STANDARD OPERATING PROCEDURE

Mill, Pellet

Model: CL–3
Manufacturer: California Pellet Mill (CPM)
Location: Dry Processing Pilot Plant, 1851 Food Sciences Building
Publication Date: 08/29/2014
Description and Uses

The California Laboratory Pellet Mill (Model CL-3) is a vertical ring-type die machine. The die is mounted on the main shaft, which is driven by “V” belts controlled by the main drive motor. Four drive sheaves are furnished to give a selection of die speeds. The roller is mounted on the roller shaft which rotates with bearings encased in the pellet-chamber housing. The material is extruded as pellets through the die. Pellets are normally cut off or broken by the pellet knife. Pellet length is determined by the distance the knife is set away from the die. Material is fed into the pellet mill by a constant-speed feeder screw driven by a ¼-HP gearhead motor. The feed rate from the hopper is regulated by means of an electrically operated, adjustable vibratory feeder which discharges into the feeder screw. Two CPM pellet mills are available for pilot plant use.

Power Specifications

<table>
<thead>
<tr>
<th>Laboratory Pellet Mill</th>
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<tr>
<td>Motor: Motor No. 387467</td>
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<tr>
<td>Power: ¼ HP</td>
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<tr>
<td>Voltage/Phase/Frequency: 230V/3-Phase/60 Hz</td>
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<tr>
<th>Eriez Magnetic Feeder</th>
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<tr>
<td>Model: 20A</td>
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<tr>
<td>Voltage/Frequency/Amperage: 115V/60 Hz/0.5A</td>
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Potential Hazards and Safety Precautions

**High Voltage/Possible Electric Shock (230-V)**

- Make certain to use the correct outlet that is specifically designed to fit the electrical cord plug.
- 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.

**Sharp, Rotating Cutting Blades/Abrasions, Cuts, or Severed Body Parts**

- Do not insert hands, fingers or other body parts into the hopper or the product discharge area while the pellet mill is in operation.
- The pellet knife blade is sharp! Use extra caution when cleaning the interior of the pellet mill or changing/adjusting the die or pellet knife.
**Mechanical Pinch Points/Possible Entanglement of Extremities, Hair, Jewelry or Clothing**

- Do not use any tool to assist product flow through the hopper, as serious injury may result.
- Make sure to secure long hair and any loose clothing or jewelry before operating the mill.
- Nothing, except the material for which the pellet mill is intended to extrude, should ever be placed into the hopper while the mill is running.

**Flying Debris/Potential Eye Damage**

- Do not operate the pellet mill without wearing all required personal protective equipment, including safety goggles.

**High Pressure/Possible Explosion**

- Pellet mills operate by extrusion and under high pressure. If too much material is fed into the hopper at once, high pressure can build and cause the screw to stop turning and damage the motor. Also, hot material can splash onto the operator due to excessive pressure release.

**Required Personal Protective Equipment**

- Lab Coat
- Heat-resistant Gloves
- Safety Goggles
- Hair Net (Tie Back Long Hair)
- Protective Boots
- No Open-toed or Open-heeled Shoes
- Long Pants and Sleeves
- No Loose Fitting Clothing

**Training**

**Required Training**

*Denotes courses offered online*

- Fire Safety & Extinguisher Training*
- Laboratory Safety: Core Concepts*
- Machine & Site Specific Training

**Recommended Training for Frequent Users**

*Denotes courses offered online*

- Electrical Safety & Lockout/Tagout
- Shop Safety Fundamentals: Basic Procedures & Policies*
Operation

Operation: Die Rotation

1. Be sure to familiarize yourself with the CPM Pellet Mill’s “Operating Instructions” manual before operating the mill. The manual is on file in the pilot plant office, 1955 Food Sciences Building.

2. After familiarizing yourself with the machine by reading the “Operating Instructions” manual, carefully connect the power supply and start the motor. Note: Make certain to use the correct outlet that is specifically designed to fit the electrical cord plug for this machine and that the area around the outlet, floor and your hands are completely dry when plugging or unplugging the electrical cord to/from the outlet.

3. Under the supervision of the pilot plant manager, remove the pellet chamber from the main housing and check for proper die rotation. The die must rotate in a clockwise direction with the operator facing the die from the feeder side of the mill.

4. Once the die rotation is confirmed, turn OFF the motor.

5. Replace the pellet chamber.

Operation: Roller Adjustment

1. Roller adjustments should be made under the supervision of the pilot plant manager, with the pellet mill running, feeder removed, and no feed entering the die.

2. Loosen the clamp bolt located at the bottom of the pellet chamber.

3. Using a spanner wrench, rotate the eccentric housing in a counter-clockwise direction until the roller contacts the die with just enough pressure to turn the roller at a constant speed. This can be checked at the roller shaft extension located at the rear of the eccentric housing. Caution: Excessive pressure between the roller and die must be avoided.

4. Retighten the clamp bolt.

5. Adjust the pellet knife according to your application. Note: The distance the knife is away from the die will determine the length of the pellets. This can be observed by raising the cover.

6. Replace the feeder.

7. Tighten the feeder hold-down screw to secure the feeder.

Operation: Pelleting

1. Place the material to be pelleted into the hopper. The hopper discharge height can be adjusted by using the knob to compensate for free-running or sluggish flow characteristics of the material. Note: There is no standard for hopper discharge height nor optimum level of material in the feeder tray. However, the most uniform feeding results are obtained by operating the vibratory feeder at near its maximum setting, with a very thin layer of material in the feeder tray.

