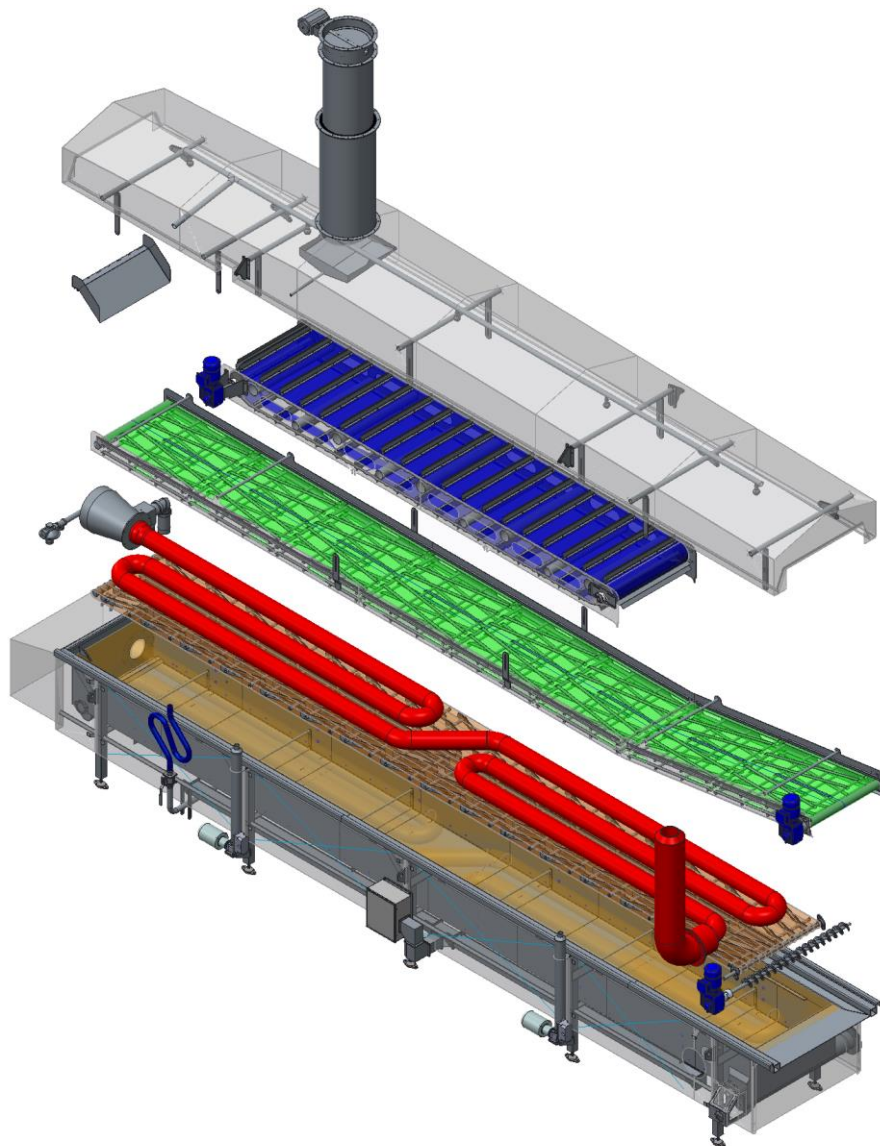


# Immersion Tube Fryer



## Installation, Operation and Maintenance Manual



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PPM Technologies reserves the right to alter at any time, without notice and without liability or other obligations on its part, materials, equipment specifications, and models. PPM Technologies also reserves the right to discontinue the manufacture of models, parts, and components thereof.

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INTRODUCTION

# 1 INTRODUCTION

Thank you for buying your equipment from PPM Technologies. This manual will help you to understand how your equipment operates and what is required to maintain peak performance. Please read it thoroughly and keep it on file for reference. Your satisfaction is very important to us. Please direct any comments, questions or concerns to our Service Department.

