



2-in. Horizontal Well Experimental Facility

This facility operates with gas/water and has been designed to study the effects of well trajectory on flow behavior for horizontal gas and condensate wells. Several well configurations can be simulated in this facility such as toe-down, toe-up, hilly terrain-sump and hilly terrain-hill.

Key Specifications

Fluids

Gas: Air

Water: Tap Water

Operating Conditions¹

Maximum Pressure: 30 psig

Temperature: Ambient

Gas Flow Rate: 0 to 0.16 MMSCFD (Superficial Gas Velocity – 0 to 85.3 ft/s)

Water Flow Rate: 0 to 77 BPD (Superficial Liquid Velocity – 0 to 0.25 ft/s)

¹Operating conditions are given and are subject to change depending upon the project

Test Section

Pipe Material: Acrylic

Diameter of Pipe: 2-in.

Total pipe length: 103.6 ft (622 D)

Test Section: 62.6 ft (376 D), lateral section and curvature
41 ft (246 D), vertical section

Developing Region: 23.8 ft (143 D) at the toe of the well

Inclination Angles: -3 to 3 degree

Maximum number
of undulations: 2

Instrumentation and Flow Characteristics

Measured Parameters	Instrumentation
Liquid Holdup	<ul style="list-style-type: none"> • Quick Closing Valves • Conductivity Probes • Wire Mesh Sensor



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Flow Pattern	<ul style="list-style-type: none"> • Surveillance Camera • High speed Camera • Wire Mesh Sensor
Pressure Gradient	<ul style="list-style-type: none"> • Differential Pressure Transducer
Liquid Film Reversal Detection	<ul style="list-style-type: none"> • High speed Camera • Salt Injection and Dye + Conductivity Probes
Slug Flow Characterization (translational velocity, slug length and frequency)	<ul style="list-style-type: none"> • Conductivity probes
Severe Slugging Characterization (Cycle duration, slug frequency and maximum expected pressure)	<ul style="list-style-type: none"> • Pressure transducers

Detailed Specifications on Liquid and Gas Supply Systems

Air Compressor

Model: (Single stage) Sundyne BMC-343 EF
 Power: 298 kW (400 HP) supplied by Kohler power generator
 Flow Rate: 19 MMSCFD
 Discharge Pressure: 500 psig
 Suction Pressure: 400 psig

Gas Flow Meter

Model: Promass 83 (83F08)
 Max. Mass Flow Rate: 42.3 kg/h
 (calculated using gas density at standard conditions)
 Measurement Uncertainty: $\pm 0.35\%$ of Flow Rate

Water Pump

Model: Leroy Somer Centrifugal Pump
 Suction Diameter: 1-1/2 inches
 Discharge Diameter: 2 inches
 Max. Discharge Pressure: 100 psi
 Min. Discharge Pressure: 10 psi

Water Flow Meter

Model: Promass 83 (83F25)
 Max. Mass Flow Rate: 18000 kg/h
 Measurement Uncertainty: $\pm 0.15\%$ of Flow Rate



