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Stirred Fluid Loss Tester

120-70 (115 Volt)
120-70-1 (230 Volt)

Instruction Manual

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Ver. 2.2

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Intro

Successfully cementing the casing string of an oil or gas well is highly dependent upon the characteristics of the cement slurry. Properties that should be considered include consistency, density, the ability to quickly develop compressive strength, rheological properties, and filtration control. Well cements that have poor filtration control can lead to a complete failure of the cementing operation. In addition, the invasion of filtrates into producing zones causes formation damage, which can greatly reduce the production potential of the reservoir. Developing cement slurries that have minimal filtration loss prevents expensive remedial cementing operations and reduces formation damage. The OFITE Stirred Fluid Loss Tester provides a reliable means of determining the fluid loss characteristics of a well cement.

Overview

A cement slurry is poured into the test cell, which is then placed into the heating jacket. The gear drive system is connected to the agitation paddle, which is dimensionally equivalent to an atmospheric consistometer paddle. The desired test temperature is maintained by a digital PID temperature controller, while the necessary pressure is applied to the cell to prevent evaporation of the liquid phase. When conditioning the cement in accordance to API (American Petroleum Institute) Specification 10 guidelines, the paddle is rotated at 150 RPM for 20 minutes. Once the cement is conditioned, differential pressure is applied to the cell. The filtrate is collected in a back pressure receiver for 30 minutes. The API defines fluid loss as the volume (ccs) of filtrate that is collected during this 30-minute interval.

Components

#120-503	Paddle Pin
#120-70-024	Packing Drive Set
#120-80-4	Temperature Controller
#120-80-6	Motor
#126-025	Packing Set
#130-76-03	Thermocouple
#152-37	AC Power Cord, 3-Conductor
#153-14	Graduated Cylinder, 50 mL × 1 mL, Glass
#153-16	Graduated Cylinder, 25 mL × 2/10 mL, Glass
#165-14-8	Type "J" Thermocouple, 1/8" × 6"
#165-44	High-Temperature Thread Lubricant, 1 oz, Qty: 2
#170-13	Test Cell O-ring, Buna N, Qty: 12
#170-16	Valve Stem, 3.25" (8.3 cm), Qty: 2
#170-17	Valve Stem O-ring, Qty: 12
#170-18	Detachable Screen, 325 Mesh with 60 Mesh Backup
#170-35	6" Adjustable Wrench
#171-11	O-ring for Backpressure Receiver, 100 mL, Qty: 2
#171-23-1	Safety Pin with Lanyard, Qty: 2
#174-14	Motor Controller

Optional:

#120-71 One Year's Spare Parts for Stirred Fluid Loss Tester

#126-025	Packing Set, Qty: 4
#130-76-03	Thermocouple, Qty: 2
#153-16	Graduated Cylinder, 25 mL × 2/10 mL, Glass, Qty: 4
#170-13	Test Cell O-ring, Buna N, Qty: 50
#170-16	Valve Stem, 3.25" (8.3 cm), Qty: 6
#170-17	Valve Stem O-ring, Qty: 50
#170-18	Detachable Screen, 325 Mesh with 60 Mesh Backup, Qty: 12
#171-11	O-ring for Backpressure Receiver, 100 mL, Qty: 12
#171-23-1	Safety Pin with Lanyard, Qty: 2

Specifications

- Maximum Pressure: 2,000 PSI
- Maximum Temperature: 400°F (204.4°C)
- Temperature is maintained by a PID temperature controller
- Variable paddle rotation speed (5 to 200 RPM)
- Filtration portion of cell is dimensionally equivalent to an API approved HTHP test cell

Setup

1. Connect the instrument to a power source. Be sure to use the correct voltage for your equipment. The Stirred Fluid Loss Tester Model No. 120-70 requires a 120 Volt power source, while Model No. 120-70-1 requires 220 Volt.
2. Connect the instrument to a nitrogen source using the connector on the back of the casing. The nitrogen source should be regulated between 2,000 and 2,500 psig.

