STANDARD OPERATING PROCEDURE

Extruder, Twin Screw, Small

Model: Micro-18
Manufacturer: Leistritz Extrusions Technik GmbH
Location: Technology Transfer Pilot Plant, 1598 Food Sciences Building
Publication Date: 03/29/2014
Description and Uses

Extrusion is a method of making plastics where the raw materials (granular or pellets) are fed to the hopper and drops into the rotating screw. As the screw rotates, the material is conveyed forward through the heated barrel. The combination of shear heat and barrel heat causes the materials to melt. As the plastic reaches the end of the screw, it is now well mixed and is called a melt. Each barrel heating zone of the extruder is set to different temperatures to ensure that a good melt is produced. The plastic is then pushed out unto the die and out of the extruder. The Leistritz (Model Micro-18) is a twin-screw extruder that is typically used in small-scale compounding and extrusion processes.

Power Specifications

Motor: Lenze, Model G, Type GFQKTA063-32
Power: 2.3 kW
Voltage/Amperage: Max. 260V/11.3A; Min. 210V/1.0A
Speed (Motor): 2950 rpm
Speed (Screws/Drive): 500 rpm

Potential Hazards and Safety Precautions

<table>
<thead>
<tr>
<th>High Voltage (210-260V)/Possible Electric Shock</th>
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<tbody>
<tr>
<td>• Make certain to use the correct outlet that is specifically designed to fit the electrical cord plug.</td>
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<tr>
<td>• Make sure the area around the outlet, floor and your hands are completely dry when plugging or unplugging the electrical cord to/from the outlet.</td>
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<tr>
<th>Belt-driven Pinch Points/Possible Entanglement of Extremities, Hair, Jewelry or Clothing</th>
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<tbody>
<tr>
<td>• Keep hands clear of moving parts at all times.</td>
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<tr>
<td>• The extruder operates at high temperatures and with high-speed moving parts. Never place any body parts near the extruder while it is in operation.</td>
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<tr>
<td>• Make sure to secure long hair and any loose clothing or jewelry before operating the machine.</td>
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<th>Flying Debris/Potential Eye Damage</th>
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<tr>
<td>• Always use proper personal protective equipment at all times while operating the extruder.</td>
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<tr>
<td>• Ensure that the vent fans are turned on while the machine is in operation.</td>
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Required Personal Protective Equipment

Safety Goggles
Protective Footwear (no open-toed shoes)
Lab Coat
Hair Net
Heat-resistant Gloves
Tie Back Long Hair
Long Pants and Long Sleeves
No Loose Fitting Clothing

Training

Required Training

*Denotes courses offered online
Machine & Site-Specific Training
Fire Safety & Extinguisher Training*
Lab Safety: Fundamental Concepts*
Personal Protective Equipment*

Recommended Training for Frequent Users

*Denotes courses offered online
Electrical Safety & Lockout/Tagout
Shop Safety Fundamentals: Basic Procedures & Policies*
# Operation

## Operation: Start-up

1. Check the circuit breaker (panel LIS) to see if the switch for the extruder is in the ON position (see Figure 1).
2. Turn on the power supply by turning the switch to ON (see Figure 2).
3. On the control panel, pull the “Ease stop” to turn the machine ON. Ensure that the motor speed controller knob is turned fully counter clockwise to the OFF position (see Figure 3).

## Operation: Extrusion

1. Turn on the water line for the extruder (see Figure 4).
2. Set the desired temperature profiles by pressing the UP and DOWN buttons on the control panel. The number on top of the temperature panel is the actual temperature while the number at the bottom is the set temperature.
3. Turn on the drive motor by pressing the GREEN button for “Motor Speed” on the control panel.
4. Slowly turn the speed up by turning the knob clockwise until the desired speed is achieved. Ensure that the torque remains below 100% (see Figure 5).
5. Once the desired temperatures are obtained, slowly start feeding the material into the hopper. **Note: Do not place any metallic materials into the hopper.**
6. Place appropriate containers below the die at the end of the barrel to catch the extruded samples. **Note: Do not stand in front of the die where the samples come out nor try to peek inside the die or barrel while it is in operation, as this can cause injury.**
7. When the experiment is complete, slowly decrease the motor speed by turning the “Motor Speed” controller knob completely counter clockwise.
8. Turn OFF the drive motor by pressing the RED button for the motor speed on the control panel.
9. Turn OFF the water line for the extruder.
10. Press the “Ease stop” to turn the machine OFF. Turn off the power supply by turning the switch to OFF.
11. Log your name and hours of equipment usage in the log sheet.

Clean-up Procedures (Assembly and Disassembly)

1. Ensure that the machine is turned OFF before disassembling the extruder. Then, unplug the extruder from the appropriate outlet. Note: Make sure the area around the outlet, floor and your hands are completely dry when plugging or unplugging the electrical cord to/from the outlet.

2. Remove the die assembly by unscrewing the bolts for the die assembly. Then, remove the pressure transducer by unscrewing the bolts for the pressure transducer (see Figure 6).

3. Using the screw puller, carefully remove the twin screws.

4. Clean the barrel and twin screws using a brass brush. Note: Only brass cleaning materials are to be used and absolutely no steel cleaning materials.

5. Once the barrel and screws are completely cleaned, align the screws as shown in Figure 7. Carefully insert/slide the screws back into the barrel. To ensure that the screws are aligned, check the end of the screws to see if the splines (flat surface) is still parallel. Note: If the screws are not aligned properly, it will break the screws and equipment drive.

6. Place the pressure transducer back by screwing the four transducer bolts in (see Figure 6).

7. Place the die back by screwing the four die bolts in (see Figure 6).
Machine Care and Maintenance

- Inspect the machine after every use for any leakage or broken parts. Report any leak or broken parts to the pilot plant manager.
- All final inspections are performed by the pilot plant manager.

Accessories

Two sets of twin screws. Different diameter and shapes of dies.