Syringe Pump Factory Acceptance Testing Review

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MERIT VRVS Meeting
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Acceptance Testing of Syringe Pump Completed

- Factory acceptance testing of syringe pump completed March 30 at Airline Hydraulics Corp (AHC) Bensalem, PA facility

- Test plan consisted of demonstrating
  - Manual syringe control with on-board controls
  - Remote control using mockup hardware (no Labview)
  - Proper sensor feedback (cylinder position, hydraulic pressure, hydraulic pump protection system)
  - Nominal piston velocity with prototypic backpressure resistance
  - 100-cycle "infant mortality" test
Testing Setup

- System tested using water as Hg substitute
- Backpressure simulated using adjustable orifice
  - Pressure gage provided adjustment feedback
- Flowmeter measured consistency of discharge (and piston velocity)
- Water drawn from bottom of barrel through checkvalve, discharged through orifice & flowmeter to top of barrel
Performance Results

• Syringe operation very smooth & controllable

• Demonstrated ability to pump against design backpressure of 1500 psi

• Problem noted: output flow varied with changing backpressure (simulated different field conditions)
  – AHC assumed backpressure depended only on downstream piping & nozzle and would be constant
  – Solution: AHC will add pressure compensator to flow control valve
Materials Problem Noted

- All cylinder surfaces tested with small magnet
- Drive cylinder tie rods (8X 1" dia, 26" long) were found to be magnetic
  - Cylinder manufacturer (Hanna) used SS 17-4PH because of tension loads exceeded strength of SS316
- Solution: Nitronic50 tie rods will be substituted by Hanna at no-cost, replaced at AHC one-at-a-time to eliminate need for system disassembly by Hanna
Follow-on Work

- Testing resulted in "punch list" of items for completion
  - Extend signal wiring to terminal strip accessible by Labview control system
  - Perform lift test of pump system, obtain weight
  - Add pressure compensator module & retest
  - Disassemble system and paint frame
  - Etc

- New scope added to AHC contract to provide sump tank and associated piping
  - Materials being ordered
  - Estimated completion mid-May
Conclusions

- Syringe pump system operation successful
  - Cylinders very controllable
  - No fluid leaks observed
  - All system protection devices successfully demonstrated

- Anticipate no major issues controlling system remotely
  - Labview system development continuing

- Delivery of completed system expected mid-May