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How to Operate the FRENCH PRESS G-M® Model 11

Transcript of Video Operating Instructions

Prepared at the University of Central Florida, Department of Chemistry
For GLEN MILLS INC.

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Part 01 - Introduction and Overview

This video will review the parts and operation of the FRENCH PRESS G-M® that are used for disrupting the cells of microorganisms.
In this equipment the cells are subjected to high liquid pressure that is followed by a rapid return to atmospheric pressure.
This pressure drop causes the cell walls and membranes to burst when the high pressure liquid contained within the cell's body escapes.

Part 02 - Parts of Standard PRESSURE CELL

There are two sections to this equipment:

1. Standard PRESSURE CELL or MINI PRESSURE CELL 3.7
2. FRENCH PRESS G-M®

The Standard PRESSURE CELL is used processing up to 35ml of cell suspension at a time.
Larger volumes can be used by breaking the sample up into multiple runs.
The Standard PRESSURE CELL has three main parts:

1. The Piston, with a "T" handle, that will be pushed against the cell suspension. It is marked with the MAX FILL line, which indicates the loading position, and the STOP LINE which indicates the end of the run.
2. The Cell Body that will hold the cell suspension.
3. At the bottom is the Closure Plug Assembly that consists of the Flow Valve Assembly, Sample Outlet Tube with a piece of flexible tubing, and the Gland Plug that is used to load the sample via the Rapid Fill Kit.

All together this is a bit heavy, about 20 pounds (9 kilograms) so hold securely at bottom so that Closure Plug does not drop off.

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Part 03 - Parts of FRENCH PRESS G-M®

The Standard PRESSURE CELL when loaded with cells for lysing will be inserted into the FRENCH PRESS G-M®. This FRENCH PRESS G-M® has considerable safety and convenience improvements over earlier models. Users still have to be properly trained in its use, and to always work safely.

When operating, there will be moving parts and liquid that will be pushed out. Therefore, be aware of pinch points and wear safety glasses, gloves, and lab coat.

This is the bottom platen. There is a hydraulic piston underneath that will be moving everything upwards and down.
Note the pinch points. Keep one's hands away from this area.
The Standard PRESSURE CELL will sit within this raised ring. Be sure the seat is clean and level.
This is the top platen that does not move. The top platen holds the piston steady as it is being forced into the Cell Body, thus increasing liquid pressure.
This is the safety clamp with the two thumb screws that will help secure the Standard PRESSURE CELL in place.

Part 04 - Controls and Gauges

On the front are six items:
(1) Pressure Gauge that reads the pressure in the hydraulic press underneath the lower platen. This is not the pressure inside the Standard PRESSURE CELL. The gauge pressure times sixteen (x16) equals the pressure inside.
For examples, if set to 1,500 psi x 16 = 24,000 psi inside the PRESSURE CELL body.

(2) Conversion Table that shows the pressure inside the PRESSURE CELL based on a reading off the pressure gauge.

(3) Ratio Selector sets the direction of the bottom platen. The choices are

- Down at the end of the run.
- Low for when using the smaller MINI PRESSURE CELL 3.7.
- High for today's run with the one inch (1") Standard PRESSURE CELL.

(4) Pause-Run Switch which can be switched to Run to turn the machine on.

(5) E-Stop button for emergency stops. By pushing it in, all electricity is cut and the unit will stop moving.
To reset, turn the Pause-Run switch to Pause. Then twist the E-Stop a little clockwise. It will pop out to a "run okay" position.

(6) Pressure Increase Knob that is turned to control the hydraulic pressure, and thus the pressure inside the PRESSURE CELL.

(-) Additionally, there is a **Power Switch** at the backside to the right.

