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Permeameter
with Data Acquisition System

RGP-560 Gas Permeameter - #127-87
CGP-90 Cement Permeameter - #120-87-DAS

Instruction Manual

Updated 5/29/2015
Ver. 1.4

OFI Testing Equipment, Inc.
11302 Steeplecrest Dr. · Houston, Texas · 77065 · U.S.A.
Tele: 832.320.7300 · Fax: 713.880.9886 · www.ofite.com

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Intro

Permeability is a measure of the ability of a fluid to flow through a porous media when subjected to a differential pressure and is mathematically equated by Darcy's Law.

- The primary function of a well cement is to isolate/seal the casing from the well bore. This seal prevents the migration of fluids into the annulus and upwards to the surface. Therefore, it is imperative that a well cement exhibit very low permeability.

- The permeability of a petroleum reservoir is one of the most influential factors governing the production capabilities of a producing formation.

Description

The OFITE Permeameter measures the steady state permeability of cement or rock core specimens one inch in diameter and one inch in length. The specimen is placed into a sleeve, which is then inserted into the "Modified Hassler" style test cell. A gas at a constant differential pressure is forced through the core and the flow rate is measured. Differential pressure (measured by a transducer), flow rate (measured by a flow meter), and the viscosity of the gas are incorporated into Darcy's law to calculate the permeability of the sample.

Components

#120-85-010	Digital Calipers
#122-220	Rubber Specimen Holder
#122-221	O-ring
#122-225	Stainless Steel Core Sleeve

Specifications

- Compressed Air: 100 PSI (689.5 kPa)
- Gas Pressure: Standard Air, Carbon Dioxide, Nitrogen, or Oxygen up to 500 PSI (3.5 MPa)
- Electrical: 115 Volt or 230 Volt 50 or 60 Hz
- Permeability Range: .01mD - 1D

Installation

1. Carefully remove the OFITE Permeameter from the packing crate and place it on a flat, stable surface.

2. Connect the unit to a 100 PSI compressed air source and a gas source up to 500 PSI. Both lines are connected to the back of the unit via ¼" NPT fittings.

3. Plug the unit into an appropriate power outlet.

Testing

1. Measure the length and diameter of a dry specimen with the supplied calipers. These measurements will be entered into the software later.

2. Place a dry specimen into the rubber specimen holder and place the specimen holder into the sleeve.

   If you are testing cement permeability, refer to “Cement Preparation” on page 11 for instructions for preparing a specimen.

Specimen

Specimen Holder

Specimen in Holder

Sleeve

Holder in Sleeve

3. Place the sleeve between the pressure plates on the permeameter.

Important

Make sure the face of the core does not come in contact with the surface of the pressure plates.

4. Screw the bottom plate upwards to insure a good seal between the specimen and the rubber specimen holder. Make sure the valve on the vise is closed.

Valve

Specimen Holder in Sleeve

5. Open the “Gas Supply” valve.

6. Open the software by double-clicking the icon on the desktop.

7. From the “Test Setup” menu, select “Program Editor”.

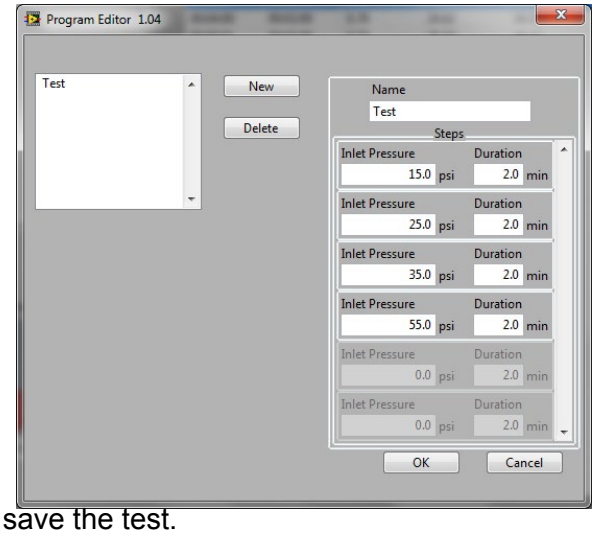
8. Click “New” to add a new test.

9. Give the test a name and add steps as necessary.

10. For each step, enter an inlet pressure and a duration.

Note

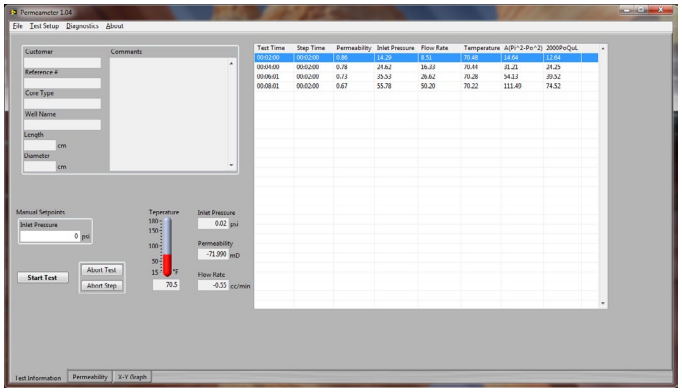
Minimum inlet pressure should be 15 PSI. It is recommended to increase the pressure in increments of at least 10 PSI. Maximum pressure is limited to 200 PSI.