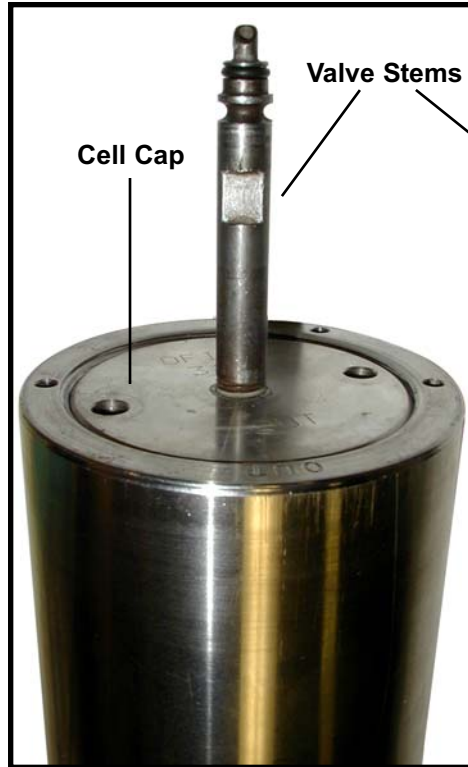
Operation

Preparing the Test Cell

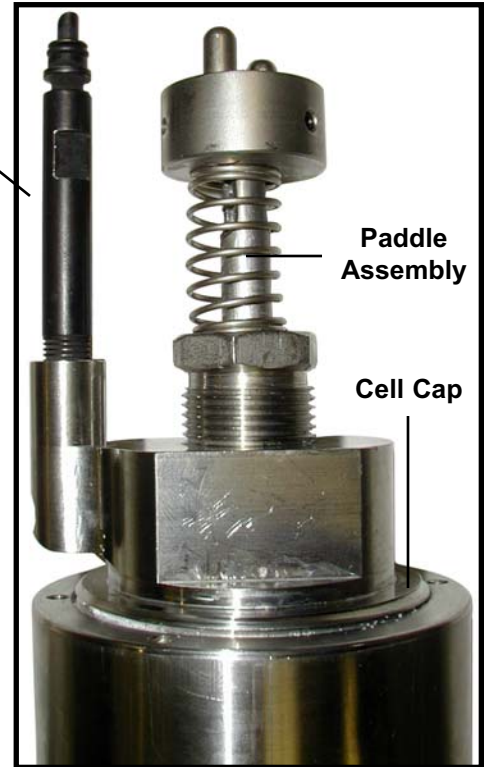
1. Begin by turning the test cell so that the end labeled "In" is facing up.
2. Apply high-temperature grease to a cell cap o-ring (Part No. 170-13) and insert it into the groove inside the test cell.
3. To facilitate cleaning, apply high-temperature grease to the entire surface of the paddle.
4. Lubricate the threads on the paddle assembly cell cap. Press the poppet valve into the closed position and insert the paddle into the test cell. Hand tighten completely.
5. Screw the valve stem (Part no. 170-16) into the paddle assembly cell cap and tighten it completely.
6. Turn the cylinder over. If possible, place the cell in a vise to prevent damage to the valve stem.
7. Mix your cement slurry as directed in API Specification 10 and pour no more than 425 ml into the test cell. Remove any cement from the o-ring groove.
8. Apply high-temperature grease to another cell cap o-ring (Part No. 170-13) and place it in the groove inside the end of the test cell.
9. Place the Cement Screen (Part No. 170-18) into the test cell on top of the o-ring with the flat side facing down.



