STANDARD OPERATING PROCEDURE

Mixing Tank, 500 Gallon with Agitator

Model: PCP
Manufacturer: Paul Mueller Company
Location: Wet Processing Pilot Plant, 1091 Food Sciences Building
Publication Date: 04/29/2015
Description and Uses

Paul Mueller processors and pasteurizers provide maximum operating efficiency for heating and cooling in dairy, beverage, and food processing applications. The tank is made of stainless steel with a diameter of 6'10," and is equipped with a Reliance Electric Easy-Clean Plus stirring motor and a Rockwell Automation SP-500 drive for the agitation of vessel contents. The tank (Model PCP) has a flat, pitched bottom with an accessible side outlet. The agitator has a “Standard Bottom Sweep” that moves the product over the heat-transfer surface and sweeps the bottom of the vessel for rapid, heavy-duty mixing and efficient heating or cooling.

Power Specifications of Agitator

Motor: SP-500, Type 1, 3-Phase
Voltage/Amperage: 208-230V, 4.4A
Speed/Frequency: 1725 maximum RPM @ 60 Hz.

The manufacturer’s Instructions Manual provides a detailed description of the instrument with diagrams of its components. Please consult with this manual located in the pilot plant office, 1955 Food Sciences Building when setting up and operating this mixing tank.

Potential Hazards and Safety Precautions

High Voltage (208-230V)/Possible Electric Shock
• Make sure that the wall outlet receptacle is properly wired and grounded, and matches the instrument’s power cord and plug.
• Do not touch the power cord or plug if hands or feet are wet, or if standing on a wet/damp surface, as severe electrical shock or death may result.

Excessive Weight/Possible Damage to Hands or Fingers when Moving or Repositioning
• The tank has two heavy, large-hinged doors that can be opened to add liquids or solids into the vessel. Use caution when opening/closing these doors to avoid injury to hands, fingers, or other body parts.

Combustibility and Explosion/Possible Physical Damage or Injury
• Do not use materials capable of developing flammable or explosive vapors in the vessel. No flammable substances of any kind are to be used in this mixing tank.

Chemical Hazards/Damage to Lungs and Respiratory Tissues
• The tank is not to be used with corrosive substances or chemicals capable of producing harmful vapors, such as chlorine or fluorine.
Elevated Work Station/Possible Injury Due to Falls
• The tank is ~7 feet high with an attached stainless-steel ladder for ease of access and inspection of sample processing. Use caution on the ladder to avoid falls.
• Do not lean too far over the edge of the open tank to avoid the possibility of falling into the tank and being injured by the mechanical sweep.

Possible Biological Contamination of Substrate
• If the doors are open and the mixing process is being inspected from the ladder, the operator should remove objects from the breast pockets of shirts or lab coats. This eliminates the possibility of foreign objects (e.g., pens, glasses, etc.) falling into the tank and contaminating the test material.

Required Personal Protective Equipment
Lab Coat
Hair Net
Safety Glasses or Goggles
No Open-toed or Open-heeled Shoes
Insulated Rubber Gloves
Dust Mask (if mixing dry powders)

Training

Required Training
*Denotes courses offered online
Machine & Site-Specific Training
Fire Safety & Extinguisher Training*
Laboratory Safety: Core Concepts*

Recommended Training for Frequent Users
Laboratory Safety: Spill Procedures
**General Operation**

1. Be sure to complete all the required training listed above, including machine and site-specific training by the pilot plant manager.

2. Be sure to wear all required personal protective equipment listed above.

3. Familiarize yourself with the mixing tank and variable-speed agitator by reading the manufacturer’s Instruction Manual (on file in the pilot plant office, 1955 Food Sciences Building) prior to operating this machine.

4. For operational instructions that follow, refer to Figure 1.

5. **Do not start the heating system while the tank is empty.** For mixing and stirring operations, set the agitator at low speed during filling. Start adding liquid ingredients and open the heating zone control valves as the product reaches 4-6 inches above the top of each zone. Add dry ingredients at a rate to maintain smooth mixing and product consistency. Frozen ingredients should be added after crushing or breaking them into small pieces, and only if there is enough liquid to float them above the stirring blades.

6. When the vessel is filled, set the agitation speed and temperature to the proper settings for the process being performed. For pasteurization: fill the tank, start the heating system, and set the stirrer at high speed. When the desired temperature is reached, change the stirrer speed to low and maintain the temperature for the required processing time. **Note:** The stirrer should be stopped when changing from high to low speed. The braking effect caused by rapidly changing inertial loads can damage the motor. Always push the “Stop” button and wait for the stirrer to stop before setting the drum switch to the low-speed setting.

7. To remove the product, set the stirrer at low speed. If using a pump to remove the product, be sure the sanitary valve is fully open to prevent air from entering the pump and causing foaming. **Note:** The stirrer will also cause foaming unless it is turned off before the product level reaches the stirrer blades.