11. Click OK to save the test.

12. On the main screen, enter the length and diameter of the specimen.

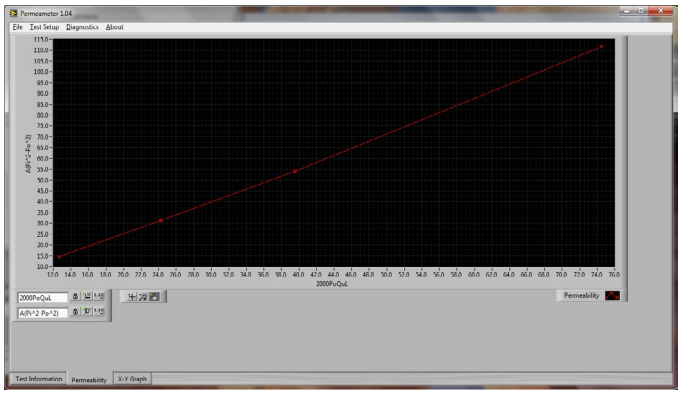
The Customer, Reference #, Core Type, Well Name, and Comments fields are all optional.

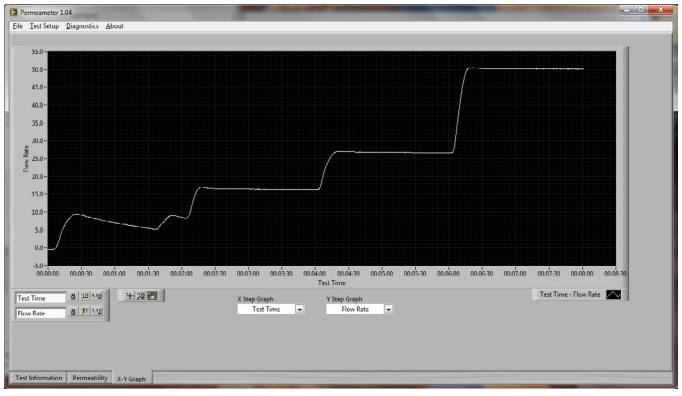


13. Click the “Start Test” button to begin testing.

14. During testing, you can see a graph of the permeability by clicking on the “Permeability” tab at the bottom of the page. On the “X-Y Graph” tab you can graph any of the following test variables on the X or Y-axis:

    - Test Time
    - Step Time
    - Permeability
    - Inlet Pressure
    - Flow Rate
    - Temperature
    - $A(P_i^2 - P_o^2)$
    - $2{,}000\ P_o\ Q\ \mu\ L$





15. At the end of the test, open the valve on the vise to release the pressure. Then unscrew the vise and remove the specimen. Close the valve before the next test.

Software

Options

To access the software options, choose “Setup” from the “Test Setup” menu.

Eurotherm Comport - This is the COM port assigned by the device driver. Refer to page 10 for instructions on determining this value.

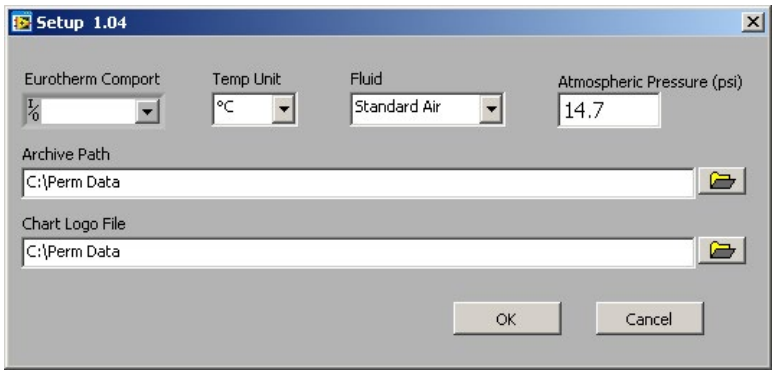
Temp Unit - Select the temperature units, °C or °F.

Fluid - Select the fluid you will be using to test permeability. Available options are: Standard Air, Carbon Dioxide, Nitrogen, Oxygen.

Atmospheric Pressure (psi) - Enter the current atmospheric pressure. This value will be used as the outlet pressure in the calculations.

Archive Path - Enter a location to save test data.

