



SOUTHWEST RESEARCH INSTITUTE



High-Viscosity Flow Loop

Heavy oil has become a significant part of natural energy resources worldwide. As new production and transport methods are developed, better understanding of flow equipment performance at these extremely viscous conditions is required. The Southwest Research Institute® (SwRI®) High-Viscosity Flow Loop (HVFL) was developed to provide real-world operational test data to meet this industry need.

The HVFL is a highly configurable facility that can provide accurate fluid viscosity and flow rate control to test equipment. The test facility layout follows general recommendations given in testing standard HI 3.61 (Hydraulic Institute (HI), *Rotary Pump Tests*, ANSI/HI 3.6, 2010) for testing electric submersible pumps. The facility provides controlled, repeatable conditions and an opportunity for well-instrumented assemblies, which is not possible in the field.

Testing Capabilities

- Multistage electronic submersible pump (ESP) performance verification
- Liquid-liquid separator performance
- Static mixer evaluation
- Flow meter evaluation
- Flow vs. pressure drop determination at viscosity (filter media, nozzles, etc.)
- Fluid characterization by SwRI's onsite laboratories
- Custom test assemblies

HVFL Operational Envelope

Nominal conditions:

- Flow Rate Range: 5 – 1300 gpm
- Viscosity Range: 1 – 4300 cP, using refined oils
- Temperature Range: 50 – 125°F, at test equipment inlet
- Pressure Range: 5 – 125 psig at test equipment inlet, up to 750 psig at test equipment outlet

Extended conditions are available with facility modifications.

Benefits to Industry

- Data generated can be used to validate or improve hydraulic models by providing enhanced viscosity correction factors.
- Equipment performance is confirmed for end users at field-like conditions.
- Equivalent flow conditions are provided between various equipment models.



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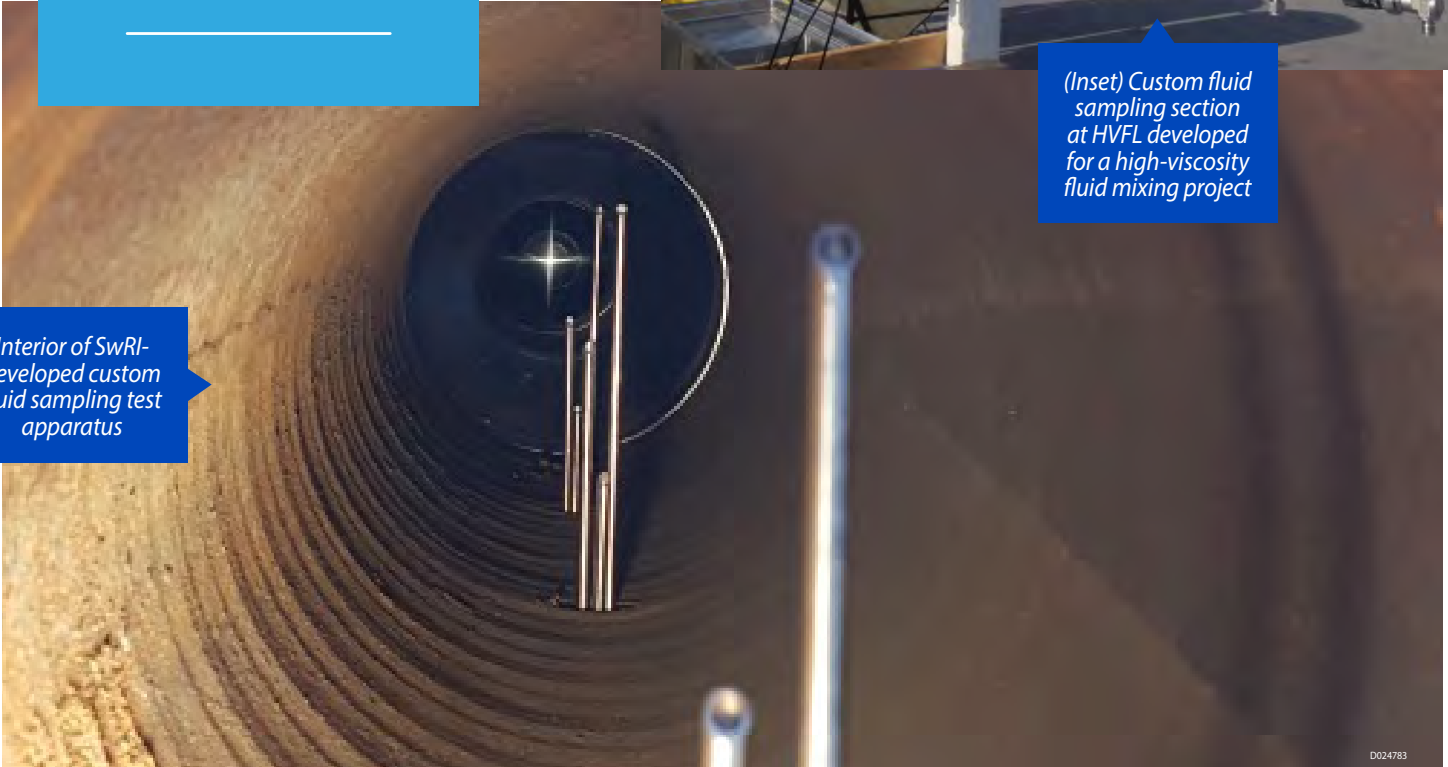
Installation at HVFL for an ESP test

SwRI is governed by a confidentiality policy that protects client names, results, and other information obtained in connection with the work performed.



(Inset) Custom fluid sampling section at HVFL developed for a high-viscosity fluid mixing project

Interior of SwRI-developed custom fluid sampling test apparatus



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