8. When the tank is empty, rinse it with warm water (45-50°C) before starting a new batch. **Note:** Do not allow rinse water to stand in the vessel. Drain the tank if it will not be used again within a few hours. Report any problems to the pilot plant manager.

9. Initiate clean-up procedures.
Heating with Steam and Cooling with Water

1. Be sure to complete all the required training listed above, including machine and site-specific training by the pilot plant manager.

2. Be sure to wear all required personal protective equipment listed.

3. Familiarize yourself with the mixing tank and variable-speed agitator by reading the manufacturer’s Instruction Manual (on file in the pilot plant office, 1955 Food Sciences Building) prior to operating this machine.

4. When heating with steam and cooling with water, refer to Figures 3 and 4 in the Instructions Manual.

5. Before starting, be sure all valves are closed. Cooling-water valves must be closed during the heating cycle.

6. Fill the tank with product.

7. When the product is deep enough to prevent foaming, turn the stirrer to low speed.

8. Referring to Figures 3 and 4 in the Instruction Manual, open the vent valve (#7) ¼ turn; open by-pass valve (#4), condensate valve (#3), and zone valves (#5) completely.

9. Open the main supply valve at “steam in.”

10. When steam exits the vent valve (#7), this indicates that air has been vented from the heat-transfer surface. When this occurs, close the vent and zone valves.

11. When product reaches the first zone valve (#5), open the valve. Note: Each outlet connection is located near the top of the zone it supplies. Progressively open the remaining zone valves in this manner until the tank is full.

12. When the temperature of the liquid is within ~8°C of the desired final temperature, close the bypass valve (#4) and adjust the regulator setting (#1). The tank contents will be automatically held at the set temperature. Note: If the contents are heated over a long period of time, check for temperature drift and reset if necessary.

13. To cool the product, turn the stirrer to high speed.

14. Close the supply valve at “steam in.” Close the condensate valve (#3) and open the by-pass valve (#4). Then, open the vent valve (#7) just ½ turn. Finally, open the coolant supply and return valves.

15. Water exiting the vent valve (#7) indicates that air has been vented from the heat-transfer surface. When this occurs, close the valve.

16. Leave the zone-control valves open and allow the product to cool to the final desired temperature.

17. When cooling is complete, turn the stirrer to low speed. Note: The stirrer should be stopped when changing from high to low speed. The braking effect caused by rapidly changing inertial loads can damage the motor. Always push the “Stop” button and wait for the stirrer to stop before setting the drum switch to the low speed setting.
18. Cooling is terminated manually by closing water “in” or “out” valves. **Note:** Be sure the pressure relief valve (#8) is working properly to protect Temp-Plate® if both valves were closed. Water expanding on heating, such as when cleaning the processor, could cause damage. To prevent this, be sure all zone valves are still open. Then, open the vent and condensate drain valves to allow the cooling water to drain.

19. To remove the product, keep the stirrer set at low speed. If using a pump to remove the product, be sure the sanitary valve is fully open to prevent air from entering the pump and causing foaming. **Note:** The stirrer will also cause foaming unless it is turned off before the product level reaches the stirrer blades.

20. When the tank is empty, rinse it with warm water (45-50°C) before starting a new batch. **Note:** Do not allow rinse water to stand in the vessel. Drain the tank if it will not be used again within a few hours. Report any problems to the pilot plant manager.

21. Initiate clean-up procedures.

**Heating and Cooling with Recirculated Water**

1. Be sure to complete all the required training listed above, including machine and site-specific training by the pilot plant manager.

2. Be sure to wear all required personal protective equipment listed.

3. Familiarize yourself with the mixing tank and variable-speed agitator by reading the manufacturer’s Instruction Manual (on file in the pilot plant office, 1955 Food Sciences Building) prior to operating this machine.

4. When heating and cooling with recirculated water, refer to Figures 5 and 6 in the Instructions Manual.

5. Before starting, be sure all valves are closed, including the main supply and return valves at “water in” and “water out.”

6. Begin filling the vessel with product. When the product is deep enough to prevent foaming, turn on the stirrer and set it to low speed.

7. Referring to Figures 5 and 6 in the Instruction Manual, fully open vent valve (#7), pump valve (#5), and the zone valves (#6).

8. Open the main-supply valve at “water in.”

9. When water comes out of the vent valve (#7), this indicates that air has been vented from the heat-transfer surface. When this occurs, close the zone valves and main supply valve. Then, leave the vent valve (#7) open. This acts as an overflow outlet for the condensing steam that is introduced into the system.