Cement Screen



Screen-Side Cell Cap



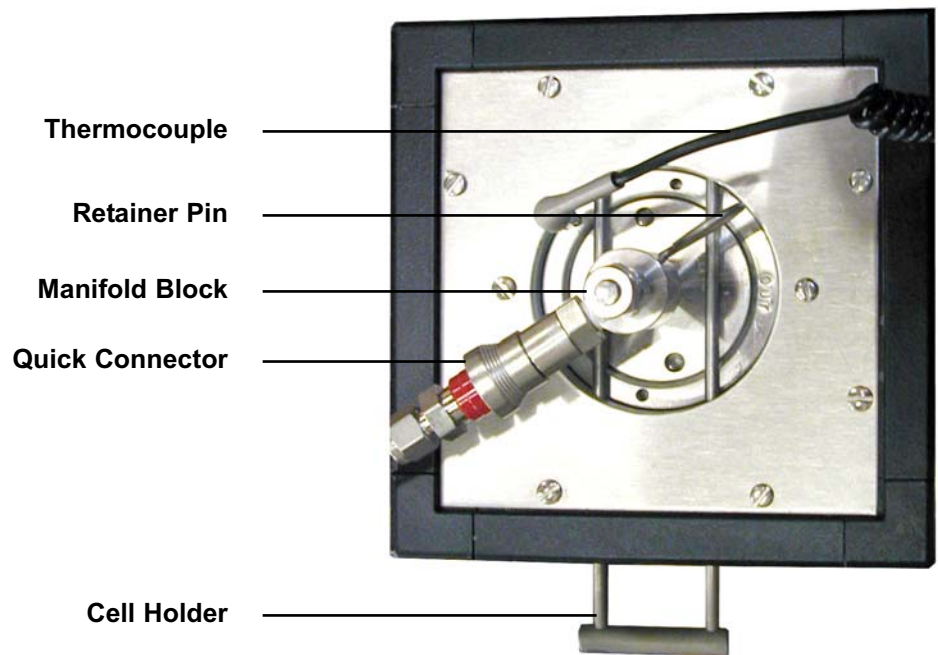
Paddle-Side Cell Cap

10. Apply high-temperature grease to another cell cap o-ring (Part No. 170-13). Then, place the o-ring into the end of the cell, on top of the cement screen.
11. Lubricate the threads of the cell cap with an anti-thread galling compound and screw the cap into the cell with the spanner wrench provided. Tighten the cap completely.
12. Screw the valve stem (Part No. 170-16) into the center of the screen-side cell cap and tighten completely.

Operation

Installing the Test Cell

1. Rotate the heating jacket until it is horizontal. The fully-open end should be facing away from the control panel.
2. Insert the test cell into the heating jacket, paddle assembly first.
3. Return the heating jacket to the vertical position and insert the cell holder to secure the test cell.
4. Connect the end of the paddle assembly to the motor below the heating jacket.
5. Attach the manifold block (Part No. 170-20) to the upper valve stem and secure it with the retaining pin (Part No. 171-22).
6. Connect the upper air line to the manifold block using the quick connect attachment.
7. Loosen the upper valve stem one half turn.



Test Cell in Heating Jacket

Operation

Performing the Test



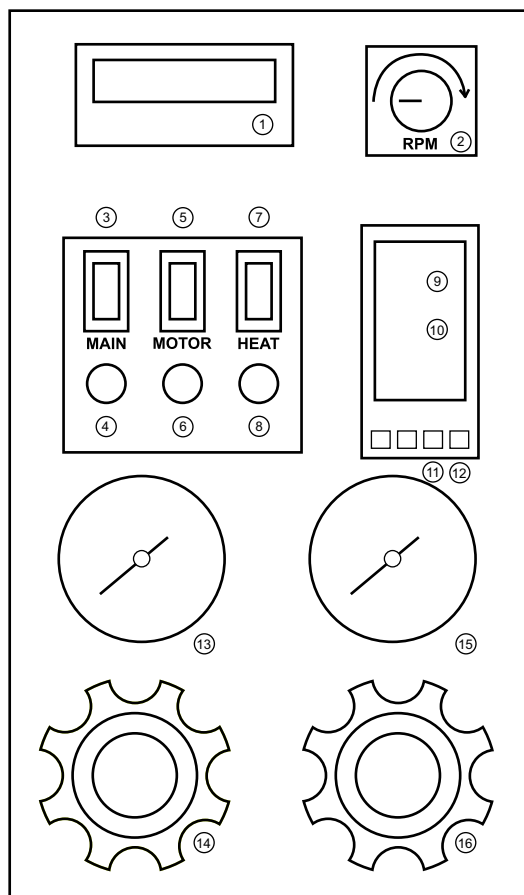
Tip

In this sections, the numbers in () refer to components identified in the “Control Panel” image at the bottom of this page.