2. Start the main drive motor. Again, check for proper die rotation. Note: The die must rotate in a clockwise direction with the operator facing the die from the feeder side of the mill.

3. Start the feeder gear motor.
4. Start the vibratory feeder. Adjust the feed rate by means of the rheostat control. **Note:** Material must be fed to the die slowly at first to allow the die holes to fill. Observe this by opening the inspection cover in the top of the pellet chamber to view the outside of the die.

5. When all the die holes have filled and the material is extruding, the feed rate may be slowly increased until the main drive motor is operating at the full-rated ampere load. **Note:** In some instances, particularly with a thin die, it may be necessary to introduce a larger quantity of material at one time or a moister material to fill up the die. When it appears that no loose material is passing through the die, either increase or decrease the rate of feed depending on how the die appears to be taking the feed material.

6. Watch the ammeter. At this point, the needle should be approaching the normal load (amperage). If not, increase the feed gradually until it does.

7. With some materials, starting a larger hold die can prove difficult. Even at very high moisture, the die may fail to fill up and start pelleting. In such cases, wrap the outside of the die with a turn or two of gummed tape. This will cause the holes to immediately fill with compressed material. As soon as pellets start forming, the paper will be torn away and may be recovered at the pellet discharge. **Caution:** Do not overload the pellet mill!

8. The ammeter, which is an indicator of load, is provided for your protection. It indicates the correct load to obtain the maximum life at the maximum capacity for which the pellet mill is designed. This life and capacity will be obtained only with correct lubrication and close adherence to instructions regarding the ammeter. **Note:** In some cases, after the die has filled and a few pellets have discharged, the pelleting will cease even though material is being delivered to the die. If this occurs, the feeder should be stopped and the die given a chance to clear itself.

9. Check for roller-shaft rotation and adjust if the shaft is skidding. **Note:** If after a few minutes of operation, the die still does not start to pellet, it may be assumed that the incorrect die was used for the particular material being pelleted, or that the material has not been properly formulated or conditioned. In such cases, it is possible that after cleaning the die and changing the formulation or starting moisture of the material, normal pelleting can resume.

10. When restarting the pellet mill after a shutdown of several hours, **DO NOT** attempt to immediately start the pellet mill at the same setting at which it was operating at the time of the shutdown. As the pellets cool in the die, they become tightly bonded in the holes. Considerable pressure is required to once again get the material in motion through the die. The mill should always be started with a relatively low feed. The feed may be increased as indicated by the ammeter. **Note:** Any operational problems should be immediately reported to the pilot plant manager.
**Operation: Shutdown**

1. Allow the feeder to empty. Then, shut OFF the vibratory feeder and feeder gear motor.

2. Allow the pellet mill to run for a short period (approximately 30 seconds) after the feeder is stopped to clear the pellet chamber of excess material. **Note:** *Avoid stopping the pellet mill under full load, as the “pad” of material which has built up on the die may make it difficult to restart. If the pellet mill does not restart easily, it will be necessary to remove the pellet chamber and clean the excess material from the face of the die.*

3. Safely turn OFF the main drive motor.

4. Initiate clean-up procedures.

**Clean-up Procedures**

1. Be sure to safely power OFF and unplug the pellet mill before attempting any clean-up procedures. **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. All parts which have been in contact with your product should be thoroughly cleaned with a brush and air hose. Soap and water may be necessary for a thorough cleaning. If so, the pellet mill should be moved into the wet pilot plant for adequate washing and rinsing. **Note:** *If parts of the pellet mill need to be removed for proper cleaning, be sure to check with the pilot plant manager and the “Operating Instructions” before doing so.*

3. Be sure to thoroughly clean the surrounding work area of any debris.

4. Dispose of all debris into the appropriate waste container.

5. Initiate check-out procedures by having the cleaned pellet mill and surrounding work area inspected by the pilot plant manager. **Note:** *Be sure to report any mill-related problems to the pilot plant manager before leaving the work area.*

**Machine Care and Maintenance**

- Before inspecting, adjusting or repairing the mill, please turn OFF all motors at the push-button control. Be sure to turn OFF and lock out disconnect switches for all motors. DO NOT remove covers or guards until all moving parts have stopped. Take great care in handling heavy parts. Lift and handle them only with equipment that is rated and designed to do the job. **Note:** *Supervision by the pilot plant manager or a trained service technician is required before attempting to adjust or repair the pellet mill.*

- Inspect the mill after every use for any leakage or broken parts. Report any leakage or broken parts to the pilot plant manager. All final inspections will be performed by the pilot plant manager.

- While lubrication requirements generally associated with pellet mills have been minimized, it is imperative that the simple lubrication instructions furnished in the “Operating Instructions” manual be followed. As previously mentioned, the manual is on file in the pilot plant office, 1955 Food Sciences Building.
The Timken bearings on the main shaft and roller shaft operate in a bath of oil. To add oil to the main housing, remove the breather cap located at the top of the main housing and fill to the level of the plug located at the side of the main housing. Oil is added to the eccentric housing by removing the vent and drain plug in the housing cap.

To fill, rotate the eccentric housing to position the vent at the top. Remove both the plug and vent. Then, fill to level of the plug hole on the side of the housing. The application is not severe and almost any good SAE 30 automotive oil will be satisfactory. Oil levels should be checked occasionally and maintained. **Note: For proper maintenance, it is advised that only the pilot plant manager or a trained service technician lubricate the pellet mill.**

Accessories

Several die accessories are available. For safety purposes, please contact the pilot plant manager if you wish to change the die to meet your desired application.