Chart Logo File - Here you can choose an image file (.jpg) to print on the graph at the end of the test



Software

Archive

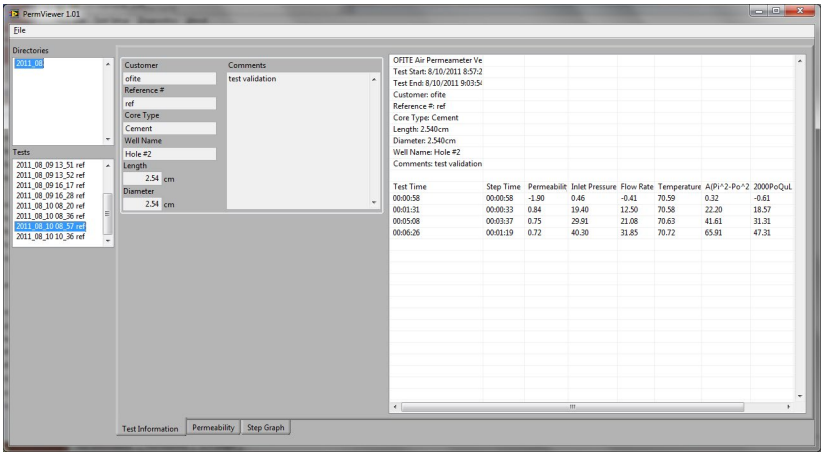
To review test data from previous tests:

1. Choose “Open Archive” from the “File” menu.

2. In the “Directories” field, choose a directory (they are labeled by year and month).

3. In the “Tests” field, choose a test to review. The test data will be displayed on the right-hand side of the screen. You can also view the permeability graph and the step graph by clicking on the applicable tabs at the bottom of the screen.

4. Click the “Export” button to save the test data in a format that can opened in Microsoft Excel.



Appendix

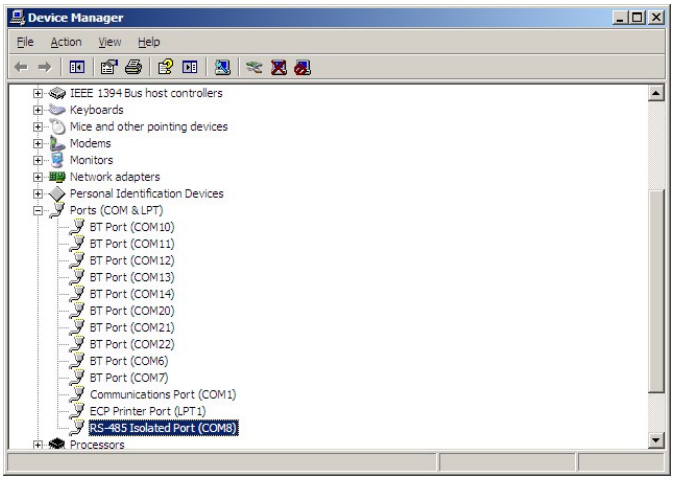
Software Installation

The OFITE Permeameter software requires a device driver. Install the device driver before installing the Permeameter software.

1. Place the device drive CD into the CD driver and follow the on-screen prompts. No special options are necessary.

2. In Windows, open the Control Panel from the Start menu. Then open the Device Manager.

3. Expand the “Ports (COM & LPT)” entry and look for “RS-485 Isolated Port”. A COM port will be listed after the name (for example, COM8). Write down the COM port number.



4. Place the OFITE Permeameter software CD into the CD drive and follow the on-screen prompts. No special options are necessary.

5. When the installation is finished, open the software and choose “Setup” from the “Test Setup” menu.

6. In the “Eurotherm Comport” drop-down list, choose the COM port from step 3.

7. Click OK to save the setting.

Appendix

Cement Preparation

A four-gang brass mold is supplied with the Cement Permeameter (Part No. 120-87) that can make cement samples one inch diameter by one inch long.

1. Lightly grease the internal surfaces of the mold assembly and the upper and lower plate to prevent the cement from adhering to the surface. Place the mold assembly on top of the lower plate

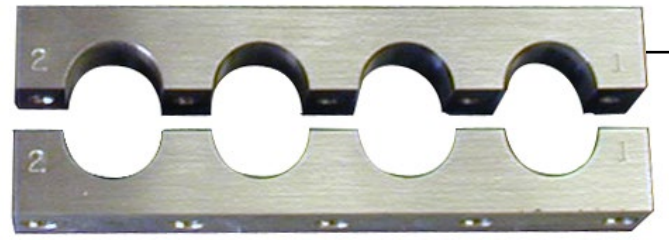
2. Prepare the cement mixture to be tested according to the procedures as outlined in API Specification 10.