10. Start the water-circulating pump (#1). **Note:** Be sure that the pump valve (#5) is fully open.

11. Open the steam supply valve at “steam in.”
12. When the product is 4-6 inches above the first zone valve, open this valve (#6). **Note:** Each outlet connection is located near the top of the zone it supplies. Progressively open the remaining zone valves in this manner until the tank is full.

13. When the temperature of the liquid is within ~8°C of the desired final temperature, adjust the regulator setting (#2), if not previously set (please refer to Operating Instructions).

14. Once set, the vessel contents will be automatically held at the set temperature. **Note:** Over long periods, check for temperature drift and reset if necessary.

15. To cool the product, turn the stirrer to high speed.

16. Close the supply valve at “steam in.” Then, turn off the circulating pump and close the vent and pump valves.

17. Open the coolant supply and return valves at “water in” and “water out.”

18. Leave the zone-control valves open and allow the product to cool to the final desired temperature.

19. When cooling is complete, turn the stirrer to low speed. **Note:** The stirrer should be stopped when changing from high to low speed. The braking effect caused by rapidly changing inertial loads can damage the motor. Always push the “Stop” button and wait for the stirrer to stop before setting the drum switch to the low speed setting.

20. Cooling is terminated manually by closing water “in” or “out” valves. **Note:** Be sure the pressure relief valve (#8) is working properly to protect Temp-Plate® if both valves were closed. Water expanding on heating, such as when cleaning the processor, could cause damage. To prevent this, be sure all zone valves are still open. Then, open the vent and condensate drain valves to allow the cooling water to drain.

21. To remove the product, keep the stirrer set at low speed. If using a pump to remove the product, be sure the sanitary valve is fully open to prevent air from entering the pump and causing foaming. **Note:** The stirrer will also cause foaming unless it is turned off before the product level reaches the stirrer blades.

22. When the tank is empty, rinse it with warm water (45-50°C) before starting a new batch. **Note:** Do not allow rinse water to stand in the vessel. Drain the tank if it will not be used again within a few hours. Report any problems to the pilot plant manager.

23. Initiate clean-up procedures.
Clean-up Procedures

1. Properly vent the tank to ensure that the ventilation devices are completely unobstructed.

2. Completely rinse out solids, foam, and other residue with cold tap water immediately after product removal.

3. Rinse the vessel with warm tap water to bring stainless-steel surfaces up to temperature before washing.

4. Use the correct type and amount of cleaner as recommended by the manufacturer (see Instructions Manual). Circulate the cleaning solution at the temperature and time recommended by the manufacturer (see note on proceeding page before washing). **Note: If using a chlorinated cleaner, be sure that the agent is drained and that no chlorine residue remains in the vessel before introducing substances containing acid, ammonia or other chemicals, as the product of such a mixture can be deadly and extremely corrosive!**

5. A non-abusive brush or pad may be used in the tank to assist in the cleaning. Note: Be sure to wear chemical-resistant gloves while washing the vessel.

6. After washing is complete, rinse the vessel with warm tap water, followed by a tepid or cold tap water rinse.

7. If sanitizing the vessel, be sure not to exceed the manufacturer’s recommended concentration for stainless-steel surfaces. Sanitizers may contain chlorine or iodine, and are potentially corrosive, depending on exposure time, temperature and concentration. Sanitize immediately before new product enters the vessel. **Note: Do not close the vessel for empty storage with wet sanitizing solution on the stainless-steel surfaces. Sanitizers should never remain in the tank for more than 20 minutes nor be allowed to dry on stainless-steel surfaces, as damage to the surface may result.**

8. Clean up the surrounding work area.

9. Initiate check-out procedures by having the mixing tank, agitator, and the surrounding work area inspected by the pilot plant manager.
Machine Care and Maintenance

Note: The vessel is made of stainless steel. Although it is a very durable, resilient material, it does have its limitations. The most noted intolerance of stainless steel is to halogen compounds, such as chlorine and fluorine. Stainless steel is extremely vulnerable to damage by certain salts and chlorinated solutions. Some suggestions to avoid surface damage to the tank are listed below.

• Do not allow contact with non-stainless steel wool, wrenches or fittings. Such contact under wet or dry conditions can trigger surface attack.

• Do not allow foreign matter of any kind to remain on the surface for more than a few hours at any one time.

• Follow manufacturers’ directions when using detergents or sanitizing compounds. Using higher than recommended concentrations may dull or corrode the surface.

• Never put concentrated detergents or sanitizing compounds into the tank when it is empty. Add water first.

• Do not allow cleaning or sanitizing compounds to remain in the tank for more than 20 minutes.

• Avoid splashing the cleaning or sanitizing solutions in a manner that would allow these solutions to dry or concentrate on the surface.

• Do not allow water to evaporate in the vessel, as this will allow salt or scale to stain the surface. Always drain the vessel completely.

• Report any problems to the pilot plant manager.

Accessories

None