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Part 05 - Loading Biological Cells into Standard PRESSURE CELL

Remove the Closure Plug from the Cell Body and lay aside for now.
Lubricate the Piston's O-ring with water, silicone, glycerol, or other acceptable materials to facilitate its movement into the Cell Body.
The Piston is inserted into the top of the Cell Body.
The Cell Body top has a little screw and the label reads upright.
Press the Piston into Cell Body just until the "MAX FILL" line reaches top of Piston.
Flip unit over and these two parts on Stand between the three posts.
Fill with cell suspension until about one inch from top.
If users have less than 35 ml, that is okay.
If greater than 35 ml, run multiple passes through the machine.
If being used for protein purification, keep samples on ice, and the Cell in the refrigerator when not in use.
Take Closure Plug and open Flow Valve Assembly a few turns (counter clock wise).
Be sure Sample Outlet Tube is pointed away from operator since some liquid might come squirting out.
Push Closure Plug all the way into Cell Body.
If liquid comes out from the Sample Outlet Tube, direct the flow into a beaker.
Actually, it is best if some liquid does drip out. This means there is no air pocket within Cell Body that could compromise the cell disruption.
Close the Flow Valve Assembly snug, not over tightened. This is a metal-to-metal seat than can be damaged if jammed in too much.
Invert all these parts as a set; be sure Closure Plug does not fall out.
When fully assembled, this equipment is a bit heavy, about 20 pounds or 9 kilograms, so hold it securely at the bottom so that the Closure Plug does not drop off.

Part 06 - Preparing FRENCH PRESS G-M®

Before putting the Standard PRESSURE CELL in place, some controls need to be set.
Confirm the Power Switch on the back right is OFF.
Set the E-Stop to the engaged position. Turn slightly clockwise until it pops out, engaged.
Set the Pause-Run Switch to Pause (turn left).
Set the Ratio Selector to Down (turn fully left).
Turn the Power Switch on back right to ON.
Set the Pause-Run Switch to Run.
The bottom Platen will now move to a fully down position.
When completely down, turn the Run-Pause Switch to Pause.
Loosen the Thumb Screws and move the safety clamp to the side.
Be sure bottom Platen is clean and level.
Start the protocol with the Pressure set to zero (counter clockwise).
The Pressure Increase Valve should be in a low pressure setting.
Turn it counter clockwise until fully open.
It is good practice to then turn this 1/4 turn in.

Part 07 - Moving Standard PRESSURE CELL into FRENCH PRESS G-M®

NOTE: It is heavy, about twenty pounds (20 lbs.) or 9 kilograms.
Support bottom Closure Plug to prevent its dropping out of Cell Body.
Lift and insert into ring on bottom Platen
Hook piston "T" handle onto "J" hooks beneath top Platen
Top of Piston inserts into recess hole in top Platen.
Be careful not to bang one's fingers or other items.
Rotate so that SAMPLE OUTLET TUBE faces front right, in direction of collection beaker.
A run of flexible tubing can be added to direct the flow.
The Flow Valve Assembly should be to the left side and is clear to turn.
Swing Safety Clamp onto top shoulder of Cell Body.
Be sure the metal brackets are not touching the Piston or it can scratch it.
Be sure the small screw on the Cell Body is not underneath the safety clamp, but is in the back.
Secure down by tightening the two thumb screws.

Position SAMPLE OUTLET TUBE and extension flexible tube to direct output into collection beaker (or other collection vessel) that is sitting in tray.
As the lower platen moves this tray will ride up to stay in position while collecting sample.

Part 08 - Plan Ahead for Target Pressure Needed

NOTE: The pressure reading on the gauge is not the actual pressure inside the Standard PRESSURE CELL [or MIN PRESSURE CELL 3.7]. A Conversion Table on front of the equipment is used to determine the proper gauge pressure reading needed to attain the proper pressure on the biological cells inside the Standard PRESSURE CELL.

A target operating pressure will be established from prior knowledge, literature citations, trial and error, or other suggestions.
For bacteria we generally set the machine gauge pressure reading to 1,500 psi and release the pressure valve keeping it above 1,000 psi.