Date Purchased: \_\_\_\_\_

Serial No.: \_\_\_\_\_

Factory Order No.: \_\_\_\_\_

General Arrangement Drawing No.: \_\_\_\_\_

## 1.1 SAFETY INSTRUCTIONS



**WARNING:** PPM Technologies is not liable for any damage or reduced performance that may occur as a result of improper equipment assembly and installation, or due to unauthorized alterations. Such actions will void any and all warranties.



**WARNING:** These instructions and safety precautions must be followed. There is danger of electrical shock to the operator.



**WARNING:** The unit must be properly grounded and verified at installation.



**WARNING:** The electrical power supply connection to the PPM-supplied unit must be made through a customer-supplied safety disconnect switch. Incorporation of an emergency stop may also be required, according to local codes.



**CAUTION:** Local safety codes and regulations must be considered when installing and/or operating this equipment.



**Product safety labels must be highly visible on the equipment. Check visibility regularly. If safety labels need replaced, contact PPM Technologies for an additional supply, free of charge.**

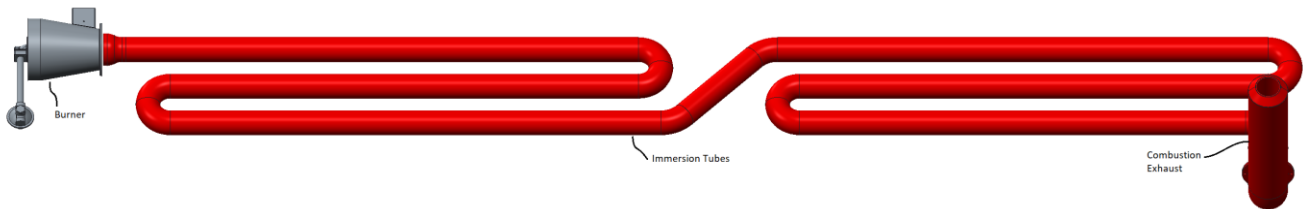


**Supporting information that may be attached (e.g., drawing) take precedence over corresponding information printed in this manual.**

Safety is a basic factor in the maintenance and operation of Immersion Tube Fryers. Proper clothing, tools and methods of handling can prevent serious injury to you or a fellow worker. A number of safety precautions are listed throughout this manual. Please study and follow the precautions and insist that your coworkers do the same.