1. Begin by turning the ‘Main’ switch (3) on.
2. Turn on the switch labeled ‘Motor’ (5) and accelerate the motor to 150 RPM using the potentiometer (2).

The motor requires some time to reach the specified speed. After turning the potentiometer, wait a few seconds before turning it again to allow the motor to fully accelerate.

3. Increase the high-end pressure (14) to 500 PSI by rotating the left-hand pressure control knob clockwise.
4. Ensure that the thermocouple is properly connected to the port on the side of the instrument casing. Insert the thermocouple into the sleeve on the top of the test cell.



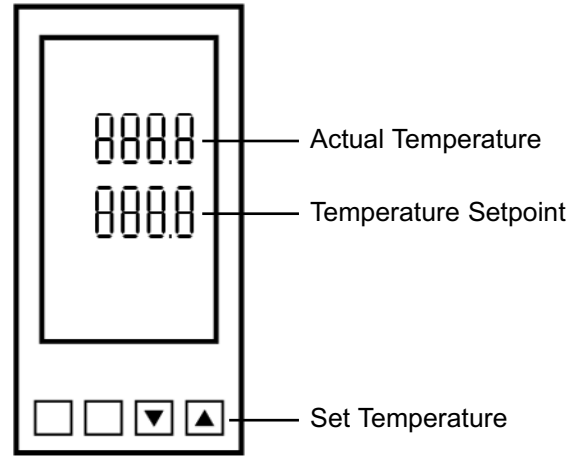
1. Motor Speed Indicator (RPM)
2. Potentiometer
3. Main Power Switch
4. Main Fuse
5. Motor Power Switch
6. Motor Fuse
7. Heat Power Switch
8. Heat Fuse
9. Current Temperature (°F or °C)
10. Temperature Setting (°F or °C)
11. Decrease Temperature
12. Increase Temperature
13. High-End Pressure Gauge (PSI)
14. High-End Pressure Control
15. Low-End Pressure Gauge (PSI)
16. Low-End Pressure Control

Control Panel



Important

The thermocouple **MUST** be properly inserted into the sleeve and plugged into the port **BEFORE** the heat is activated!



Temperature Controller



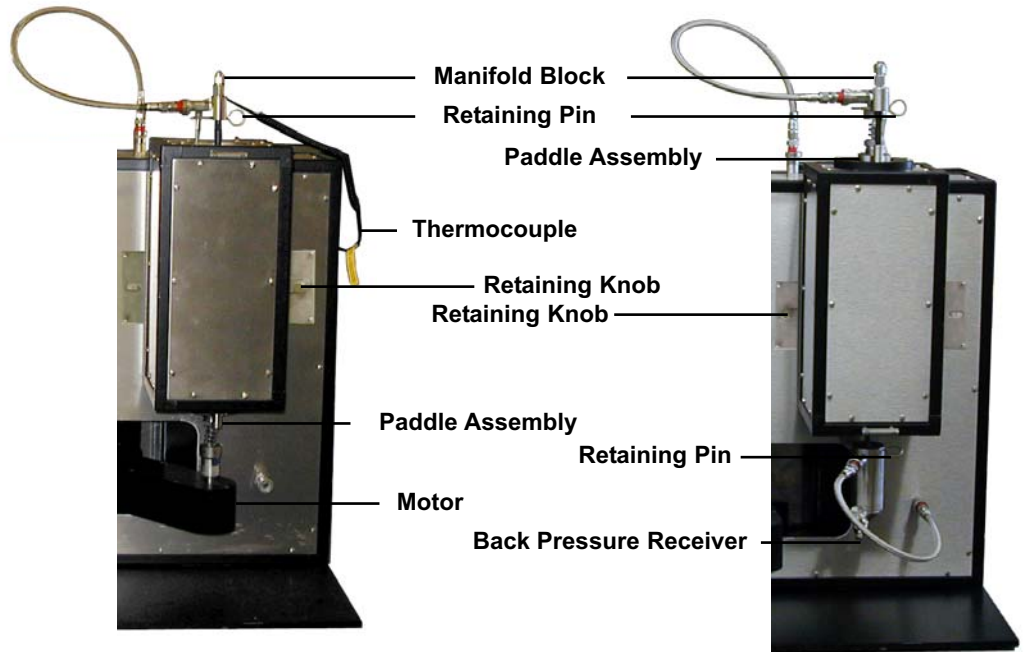
Note

5. Set the temperature controller (11 - 12) to the desired setting and turn the 'Heat' switch (7) on.
6. Once the test cell reaches the desired temperature, condition the cement for another 20 minutes. Then turn off the 'Motor' switch (5).

