Servicios Petroleros ZV

INFORMATION

MTE-LARGE SCALE PIPE VISCOMETER

MODEL No. ST-002

DESCRIPTION

The efficiency of a fracturing fluid application begins with the correct design and engineering of the treatment. There are many engineering/computer models available to the industry today for predicting two-dimensional and three-dimensional fracturing, but these models are only as accurate as the data that is fed into them.

The MTE laboratory scale equipment is used to measure the rheological properties of fracturing fluids for the research and development of new and improved additives and systems. Data extracted from these units can be used to design stimulation treatments. However, when engineering the treatment using lab scale data, a tremendous scale-up factor must be used to equate shear rate, shear stress, apparent viscosity, etc. data measured through a capillary tube over a short distance to actual rates and stresses encountered during an application through large I.D. tubing or casing at high rates, and for long periods of time.

Statistics show that when a scale-up factor is used in the engineering design, the chance of design error increases with the magnitude of the scale-up factor. The most accurate data is acquired from actual monitoring of field applications. However, this process is extremely time consuming and very expensive.

Messina has custom designed and engineered large scale pipe viscometers and field simulators capable of more closely simulating field applications to provide the operator with engineering data which requires a much smaller scale-up factor. Data extracted from these units provides an accurate and economical means of producing an optimum fracturing fluid design and application.

Monterrey, Nuevo León.
Tel +52 811.931.1102
info@sepezv.com

The MTE Pipe Viscometer and Field Simulator consists of three component networks which are inter-connected to build a large scale apparatus capable of measuring friction pressures, slip coefficents, fluid stability, rheological behavior, etc, at critical velocities to aid in the calculation of optimum pump rates, and to determine the efficiency of a fracturing fluid system. Each network, and some of the features of each network are summarized as follows.

FLUID MIXING AND DELIVERY SYSTEM

Three mix tanks are contained in this network. The base fracturing fluid is mixed in a five barrel, lined tank using a lightning mixer. The base fluid is then discharged by a Moyno pump capable of delivering a rate of 65 GPM. The liquid additive base package is placed in a one barrel, lined mix tank and metered into the flow lines using a precision metering pump. At the same time, a crosslinking agent or special reactive solution is metered into the flowline from a 25 gallon, lined mix tank using a precision metering pump. Each pump is specially designed to deliver the fluids and additives at rates and concentrations typical of the majority of system designs used in fracturing applications by the industry.

The three phases are mixed downstream of the tanks using a hi-shok, in-line static mixer. The finished fracturing fluid is then injected into the history simulator

HISTORY SIMULATOR

The history simulator consists of two coils of 1/4" tubing (100 ft. total length) submerged in a high temperature bath capable of heating the test fluid to temperatures up to 350°C. Digital pressure transducers are mounted at 50 ft. intervals to measure the pressure drop across each section. Magnetic flowmeters are used to measure the velocity of the fluid at the discharge side of the coils. The data is fed into a dual channel data recorder for calculations. This network is designed using a loop, thus fluid can be either 1) transmitted through the simulator and into the pipe viscometer tubes, 2) transmitted through the simulator and returned to the mixing tanks for continuous shear monitoring, and/or 3) allowed to bypass the simulator for non-disruptive measurement of the rheological properties using the pipe viscometers.

PIPE VISCOMETERS

The pipe viscometer assembly consists of 3 jacketed and multi-ported, polished and micrometered tubes, each 20 ft. in length. The tubes are 1/2", 3/4", and 1" I.D. and are equipped with dampening chambers on each end to buffer the end effects of the fluids as they are transmitted through the pipes. The insulated jackets are heated with the oil from the heater bath, which is pumped through the jackets in a closed loop fashion.

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Each tube is equipped with a saddle mount, zero restriction, magnetic flow meter, thermistor temperature sensors, and digital differential pressure measuring and recording instruments. The data is fed into a multi-channel data logger for calculations.

Each network is designed for single pass or continuous cycle measurements, thus the rheology can be continuously monitored over a period of time under continuous or changing shear, and at temperature.

The scaling factors using 1/2" to 1" I.D. viscometer tubes, are much more accurate and reproducible, and afford a much more efficient fracturing stimulation design.

The unit is shipped in component parts. Some assembly is required at location. The apparatus occupies approximately 175 square feet of lab floor space. Compressed air or nitrogen, water, and electricity 230V, 50 Hz (for export) are the utilities required for operation. The unit is export crated. The shipping weight is approximately 7,000 lbs. Each unit is individually manufactured to exact specifications. Allow 8-10 months delivery to FOB port.

Unit comes complete with installation, operational, and maintenance instructions, and a supply of spare parts for normal operation. Additional spare parts are available through Messina Incorporated.

MTE- LARGE SCALE PIPE VISCOMETER is a Messina trademark

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