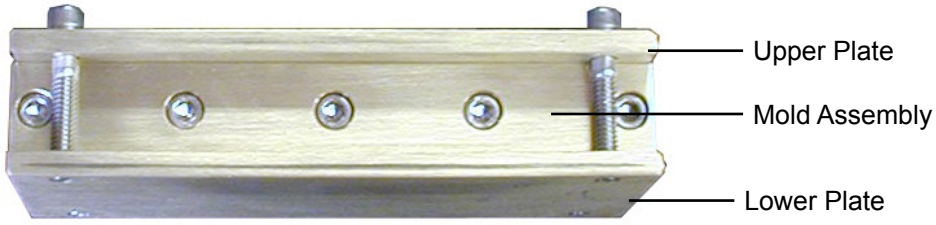
3. Carefully pour the cement into the molds. Place a puddling rod into each mold and tap the bottom to remove any entrapped air. Wipe any excess cement from the mold assembly.

4. Place the upper plate on top of the mold assembly. Clamp the plates together using the four screws provided.

5. The mold assembly should be cured in either a heated water bath or an HTHP Curing Chamber.

6. After the samples have cured remove the four screws that hold the upper and lower plates together. Then remove the five screws that hold the mold assembly together. The cement specimens can now be tested in the permeameter.





Appendix

Manual Mode

The Permeameter can be operated with or without the data acquisition system. To run the instrument in manual mode:

1. Prepare the instrument and specimen according to steps 1 - 5 on page 5.

2. Use the up and down arrows on the Delta P controller to set the inlet pressure.

3. Record the inlet pressure and flowrate.

4. At the end of the test, open the supplied spreadsheet and fill in the red boxes with the information from the test. The spreadsheet will automatically calculate the permeability of the specimen.

Warranty and Return Policy

Warranty:

OFI Testing Equipment, Inc. (OFITE) warrants that the products shall be free from liens and defects in title, and shall conform in all respects to the terms of the sales order and the specifications applicable to the products. All products shall be furnished subject to OFITE's standard manufacturing variations and practices. Unless the warranty period is otherwise extended in writing, the following warranty shall apply: if, at any time prior to twelve (12) months from the date of invoice, the products, or any part thereof, do not conform to these warranties or to the specifications applicable thereto, and OFITE is so notified in writing upon discovery, OFITE shall promptly repair or replace the defective products. Notwithstanding the foregoing, OFITE's warranty obligations shall not extend to any use by the buyer of the products in conditions more severe than OFITE's recommendations, nor to any defects which were visually observable by the buyer but which are not promptly brought to OFITE's attention.

In the event that the buyer has purchased installation and commissioning services on applicable products, the above warranty shall extend for an additional period of twelve (12) months from the date of the original warranty expiration for such products.

In the event that OFITE is requested to provide customized research and development for the buyer, OFITE shall use its best efforts but makes no guarantees to the buyer that any products will be provided.

OFITE makes no other warranties or guarantees to the buyer, either express or implied, and the warranties provided in this clause shall be exclusive of any other warranties including ANY IMPLIED OR STATUTORY WARRANTIES OF FITNESS FOR PURPOSE, MERCHANTABILITY, AND OTHER STATUTORY REMEDIES WHICH ARE WAIVED.

This limited warranty does not cover any losses or damages that occur as a result of:

- Improper installation or maintenance of the products
- Misuse
- Neglect
- Adjustment by non-authorized sources
- Improper environment
- Excessive or inadequate heating or air conditioning or electrical power failures, surges, or other irregularities
- Equipment, products, or material not manufactured by OFITE
- Firmware or hardware that have been modified or altered by a third party
- Consumable parts (bearings, accessories, etc.)

Returns and Repairs:

Items being returned must be carefully packaged to prevent damage in shipment and insured against possible damage or loss. OFITE will not be responsible for equipment damaged due to insufficient packaging.

Any non-defective items returned to OFITE within ninety (90) days of invoice are subject to a 15% restocking fee. Items returned must be received by OFITE in original condition for it to be accepted. Reagents and special order items will not be accepted for return or refund.

OFITE employs experienced personnel to service and repair equipment manufactured by us, as well as other companies. To help expedite the repair process, please include a repair form with all equipment sent to OFITE for repair. Be sure to include your name, company name, phone number, email address, detailed description of work to be done, purchase order number, and a shipping address for returning the equipment. All repairs performed as "repair as needed" are subject to the ninety (90) day limited warranty. All "Certified Repairs" are subject to the twelve (12) month limited warranty.

Returns and potential warranty repairs require a Return Material Authorization (RMA) number. An RMA form is available from your sales or service representative.

Please ship all equipment (with the RMA number for returns or warranty repairs) to the following address:

OFI Testing Equipment, Inc.
Attn: Repair Department
11302 Steeplecrest Dr.
Houston, TX 77065
USA

OFITE also offers competitive service contracts for repairing and/or maintaining your lab equipment, including equipment from other manufacturers. For more information about our technical support and repair services, please contact techservice@ofite.com.