



SOUTHWEST RESEARCH INSTITUTE



Multiphase Flow Facility

Southwest Research Institute® (SwRI®) has a long track record of providing multiphase flow research and testing services to the oil and gas industry. SwRI offers unique facilities and capabilities to help oil and gas companies advance the technology required for topside and subsea applications.

Facility Capabilities

Fluids

- Natural gas, nitrogen
- Crude oil, condensate, refined oil
- Fresh water, saltwater
- Oil and water combined
- Chemical injection

Operating Conditions

- Pressure: 100 psig to 3,600 psig
- Temperature: 40°F to 120°F
- Gas volume fraction: 0% to 100%
- Water cut: 0% to 100%

Instrumentation

- Various gas and liquid reference meters
- Temperature, pressure, differential pressure
- Gas volume fraction (GVF)
- Water cut
- Deposition and holdup monitoring by gamma ray densitometer
- High-pressure flow visualization

Flow Rate Range

- Total volumetric rate limited to 1.8–2.4 acfs (combined gas and liquid), depending on test section DP
- Potential for expanding volumetric capacity to ~5 acfs with upgrades
- Liquid flow rates up to 32,000 bpd

Research Areas

Multiphase Flow

- Characterization
- Hydrodynamics
- Modeling

Equipment Testing and Qualification

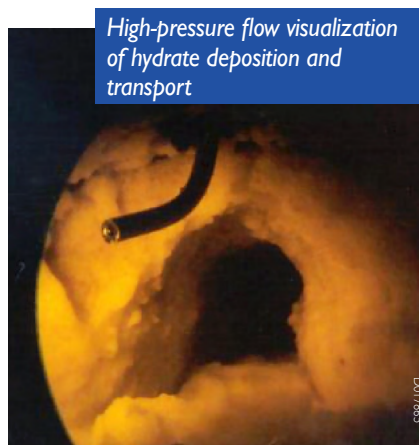
- Multiphase/wet gas meters
- Sampling systems
- Multiphase pumps
- Gas-liquid separators
- Phase fraction instrumentation

Flow Assurance

- Hydrate
 - Agglomeration/deposition
 - Plug removal techniques
 - Transport
- Wax deposition
- Gelled crude oil yield strength



Gas-liquid separator performance evaluations at high pressure



High-pressure flow visualization of hydrate deposition and transport



Cone meter testing under wet gas conditions

High-Pressure Multiphase Flow Loop Configurations

Customized test sections are assembled using 1-inch to 5-inch nominal pipe sizes of various lengths. Some possible system configurations include:

- **Standard**

Gas and liquid phases metered independently and combined upstream of test section. Available conditions include gas flow rates to 2.4 acfs, liquid rates to 32,000 bpd, and test section differential pressures to 100 psi.

- **High DP**

Test section differential pressures up to 200 psi at flow rates up to 1.0 acfs (gas and liquid combined). Typical projects include hydrate formation and dissociation studies requiring large pressure differentials.

- **Submerged Pipe**

Specialized test section submerged in water bath. Typical projects include flow assurance and inhibitor testing and gel strength estimation, and subsea equipment evaluation.

- **Inclinable Test Section**

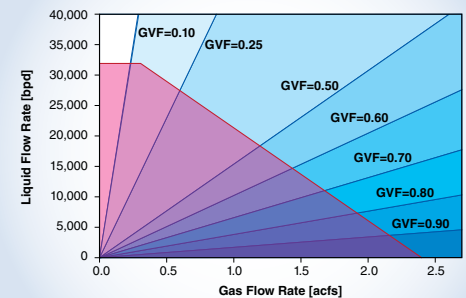
216-ft-long test section with variable inclination angle from 0° to 90°. Test sections can be customized to meet specific test needs with flexibility for facility modification.



Downhole multiphase flow meter installed on an inclinable test section



High-pressure Multiphase Flow Loop with 3-phase (oil/water/gas) field-like multiphase and wet gas conditions



Combined flow rates of gas and liquid constrained within the total volumetric limit of 2.4 acfs

We welcome your inquiries.
For more information, please contact:

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SOUTHWEST RESEARCH INSTITUTE

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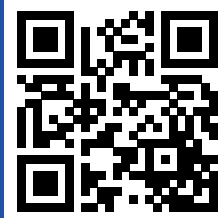
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