If you notice a leak from the bottom end of the test cell, lower the pressure and tighten the packing nut on the paddle.

7. Close the upper valve stem by tightening it all the way. Then, lower the high-end pressure (14) down to 0 PSI.
8. Remove the manifold block from the upper valve stem and disengage the motor from the paddle assembly.
9. Pull the retaining pin knob and turn it a few degrees. Rotate the heat jacket 180° so that the paddle assembly is now on top. Now rotate the retaining knob back to its original position to lock the heat jacket into place.
10. Attach the manifold block to the valve stem on the paddle assembly and secure it with the retaining pin.
11. Attach the back pressure receiver to the lower valve stem and secure it with the retaining pin.
12. Connect the lower air line to the back pressure receiver using the quick connect attachment.
13. Based on the temperature of your project, refer to API Specification 10 to determine the water vapor pressure inside the test cell. Set the high-end pressure (14) to this value plus 1,000 PSI.

Heating Jacket Orientation



Installing the Test Cell

Performing the Test

14. Loosen the upper valve stem one half turn.
15. Set the low-end pressure (16) to the appropriate pressure based on API Specification 10 by rotating the right-hand pressure control knob clockwise.
16. Loosen the lower valve stem one half turn. Begin timing for 30 minutes.



It is important to begin timing as soon as you open the lower valve stem. The results of your test are determined by the amount of fluid collected during this 30-minute period.

17. Open the release valve on the back pressure receiver and collect the resulting fluid in the graduated cylinder. When you hear air instead of liquid, close the valve. Repeat this step every few minutes for 30 minutes.
18. After 30 minutes, close both valve stems, reduce both pressure settings to 0 PSI, turn off the 'Heat' switch (7), and reduce the temperature setting.
19. Record the volume of the filtrate collected. Multiple that value by two to determine the fluid loss.



20. Remove the test cell from the heating jacket and place it in a sink of cool water with the paddle assembly upward. It is best to rest the cell on a pair of brick with the valve stem in the space between to prevent damage.

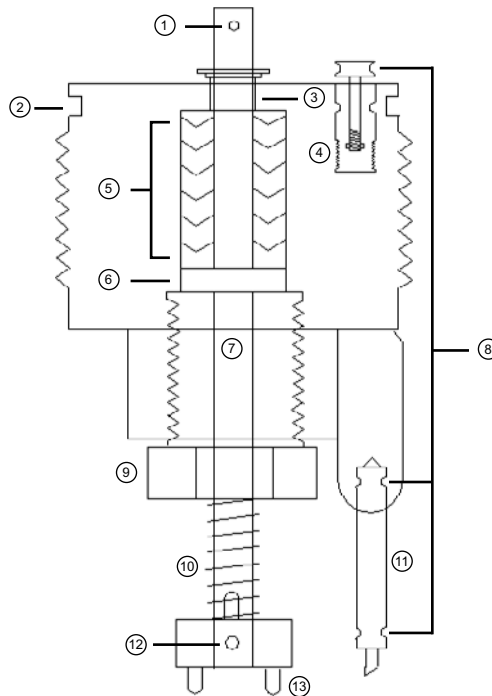
Remember to wear protective gloves to prevent burns.

21. Once the cell has cooled, release the pressure by slowly opening the valve stem on the paddle assembly.
22. Disassemble the test cell and clean all of the components thoroughly. Press the poppet valve back into the closed position.



Be sure to clean the test cell, paddle assembly, and all other components immediately to prevent the cement from hardening and damaging the equipment.