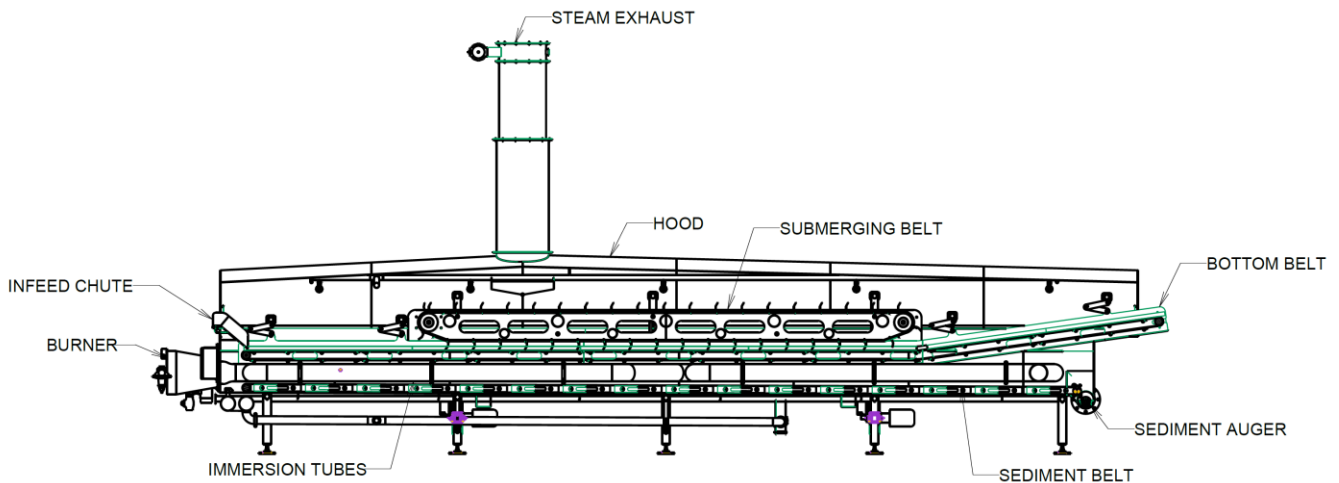
## 1.2 DESCRIPTION

The Immersion Tube Fryer uses high velocity air, heated through a special burner system, to heat a bath of oil (see **Figure 1**). The high temperature of the oil is enough to cook the product and vaporize moisture contained inside the product. This creates a crunchy, oily snack that customers desire for snack foods. The Immersion Tube Fryer differs from other fryers by having the heating occur directly in the tank of the fryer. This greatly reduces the piping and overall complexity, especially in removing the thermal fluid system for heating the oil. Total oil capacity required is also reduced which decreases the time required to obtain frying temperature and lower the time required to cool the oil for cleaning processes.

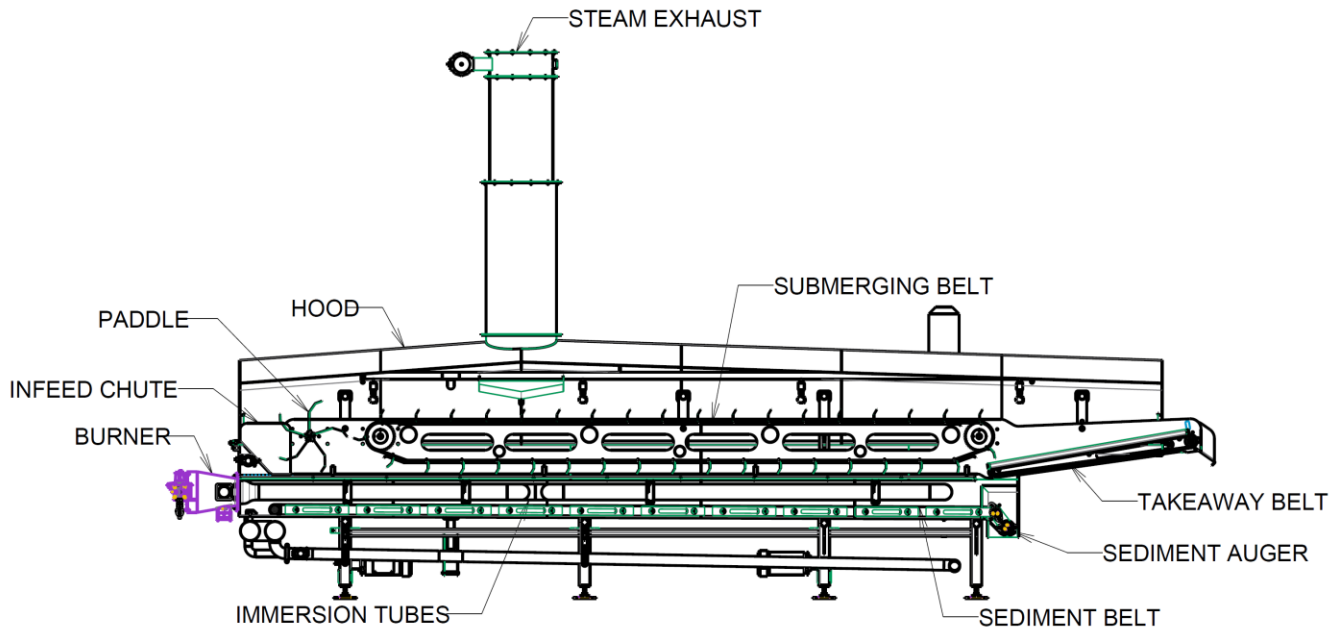


**Figure 1**

Depending on the product being fried, there are different configurations of belts that can be used during frying. If the product sinks, just a lower belt can be used to draw the product through the fryer and out through the discharge (see **Figure 2**). If a product floats during the entire process, just a submerging belt can be used to keep the product submerged during the frying process and a takeaway belt can be used at the discharge to pull the product out the discharge (see **Figure 3**). If the product sets its shape during the initial process of frying, a paddle can be added to the infeed to tumble the product prior to final frying (see **Figure 3**). Some products may require mixing and matching of all the components (see **Figure 2**).