Knowing the pressure needed to break the cells, look on the Conversion Table under column labeled: 1" Standard PRESSURE CELL. Then look to "Gauge Pressure" to determine what the gauge is to reach during the run.
Example: Suppose the biological cells need 20,000 psi to properly rupture. The Conversion Table shows this is 1,280 psi.
During the run, the PRESSURE INCREASE valve will be rotated until the Gauge reads the needed 1,280 psi.

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Part 09 - Operation of FRENCH PRESS G-M®

Set the Pause-Run Switch to Pause.
Turn power switch in the back to ON.
Confirm that the E-Stop is in the engaged position (out towards user).
Set the RATIO SELECTOR to HIGH.
This is the setting that is used with the 1" Standard PRESSURE CELL (40,000 psi; 35ml) only.
The HIGH is not used with the MINI PRESSURE CELL 3.7.
Set the Pause-Run Switch to Run.
You will see that the bottom platen moves everything upwards.
Check that the Piston's top is in the recess in the top platen.
Adjust the Pressure Increase Valve (turn knob clockwise) until the Pressure Gauge reaches the desired value.
For this example run, the target is 1,280 psig.
Once the target pressure is reached, or held at pressure for a few seconds or minutes depending upon the protocol, the samples can be released from the Standard PRESSURE CELL.
Slightly turn the Flow Valve Assembly counter clockwise to allow the sample to exit the Sample Outlet Tube.
Direct the sample dripping out towards the collection beaker.
To keep the pressure above 1,000 psi, and give the hydraulic pump a chance to catch up, an adjustment may be needed.
Gently turn the Flow Valve Assembly to keep the pressure above 1,000 psi to ensure lysing.
Adjust the Flow Valve Assembly so that the flow rate is about 10 to 15 drops per minute.
Keep watching the piston STOP marking.
When the STOP line reaches the Cell Body, switch to Pause.
Though there is an internal cut off safety limit switch, the user must be ready to shut the system off.
The run is completed

Alternative Method of Loading Cells into Standard PRESSURE CELL by Aspiration

Cells can be loaded into the Standard PRESSURE CELL by putting the flexible tubing into a beaker or test tube filled with sample or cleaning fluids.
Opening the Flow Valve Assembly several turns.
Then turn Ratio Selector to Down.
Then turn the Pause-Run Switch to Run.
The cells are aspirated into the Standard PRESSURE CELL.
When completed turn the Flow Valve Assembly handle clockwise to close the Valve.

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Part 10 - End of Run

Open the Flow Valve Assembly counter clockwise three or more turns.
Be careful as the liquid can spray out at this point. (Direct tube into beaker.)
Remove the flexible tubing from the beaker.
Turn the Ratio Selector to Down.
Set the Pause-Run Switch to Run.
Everything will now move downward.
When the bottom platen is at the lowest position, switch to Pause, and shut the machine off at the back right switch.
Loosen the two thumb screws and move the safety clamp away from the cell body.
Remove the Standard PRESSURE CELL from the FRENCH PRESS G-M®

Part 11 - Cleaning

All parts including Backing Rings and O-rings on the Piston, Closure Plug, and Flow Valve Assembly should be removed for cleaning
Replaced any worn or damaged parts.
Inside of the Cell Body should be inspected for debris and cleaned if necessary.
Store all parts dry or with light coating of oil.
Additional, parts can be cleaned by blowing with compressed air. (Wear safety glasses.)

Part 12 - Centrifuge Processing to Show Disruption of Samples

The amount of lysis can be analyzed by centrifuging the samples.
The Sample on the left is before lysis.
The Sample on the right is after lysis.
(Putting two samples into centrifuge, covering, closing top, run centrifuge, remove tubes.)
Lysis can be analyzed after centrifugation by looking at the amount of [whole] bacteria still remaining in the two samples.
The Sample on the left is before French Pressing.
The Sample on the right is after French Pressing.
Note that there are still many [whole] bacteria present in the Sample on the left, but none in the Sample on the right

Click here to view the text of an older FRENCH PRESS Operating Manual (Feb 2007 Rev 1)

We want your experience to be optimum, please contact us with any questions or comments.

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