



Taha Kimia Tajhiz Co.



Core Lab

Mixing Unit with Shear Loop and Pipe Rheology System, MU-SH100 & PR-100 Datasheet

Drilling & Stimulation Properties

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Mixing Unit with Shear Loop and Pipe Rheology System, MU-SH100 & PR-100

This system is designed to evaluate the rheological properties of completion and fracturing fluids. This is carried out by mixing the completion fluid or fracture gel in the paddle stirrer tanks and then pumping a through a heated shear loop to condition the fluid and simulate down hole conditions. The fluid/slurry is then pumped through a series of pipes to measure the shear stress exhibited by the fluid/slurry at different shear rates. Using this shear stress vs. shear rate data the rheological properties of the slurry can be determined (n' , k' , apparent viscosity). Following the determination of the rheological properties with the Pipe Rheometer, the fluid/slurry is then either disposed of or used in ancillary experiments. After measurement in the system the exiting fluid can be returned to the mixing tanks or used in experiments in the RPTA or AFCS systems.



Mixing System – comprising 50 gallon lidded plastic tank complete with centrifugal feed pump, paddle stirrer and associated tubing, valves and fittings.

Pumping System - comprising a Primary Pressure Pump fed by the Mixing System Pump a Cross Linking pump allows introduction of the cross linking agent to the fluid exiting the Primary Pump. The Pressure Pump can deliver gel at up to 1,000 ml per minute and a maximum pressure of 4,800 psi. The Cross Linking Pump injects fluid at a variable rate of 5 ml per minute up to 120 ml per minute.

Heated Well Bore Shear Rate Simulator - to simulate high shear well bore environment and to raise fluid temperature from ambient to a maximum of 300 °F. A shear rate of 1,500 reciprocal seconds has been selected to represent the most common rate seen in operations however customized shear loops are available as a factory installed option. The length of the shear loop can be



manually adjusted to allow variable residence times of 1 minute, 2.5 minutes or 5 minutes.

Heated Fracture shear Simulator – to simulate the shear forces a completion fluid would experience as it progresses down the length of the fracture. To accomplish this a shear rate of 80 reciprocal seconds has been selected as most representative of the actual reservoir conditions. Residence time for the fluid is fixed at 5 minutes with temperature of up to 300 °F obtainable.

Modular Pipe Rheometer - comprising 4 varying diameter straight tubing with digital gage and differential pressure transducer array. Complete with oil bath heating system to maintain system temperature.

Cooling Loop and Back Pressure System - to cool fluid to below 212 °F before exiting the system and to maintain system pressure during the rheological measurements.

Data Acquisition System - PC based system with USB 2.0 data acquisition and minimum workstation with PC, Dual 21 inch LCD Monitors, 1GB RAM, 520GB Hard Drive, CD/DVD RW with Microsoft Windows Operating System. Custom inter-active graphics based control software allows for the control and operation of the system whilst monitoring and recording all pressure, temperature, flow rate. On screen custom graphing of data is accomplished through the inter-active program interface. From the flow rate, differential pressure and the diameters and lengths of the four pipes shear stress of the fluid is calculated along with the shear rate in each tube. The viscosity of the fluid at each shear rate is then displayed real time.

Note: Pipe Rheometers are available to cover the full range of fluids encountered in completion and stimulation studies. A number of set ups may be required to cover the range anticipated in a particular laboratory and can be easily substituted into the system.