**Figure 2**



**Figure 3**

One byproduct of the frying process is the creation of fines. Some product will only generate a small amount of fines but other products can generate a large amount of fines. Beyond general cleanliness, fines can degrade the oil quality if they remain in the oil. Additionally, fines that fall directly onto the immersion tubes may stick and burn to the surface which is very hard to remove, affects the heat transfer and quickly degrades the oil. With a product that doesn't generate much fines, the flow of oil will often be enough to pull the fines to the end of the fryer. For products that create a larger amount of fines, a sediment belt can be added to the bottom of the fryer to help pull product to the discharge (see **Figure 3**). If large chunks of fines will be expected, screens can be added above the immersion tubes. At the discharge of most fryers, augers are used to pull the sediment to the oil outlet and into the high velocity oil flow. That oil can then be diverted to a number of different filter options to help in pulling sediment out of the oil. A Continuous Drum Filter is usually used first to pull the largest pieces of sediment out. It operates continuously and does not need to have filter mediums changed periodically. If finer sediment collection is desired, various systems exist to filter out the finer sediment particles. Bag filters and paper filters are two such systems, though others exist.

The hood of the Immersion Tube Fryer has been developed in order to protect and preserve the quality of the frying oil. As the product is fried, water turns into a vapor and rises upward. The steam exhaust should be regulated so that it forms a barrier of steam above the oil. This barrier displaces the oxygen in the air and protects the oil from oxidizing. The condensation that forms runs along the inside of the hood and down into condensation channels connected to one or more drains. This prevents contamination of the oil due to "re-dripping". The customer is responsible for all connections beyond the steam exhaust valve including ducting, fans and hoods. The telescoping mechanism on the steam exhaust must be remain unloaded with no lateral forces on the connection. As the hood is raised, the larger pipe runs outside the smaller pipe. There is a sealing ring of oil and heat-resistant material between the components.

## 2 INSTALLATION

### 2.1 GENERAL REMARKS

#### 2.1.1 SUPERVISION

Purchases of one or more PPM machines may in certain cases include installation supervision and commissioning in the order; refer to the order confirmation. This is also possible even if this is not included in the order but is then available at a fixed daily cost plus remuneration of all traveling and subsistence expenses.

This service then comprises:

- Instructions to installation staff.
- Checking of the finished installation.
- Instruction and training of your production personnel.

The physical installation of machines/peripheral equipment/media or product development is not included.

#### 2.1.2 PURCHASER RESPONSIBILITIES

- All permits, charges and taxes.
- All import costs (customs etc.).
- Alterations to existing equipment and/or buildings.
- Building workers/installation personnel.
- Unloading, transport to the destination, weighing or fixing.
- Lubrication of bearings.
- Checking that all protective devices are correctly installed.
- Electrical installation and controls of the same.

#### 2.1.3 INSTALLATION RESPONSIBILITY

The entire installation of machinery and connection of media is to be done by qualified personnel. Only in those cases when PPM's own personnel or personnel contracted by PPM have undertaken this work, will PPM accept responsibility for the work done.



**WARNING: PPM Technologies is not responsible for damage or personal injury resulting from improperly designed or constructed supports. Installation of the Fryer on improperly designed or constructed supports will void any and all warranties.**

The customer is responsible for following all local, state, or other codes and emission regulations. Compliance with those regulations is the sole responsibility of the customer.

PPM recommends the use of a licensed HVAC contractor for both the steam and combustion exhaust systems.

