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Standard Operating Procedure

Procedure: Bioplastics Compression Molding

Department: Bioeconomy Institute

Building/ Room Number: Biorenewables Research Laboratory (BRL) 1115

Supervisor: Jacquelyn Baughman

Procedure Overview: Compression molding is a procedure where a molding material is placed in an open, heated mold cavity. The mold is closed with a top and pressure is applied to force the material to contact the entire mold area. Heat and pressure are maintained until a desired cure time. Different materials require different cure times, temperatures, pressure, and cooling. The compression molder in lab 1115 is a Wabash MPI Compression Press. It is capable of delivering 15 tons of pressure and temperatures up to 500 degrees Fahrenheit. It is also capable of water and air cooling.

Health and safety information for materials used: This machine operates under high temperatures and immense pressure. Never place any body parts in the machine while it is warming up, loading, or unloading. Pay attention to the warning tags on the machine. Never try to bypass any safety features of the machine. To ensure safety, keep the front door closed when the machine is operating.

Hazard Control Measures:

- Safety glasses
- Lab coat
- Heat Resistant Gloves

Waste Disposal Procedures: Bioplastics can be disposed of in nonhazardous waste (garbage) container.

Decontamination Procedures: None

Spill Containment and clean up procedures: Bioplastics spills can be cleaned up with water and paper towels. The mold cavity can with paper towels and water. All can be placed in nonhazardous waste (garbage) container.

Using substances requiring special procedures: No

Written By: Zach Bartlett and Adrian Ramirez

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Approved By: Jacquelyn A. Baughman

Date: 6/30/2011

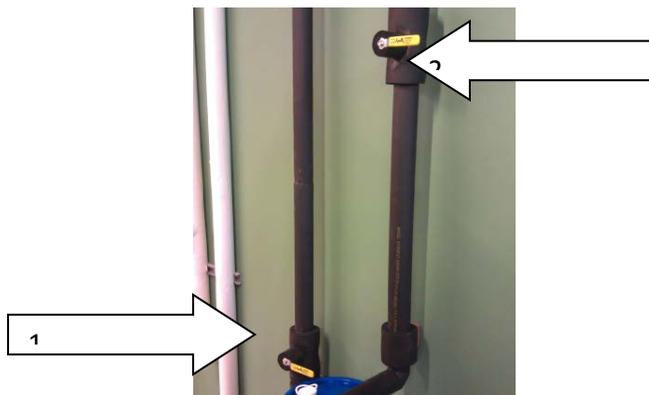
Detailed procedures, operation instructions, maintenance, and emergency contact information list is attached.

Equipment Description

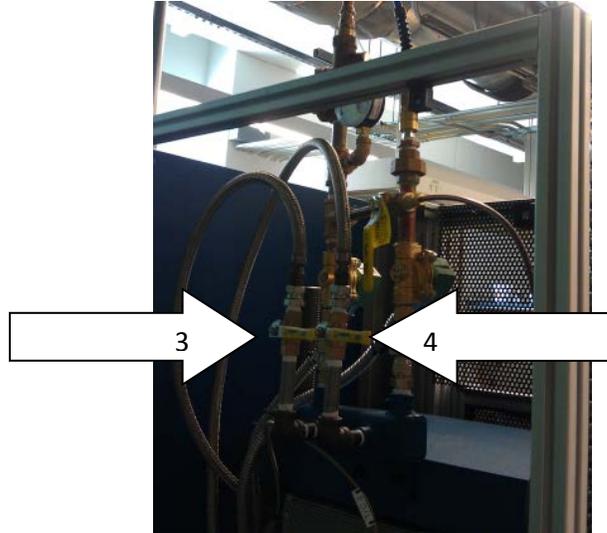
The Genesis Series Wabash MPI Compression Press is a state-of-the-art hydraulic press for compression molding of rubber, plastics and composites; also for laminating. Behind the guard door is located two hydraulically operated platens. These two platens are capable of heating to 500 degrees. They are also capable of being cooled by air and water. Hydraulics push the two platens together allowing the mold to force the product into the shape of the mold. This machine is operated by the control panel on the outside. There is a controller panel that is used for semi- automatic and manual settings. There are green push controls to turn on the power, hydraulics, and platens. There is a red emergency shut off switch as well. The pressure is adjusted by a knob on the lower right hand side of the machine. Temperature controls for each platen are on the top right side. Water and air switches are on the front as well. Also, there is a switch to operate between semi-automatic and manual.

