

**OFITE**

**MODEL 230**

**SINGLE CELL**

**ULTRASONIC**

**CEMENT ANALYZER**

**MANUAL**

## **OPERATING INSTRUCTIONS**

### **OFITE MODEL 230 ULTRASONIC CEMENT ANALYZER**

#### **GENERAL**

The OFITE Ultrasonic Cement Analyzer was designed to estimate the compressive strength of well cements under simulated downhole conditions. Its main usage is to estimate the time required for a cement to develop compressive strength and it is also used as a quality control device to compare well cements. The Model 230 is fully capable of testing cements in strict accordance to the guidelines as listed within API Specification 10.

#### **DESCRIPTION**

The primary component of the Model 230 is the high pressure test cell which is machined from a solid piece of hardened steel alloy. The test cell caps are sealed via traditional "O" rings.

A mixed cement is poured into the test cell and the top cap is screwed in place. Ultrasonic transducers are then attached to the end caps of the test cell with high temperature vacuum grease

The temperature of the slurry is maintained by a microprocessor based temperature controller. The heating jacket uses band heaters and the temperature of the slurry is measured via an internal thermocouple assembly.

Pressure is maintained by the use of an air driven, hydraulic pump which utilizes water as the pressurizing medium. The pressure is measured via a pressure gauge in units of PSI.

As the cement is heated the ultrasonic transducers measure the transit time it takes for the wave to propagate through the sample. This data is then interpreted with correlations that have been developed in the laboratory to estimate the compressive strength of the cement.

Upon termination of a test, the cell can be easily cooled by use of the coolant system. The system uses water as the cooling medium and is controlled by an electric solenoid.

## **INSTALLATION**

1. Carefully remove the instrument from the wooden crate.
2. An air or nitrogen (100-120 psi) supply should be connected to the air supply on the back of the instrument.

PLEASE NOTE THAT THE UNIT UTILIZES 1/4 INCH NPT FEMALE CONNECTORS FOR ALL SUPPLY LINES.

3. The drain and coolant supply lines should be connected in similar manner.
4. Ensure that all electrical switches are in the "OFF" position and make the necessary electrical connections in accordance to local codes. Ensure that the unit is grounded.
5. Unpack the computer system and connect it to the unit via the serial cable provided.

## **PERFORMING A TEST**

1. Before starting a test turn all electrical switches to the "OFF" position, close all valves and turn all regulators counter-clockwise.
2. Turn the "MAIN" switch to the "ON" position
3. Fill the test cell as outlined below.

## **FILLING THE TEST CELL**

1. To assist with the removal of set cement lightly coat the inside of the test cell and the wetted parts of the end caps with a high temperature, waterproof grease. It is recommended to lightly grease the "O" rings on a periodic basis.
2. Prepare the cement slurry as stated within API Specification 10.
3. Replace the bottom cap and pour cement into the cell until it comes to within 1/8" inch of the fill line. Then add water until it reaches the fill line. It is helpful to tap the side of the test cell while filling to remove any entrained air. Re-attach the top cap.
4. Wipe the test cell clean to remove any cement on its exterior.
5. Apply a small amount of high temperature vacuum grease to the ends of the ultrasonic transducers.
6. Place the test cell into the heating well insuring that the bottom transducer is firmly attached to the end of the cap.

7. Attach the pressure fill line and tighten with a wrench. Insert the thermocouple in the remaining pressure port and tighten finger tight and then back off ¼ turn. Attach the thermocouple cable.

## **TEMPERATURE CONTROLLER**

The temperature controller utilizes a high alarm set point which will bring the unit to an alarm condition if the temperature ever exceeds this value. An alarm condition is evidenced by the illumination of the "1FSH" annunciator blinking in the display.

**If the slurry thermocouple is unplugged an alarm condition will occur and the unit cannot be pressurized or heated.**

To adjust the high alarm set point perform the following.