#### 2.1.4 FIRE SUPPRESSION SYSTEM



**WARNING: FIRE SUPPRESSION MUST BE INSTALLED IN THE FRYING SYSTEM. THE CUSTOMER IS RESPONSIBLE FOR FOLLOWING ALL LOCAL, STATE AND OTHER CODES. THE SYSTEM MUST COMPLY WITH ALL CODES AND BE APPROVED BY THE LOCAL FIRE MARSHAL. YOUR WARRANTY AND INSURANCE WILL BE DENIED IF A PROPER SYSTEM IS FAILS TO PERFORM CORRECTLY OR IS NOT INSTALLED.**

## 2.2 MECHANICAL

- When lifting the fryer, ensure that it is lifted only from approved lifting points which include any part of the frame as long as it is within 12” from an leg.
- Ensure that the machine stands stably, horizontally and vertically, on the intended site and that no damage has occurred during transit.
- Perform the necessary pipe routing in order to allow the filling of the tank with water and the drainage of water from the drainage point(s) to an intended site.
- Check that the motor gear units are filled with the oil type and quantity recommended by the motor manufacturer (see separate instructions). Verify that vents are installed according to the manufacturer instructions.
- The combustion exhaust should NOT be connected to a powered exhaust fan. Connecting to an exhaust blower will affect the combustion and could lower the efficiency of the combustion system.
- The combustion exhaust should be vented using a flue system which naturally drafts the combustion gases out of the room.

## 2.3 ELECTRICAL

- Perform electrical connection of the motor in accordance with the instructions on the lid of the junction box. **TO BE DONE BY A QUALIFIED ELECTRICIAN.** Always use a motor protector.
- Check that the correct voltage is connected to the motor.
- If there is risk of water condensing in the junction box, fit a drainage pipe.
- Check the direction of rotation of all motors



**WARNING:** The electrical power supply connection to the PPM Technologies-supplied control must be made through a customer-supplied disconnect switch which must be mounted next to the controls. If possible, install the control at a location where it will receive adequate ventilation. This will ensure prolonged component life.



**CAUTION:** The conductor, between the Immersion tube fryer and control panel must be of sufficient size to carry the current designated on the equipment nameplate.



**CAUTION:** Be certain that the equipment is properly grounded.



**WARNING:** PPM Technologies is not responsible for damage or personal injury resulting from improperly designed or constructed supports. Installation upon improperly designed or constructed supports will void any and all warranties.



**CAUTION:** Do not make any alterations to the equipment without first consulting PPM Technologies. PPM Technologies will not assume any responsibility for poor system performance or mechanical failure as a result of unauthorized alterations to the equipment. Such actions will void any and all warranties.



**CAUTION:** Local safety codes and regulations must be considered when installing and/or operating this equipment.



## **2.4 WATER TEST**

Begin the water test with all the valves closed. Begin filling with water using water hose, checking for leaks as the level rises. Once the level nears the operating level, valves should be opened, checking for leaks as they are opened, starting first with the manifold valves, then working backward until all the valves to operate the system have been opened. The manifold valves can then be closed to 10% and the system pump started at 10%. With the conveyors running and the drum filter running, finish filling the fryer until the approximate oil level height is achieved. Check that the flow through the fryer is undisturbed and evenly distributed throughout. Gradually ramp the circulation pump speed up while opening up the manifold valves to adjust overall oil turnover time and oil flow through the infeed manifolds. Once the water test is complete, a cleaning cycle is recommended prior to filling with oil.

**Disclaimer**

PPM and its agents to ensure the accuracy and reliability of the information contained in this reference guide have put every reasonable effort forth. However, neither PPM, its agents, nor its consultant(s) make any representation, warranty, or guarantee in connection with the publication of these recommended methods and procedures. PPM hereby disclaims any reliability for loss or damage resulting from their use; for the violation of any federal, state, county, or municipal regulations with which these recommended methods and procedures may conflict; or for the infringement of any patent resulting from use of these recommended methods and procedures. These handling and installation instructions are not intended to preclude normal safety procedures, which should be followed to prevent injury to personnel. SAFE INSTALLATION PROCEDURES SHALL BE ENTIRELY THE RESPONSIBILITY OF THE INSTALLER.

