficial Gas Velocity – 0 to 89 ft/s)  
- Water Flow Rate: 0 to 380 BPD (Superficial Liquid Velocity – 0 to 0.11 ft/s)  
- Oil Flow Rate: 0 to 380 BPD (Superficial Liquid Velocity – 0 to 0.11 ft/s)

Test Section

- Pipe Material: Carbon Steel / Acrylic  
- Diameter of Pipe: 6 inch  
- Test Section: 185.0 ft (370 D)  
- Inclination Angles: -2 to 2 degree

Instrumentation and Flow Characteristics

<table>
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<th>Measured Parameters</th>
<th>Instrumentation</th>
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| Liquid Holdup           | • Quick Closing Valves  
|                         | • Wire Mesh Sensor                                   |
| Flow Pattern            | • Hi-speed Camera  
|                         | • Wire Mesh Sensor  
|                         | • Visual Observation                                  |
| Pressure Gradient       | • Differential Pressure Transducer                  |
| Wetted Wall Fraction    | • Measuring tape  
|                         | • Wire Mesh Sensor                                   |
| Liquid Film Height      | • Wire Mesh Sensor  
|                         | • Capacitance / Conductivity Probe                  |
| Entrainment             | • Iso-Kinetic Sampling Probe                        |
Detailed Specifications on Liquid and Gas Supply Systems

Air Compressor
Compressor 1: (Single stage) Diesel powered portable rotary screw
Compressor 2: (Dual stage) Electrical powered, stationary
Flow Rate: 2640 SCFM
Discharge Pressure: 100 psig

Gas Flow Meter
Model: CMF300
Nominal Mass Flow Rate: 136,080 kg/h
Max. Mass Flow Rate: 272,160 kg/h
Measurement Uncertainty: ±0.35% of Flow Rate

Oil Pump
Model: Moyno Progressing Cavity Pump
Discharge Rate: 6800 BPD
Suction Diameter: 4 inches
Discharge Diameter: 4 inches

Oil Flow Meter 1
Model: CMF100
Nominal Mass Flow Rate: 13,600 kg/h
Max. Mass Flow Rate: 27,200 kg/h
Measurement Uncertainty: ±0.35% of Flow Rate

Figure 1: Schematic of 6-in. Low Pressure Large-Diameter Pipeline Flow Loop
Figure 2: Sample Schematic of Test Section using Wire Mesh Sensors and Flow Visualization Box

Figure 3: Side View of Low Pressure Large-Diameter Pipeline
Figure 4: Top View of Low Pressure Large-Diameter Pipeline