Fluid Flow Projects

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

Measured Parameters	Instrumentation
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

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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

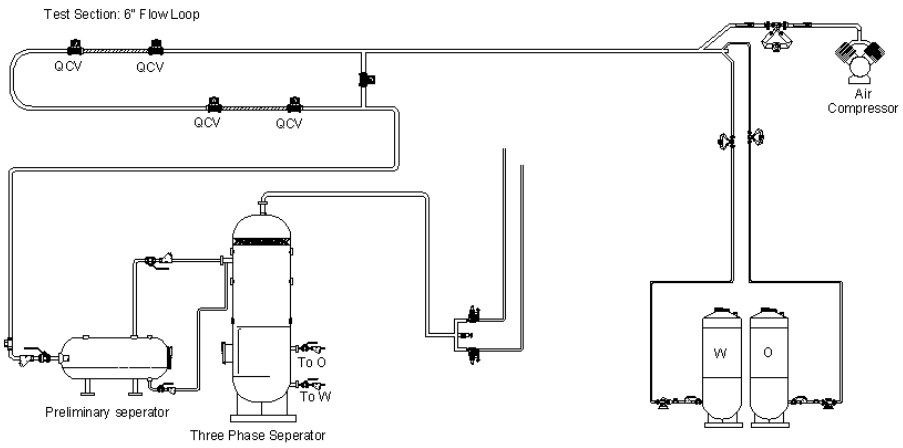

Figure 1: Schematic of 6-in. Low Pressure Large-Diameter Pipeline Flow Loop

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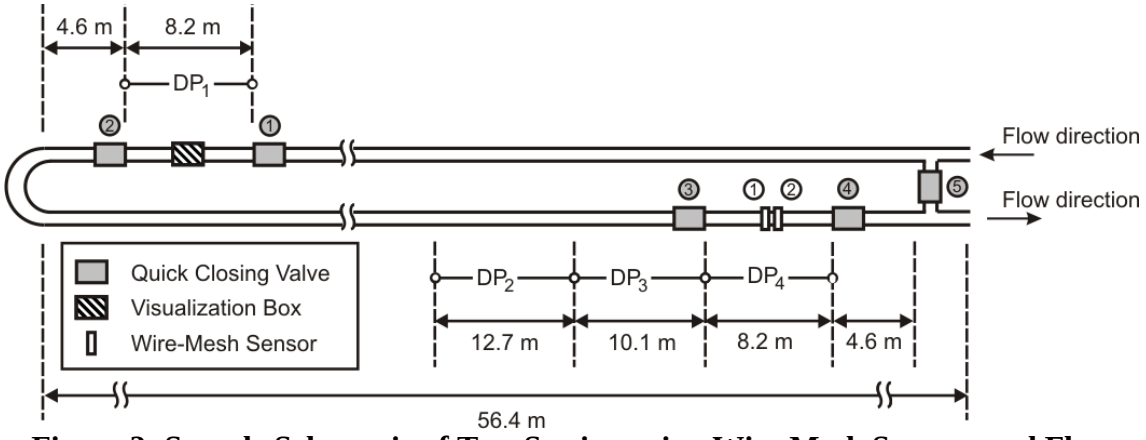

Figure 2: Sample Schematic of Test Section using Wire Mesh Sensors and Flow Visualization Box

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

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

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