IN NO EVENT SHALL PPM BE LIABLE FOR CLAIMS OF PERSONAL INJURY OR FOR SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR REVENUE, LOSS OF USE OF THE IMMERSION TUBE FRYER OR ANY ASSOCIATED EQUIPMENT, COST OF CAPITAL, COST OF THE SUBSTITUTE EQUIPMENT, FACILITIES OR SERVICES, DOWNTIME COST, CLAIMS OF CUSTOMERS OF THE OWNER FOR SUCH DAMAGES, OR FOR DAMAGE TO PROPERTY, WHETHER SUCH CLAIM SHALL BE FOR BREACH OF CONTRACT, BREACH OF WARRANTY, NEGLIGENCE OR STRICT LIABILITY, AND WHETHER SUCH CLAIM ARISES OUT OF OR RESULTS FROM THIS LIMITED WARRANTY, OR EXPRESS OR IMPLIED WARRANTIES, OR FROM THE DESIGN, MANUFACTURE, SALE, DELIVERY, RESALE, INSTALLATION, TECHNICAL DIRECTION OF INSTALLATION, INSPECTION, REPAIR, OPERATION OR USE OF THE CONVEYOR OR SAFETY CABLES.

All specifications are subject to change without notice.

### 3 OPERATION

#### 3.1 CHECKLIST BEFORE OPERATION

- Check that lubrication has been performed in accordance with the maintenance instructions
- Check that the fryer and the filter are clean and dry
- Check that all access panels and drain valves are closed
- Check that all guards are in place and secure
- Check that no unauthorized personnel (like the public and children) are around, in or near the fryer
- Check that the belt(s) and sliding strips are intact
- Check that no tools or other foreign objects are in or on the machine and that all screws and fasteners are in place and tightened
- Check that all valves are in the correct position to start filling the fryer with oil



**CAUTION: Make sure there is no water left in the fryer pan, pipes or drains when you start heating the oil. The water will turn to steam and the pressure created to lead to hot oil being sprayed out of the fryer and lead to serious burns.**

#### 3.2 START-UP PROCEDURE

- Move all valves to operating position
- Put the control panel into manual mode
- Start the Day Tank Pump or Gravity Fill Valve
  - The system will begin filling with oil
  - The system will stop filling when it reaches the maximum fill height
- Once the oil reaches the immersion tubes, the circulation pump can be started at 10% to help purge all the air from the system
- After a few minutes of cycling oil through the system as it continues to fill, the system can be put into auto mode

#### 3.3 OPERATING INSTRUCTIONS

The system is designed and intended for continuous operation. The system is controlled and run by a PLC and OIT.

Once the system is filled, the system should be switched to Auto Mode. Once the Auto Mode is selected, the circulation pump, sediment auger, filter systems and any feeding and discharging conveyors will all start-up.

Check the oil flow coming through the infeed manifolds for correct flow and turbulence. If there is only one manifold, the valve should be fully open.

Start the belts and check them for proper tracking and speeds.

Start the system heating. The fat should be heated gradually, stopping at a temperature of 185-205°F to allow water in the system to boil off.

Once the system reach temperature, the remaining equipment in the line can be started and frying can begin.

### 3.4 ADJUSTMENTS

The following adjustments can be made on most fryers:

- Oil Temperature. This is controlled on the HMI in the recipe section. Care must be taken to not choose an oil temperature that may ignite the oil.
- Pump Speed. This is controlled on the HMI in the recipe section. Increasing the pump speed increases the oil speed through the fryer and decreases the oil turnover time through the fryer. Increased oil speed may affect product travel in the fryer and increase turbulence at the infeed manifolds.
- Belt Speed(s). This is controlled on the HMI in the recipe section. Belt speed will impact the speed of the product through the fryer. If frying time needs to be increased, the belt speeds should be decreased.
- Manifold valve(s). If there is only one manifold, the valve should be fully open. If there are multiple manifolds, the manifold that you wish to decrease flow through can have its valve partially closed.
- Fresh air baffle on steam exhaust. This should be set to control the amount of fresh air pulled into the fryer to a minimum while keeping a bed of steam above the oil and avoiding pushing steam out into the room.
- Remaining motors should be set at reasonable speeds that matches their intended purpose
- Other settings that may be inputted into the HMI include oil level and oil temperature alarm limits