1. Place the controller into the "OPERATOR" level and access the "AL" menu. Using the "SCROLL" key access "AL1".
2. Use the "?" and "?" keys to adjust the high alarm set point to the desired level.
3. Wait approximately 10 seconds and the controller will automatically return to the normal display mode.

## **APPLY PRESSURE TO THE TEST CELL**

1. Switch the "WATER SUPPLY" valve to the "ON" position. When all air is expelled from the test cell and water flows from the thermocouple fitting tighten it with a wrench.
2. Turn the "BACK PRESSURE REGULATOR" clockwise approximately four or five turns.
3. Switch the "AIR SUPPLY" valve to the "ON" position and turn the "PUMP" switch to the "ON" position.
4. Turn the "REGULATOR" clockwise until the desired pressure is obtained.

**NOTE THAT SETTING THE BACK PRESSURE REGULATOR IS A TRIAL AND ERROR PROCEDURE. YOU SHOULD ALWAYS ADJUST THE INITIAL PRESSURE SLIGHTLY HIGH AND THEN USE THE BACK PRESSURE REGULATOR TO REDUCE IT TO THE DESIRED PRESSURE.**

The purpose of the back pressure regulator is to maintain uniform pressure by automatically bleeding the system due to the increase of pressure from thermal expansion.

## **APPLY HEAT TO THE TEST CELL**

The Eurotherm Model 2408 is the most important component of the temperature control system and it is strongly recommended that operators carefully study the Model 2408 instruction manual to learn the features of the controller. Of particular importance to the operator are the sections which entail programming temperature profiles and running programs.

1. Program the temperature profile you wish to perform into the Model 2408 Controller.
2. To begin heating the system turn the "HEATER SWITCH" to the "ON" position and push the "RUN" button on the controller.

**As the vessel heats up the pressure will try to increase due to the thermal expansion of the fluids. However, if the back pressure regulator is properly set it will prevent this from happening.**

## **DATA COLLECTION**

1. Turn the PC on and open the "UCA" software. Insert the file name you wish to use in the dialogue box.
2. At this point the instrument is essentially processing data and the transit time and the estimated compressive strength are displayed on the screen. Simultaneously it is storing the data in a spreadsheet format which can be plotted or printed in the format desired.

## **TERMINATION OF TEST**

1. After the cement has reached the desired compressive strength the PC can be turned off. In addition, the "PUMP" and the "HEAT" switches should be placed in the "OFF" position.
2. Immediately start the cool down procedure by turning the "COOLANT" switch to the "ON" position. **DO NOT** release the pressure until the temperature has been reduced to a minimum of 200 degrees F.
3. Switch the "WATER" and "AIR" supply valves to the off position.
4. After cooling to less than 200 degrees, release the pressure by slowly opening the "PRESSURE RELEASE" valve. The pressure gauge slowly returns to zero.

5. Slowly loosen the gland on the slurry cup thermocouple and carefully remove it from the test cell. Note if there appears to be any pressure on the vessel. If signs of pressure aren't present remove the pressure tube as well.
6. Remove the test cell from the heating jacket and remove both the bottom and top caps. Press the cement from the cell.
7. Return the test cell caps to the test cell to prevent dust and other matter from entering the test cell. Close all valves and return all switches to the "OFF" position.

### **GENERAL MAINTENANCE**

1. One of the most important elements concerning trouble free operation is keeping the interior of the test cell as clean as possible.
2. A low pressure filter is used to protect valves and the pump. Clean these filters frequently by flushing the elements with clean water.
3. Routinely check the air filter going to the pump for excess water. If necessary, drain the water with the fitting provided on the bottom of the air filter.

For more information, please contact us:

ExpotechUSA

10700 Rockley Road  
Houston, Texas 77099  
USA

281-496-0900 [voice]

281-496-0400 [fax]

E-mail: sales@expotechusa.com

Website: www.ExpotechUSA.com