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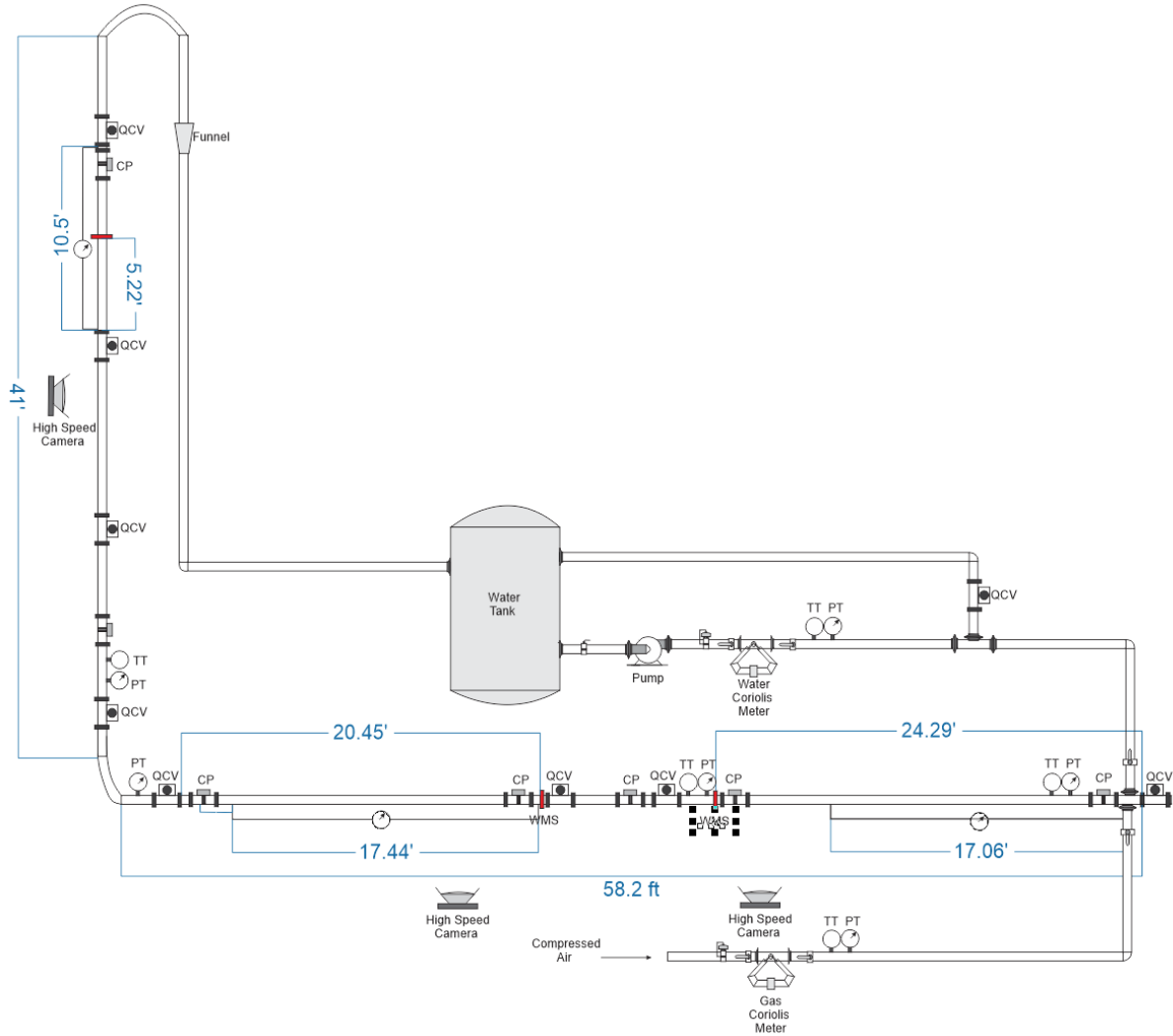


Figure 1. Schematic of 2-in. Horizontal Well Facility

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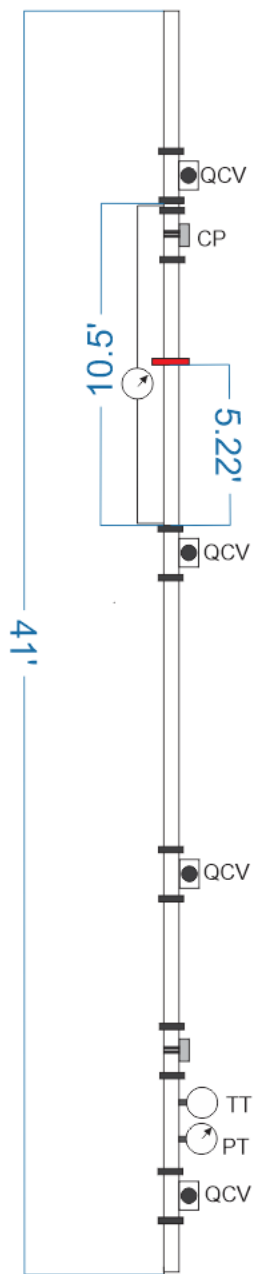


Figure 3. Schematic of 2-in. Horizontal Well Facility – Vertical Section



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Figure 4. 2-in. Horizontal Well Experimental Facility



Figure 5. Curvature Section

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Figure 6. 2-in. Horizontal Well Experimental Facility

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