Pre-Analysis Checklist

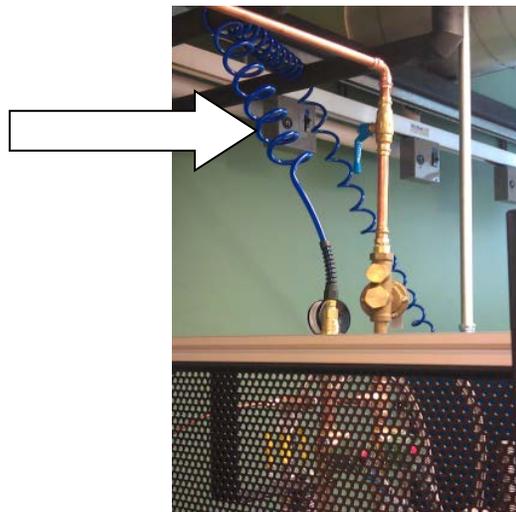
1. Make sure the hydraulic pump button is off before servicing inside the machine.
2. Inspect the machine for any loose, broken, or worn parts. Report any unsafe conditions to the lab supervisor.
3. Make sure the platens and the inside of the machine are cleaned.
4. Never attempt to bypass any of the safety features of the machine (such as the two buttons to close the clamp).
5. After inspecting and cleaning the machine, turn on the two water valves, and air valves on the back of the machine.
6. Make sure the oil reservoir has sufficient oil (3/4 full), and the hydraulics is properly connected.
7. Make sure you know where the emergency stop button is located.
8. The two hydraulic cooling water pipes (labeled 1 and 2) on the west, green wall have to be turned on.



9. Turn on the two platen cooling water valves (labeled 3 and 4) on the back of the machine are turned on.



10. Follow the blue air line to the regulator. Make sure it is connected properly and there is a pressure reading when in the ON position.



11. The two domestic cold water valves must be turned on. Follow the pipe that is labeled DOMESTIC COLD WATER and turn on the valves.



12. The water valve on the back of the machine (labeled 5) should be closed.

Manual Operation

1. Close the guard door.
2. Turn the Disconnect switch (Red knob on yellow panel on the right/west top side of the compression molder) to the On (closed position).
3. Ensure the EMERGENCY STOP BUTTON IS PULLED OUT.
4. Press CONTROL POWER ON button and the green light will illuminate.
5. Press the HYDRAULIC PUMP ENABLE button and the green light will illuminate.
6. Press the PLATEN HEAT ON button and the green light will illuminate.
7. Select the MANUAL position of the MAN/SEMIAUTO selector switch.
8. Adjust the temperature controller to the desired setpoint.
9. When desired temperature is reached, open the guard door and place mold in between the two platens then close the guard door.
10. Press and hold the two CLAMP CLOSE buttons. The hydraulics should move the two platens together.
 - a. If Air cooling is required for your procedure, pull the AIR button to activate the air cooling feature.
11. When the clamp is sealed, you can adjust the pressure with the CLAMP PRESSURE ADJUSTMENT knob. The max is 15 tons.
12. Leave the mold in place under pressure and heat for your cure time.
13. After your cure time, if water cooling is needed pull the WATER ON button to activate water cooling.
14. When temperature reaches between 70-80 degrees, press the CLAMP OPEN button.
15. It is now safe to open the guard door and remove the mold.
16. For precautionary purposes, use hot glove to remove the mold from the platens.

Semi-Auto Operation

1. Close the guard door
2. Turn the Disconnect switch (Red knob on yellow panel on the right/west top side of the compression molder) to the On (closed position).
3. Ensure the EMERGENCY STOP BUTTON IS PULLED OUT.
4. Press the CONTROL POWER ON button and the green light will illuminate.
5. Press the HYDRAULIC ENABLE ON button and the green light will illuminate.
6. Select the SEMIAUTO position of the MAN/SEMIAUTO selector switch.
7. Press the PLATEN HEAT ON button and the green light will illuminate.
8. Adjust the temperature controller to the desired setpoint.
9. Pull the AIR push/pull button.
10. Pull the WATER ON button.
11. On the main menu of the control panel hit F2 to access the cycle overview.
12. Hit F2 again to run the current recipe. This is a pre-programmed for a 7 minute cure time and 10 minutes of air and water cool.
13. Select the AUTO position of the REHEAT button and it will momentarily depress the HEAT ON button. It will illuminate and activate the temperature controls.
14. When the desired temperature is reached, open the guard door and place mold in between the two platens and close the door.
15. The CLAMP SEALED light will illuminate indicating the operator may release the CLAMP CLOSE button. This clamp will continue to build pressure to the setting of the panel mounted adjustable relieve valve.
16. Set the pressure with the CLAMP PRESSURE ADJUSTMENT KNOB.
17. When the cycle is complete and the platens are cooled between 70-80 degrees press the CLAMP OPEN button.
18. For precautionary purposes, use hot glove to remove the mold from the platens.

Machine Shutdown

1. Shut off valves labeled 1-5.
2. Turn off Disconnect Switch on the top west side of the machine to off.
3. Clean off the platens and mold.
4. Close guard door.

Maintenance

Periodically the machine will need to replace the hydraulic oil and lubrication. Before doing any work with the hydraulic oil and lubrication turn off the machine. In addition, before adding hydraulic oil it needs to be pre-filtered to 10 microns. There are three locations that need to be lubricated. The oil reservoir, electric motor, and moving platens. Refer to Section 3-9 of the owner's manual for the hydraulic oil and grease required.

Emergency Contacts

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Training Sign-Off

Trainee Date Trainer