Paddle-Assembly Cell Cap

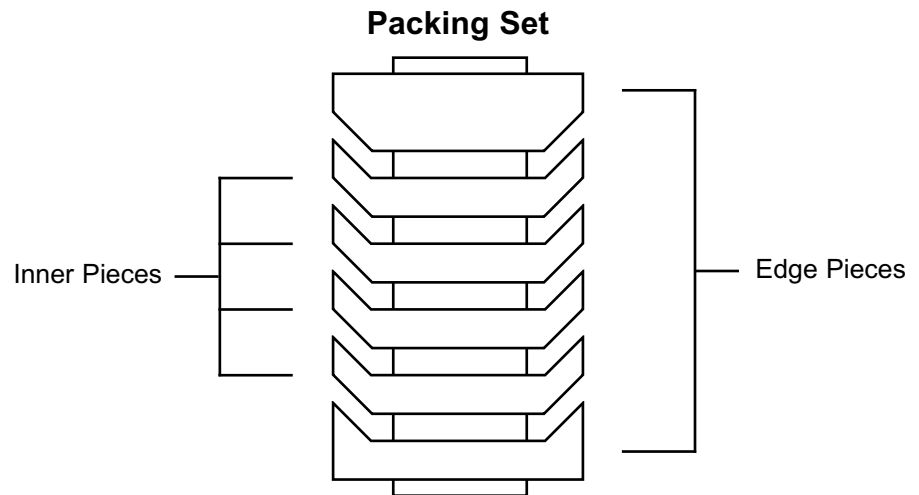


1. Paddle Pin (120-503)
2. Test Cell O-ring (170-13)
3. Rulon Bearing (126-027)
4. Poppet Valve
5. Packing Set (126-025)
6. Drive Shaft (126-029)
7. Brass Packing Ring (126-026)
8. Valve Stem O-ring (170-17)
9. Packing Nut (126-031)
10. Spring (126-033)
11. Valve Stem (170-16)
12. Holding Pin (126-035)
13. Spyder Coupling

Maintenance

If fluid is leaking from the paddle-assembly end of the test cell, it may be necessary to disassemble the paddle assembly and inspect the various parts for wear.

1. Examine the o-rings on the cell cap (2) and the valve stems (8). If any of these o-rings are worn or damaged, replace them and try the test again. If the leak continues, proceed to step 2.
2. Pull the spyder coupling (13) down onto the spring (10) and remove the holding pin (12) that secures it to the drive shaft (6).
3. Unscrew and remove the packing nut (9) in the center of the paddle assembly cell cap.
4. Remove the drive shaft (6), brass packing ring (7), and packing set (5).
5. Examine the packing set for wear or damage.



6. If the packing set is worn or damaged, replace it with a new set.
7. Reinsert the drive shaft into the cell cap.
8. Slide the packing set onto the drive shaft, followed by the brass packing ring, and secure with the packing nut.



The packing set must be assembled on the drive shaft with the two flat-sided pieces on the outside of the set and the concave portions of the inner pieces facing toward the paddle assembly.

9. Slide the spring onto the drive shaft, followed by the spyder coupling.
10. Pull the spyder coupling down onto the spring and reinsert the holding pin that secures it to the drive shaft.



Note

The paddle is held onto the drive shaft with a small paddle pin (1). If the cement inside the test cell begins to harden while the motor is engaged, this pin is designed to break, allowing the motor to continue turning without damaging any expensive parts. If this happens, it will be necessary to replace the pin before continuing usage.

1. Remove any remaining pieces of the broken pin.
2. Reinsert the drive shaft into the paddle assembly and align the holes on both.
3. Insert the new paddle pin into the hole to secure the paddle to the drive shaft.

After a test is finished, the paddle assembly cell cap may be very difficult to unscrew. This is due to extra pressure within the cell that is yet to be released. To solve this problem, release the pressure inside the test cell.

1. Remove both valve stems from the cell caps.
2. Using a small, pointed object, dislodge any material that may be blocking the openings beneath the valve stems.
3. Unscrew the poppet valve with the included tool and dislodge any material that may be blocking the opening.



Important

Excess pressure within the test cell can be dangerous if handled improperly. Exercise caution when cleaning the cell cap openings to reduce pressure.



Poppet Valve Removal Tool