### 3.5 FRYER DRAINING

Once product is done being ran through the fryer, the heating system and the belts can be turned off on the auto screen. The oil should then be circulated through the fryer until the temperature drops below 180° F. Once that temperature has been reached, the pump should be turned down to 25% and the valve to pump oil back to the day tank can be opened. Once the oil level has dropped low enough that the pump starts to draw in air, the pump should be turned off IMMEDIATELY. Not all of the oil is possible to be pumped back to the day tank. The remaining amount of oil can be drained using the 3-way drain valve, the drain ports on the pump body and from the fill piping from the day tank. There may be some areas not covered here that still need to be drained.

### 3.6 EMERGENCY SHUTDOWN

The Emergency Stop button should be pressed and, if a fire is present, the steam baffle should be closed.



**CAUTION: DO NOT LIFT THE HOOD IF THERE IS A FIRE!**

### 3.7 FRYING OIL TROUBLESHOOTING GUIDE

Dark oil	Smoke	Fast oil deterioration	greasy product	Sticky product	Frothing	
•	•	•		•	•	1. Overheating. Check temperature controller.
•	•	•			•	2. Contaminated oil. Filter oil continuously.
•			•			3. Fryer not completely cleaned of cooking residues. Ensure that all surfaces are thoroughly cleaned. <b>Review recommended cleaning procedure in cleaning and maintenance section of your fryer manual.</b>
•	•	•		•		4. Insufficient oil turnover. Maintain a minimum quantity of oil in the fryer, or increase the quantity of the product.
	•	•	•		•	5. Excess moisture in the product. Remove surplus water before frying.
	•				•	6. Rapid oil breakdown. Consult with your oil supplier to find a more stable oil.
•		•		•		7. Oil not stable enough for prevailing conditions. Consult with your oil supplier.
		•				8. Oil in contact with copper or brass. Remove any copper or brass from contact with oil.
			•			9. Frying temperature low. Increase frying temperature. Also check temperature controller operation.
			•			10. Poor frying oil condition. Replace old oil with fresh.
			•			11. Cleaning compound still in fryer. Rinse fryer thoroughly after caustic cleanser and neutralize before draining. <b>Review recommended cleaning procedure in cleaning and maintenance section of your fryer manual.</b>

### **3.8 LIFTING THE HOOD**

The hood can be lifted whether in auto or manual mode. Speed can be controlled on the Hood Lift Control HMI page.

To lift the hood, press and release the “Raise Hood” button.

Ensure that the hood lifts level on all 4 corners. If it does not, one of the lifts has failed and should be stopped immediately. The lifts have a limit on height and should stop before damage is done to the lift system.

To lower the hood, first make sure that nobody is in the vicinity of the fryer. This includes a final check for objects and people inside the fryer. Always monitor the lowering of the hood to make sure no damage is done to any person or equipment. The lifts have a built-in stop and will stop lowering once they have reached their bottom limit.



**CAUTION: DO NOT LIFT THE HOOD IF THERE IS A FIRE!  
DO NOT LIFT THE HOOD UNTIL THE TEMPERATURE IS BELOW 180° F**

## 4 CLEANING AND MAINTENANCE

### 4.1 RECOMMENDED CLEANING PROCEDURE

The following cleaning procedures are effective for most typical food processing applications. If you encounter a stubborn cleaning problem, please contact PPM for assistance.

An effective cleaning program is essential to the efficient operation of your fryer. It will help to maintain oil quality, allowing you to consistently produce the volume of high-quality products you require.

The most common procedure for cleaning fryers is the boil-out method which employs a heavy-duty caustic (or alkaline) cleaning product. Low foaming type should be used if using CIP spray valves in the hood. If using granular type, mix with solution before adding to the fryer.



**CAUTION: Always wear proper protective clothing when cleaning fryers. Cleaning solution is extremely caustic and will cause severe chemical burns if it gets onto your skin or into your eyes. Required clothing includes, but is not limited to, full face protection, gloves and complete overalls. Follow the cleaning compound suppliers' recommended safety procedure.**

#### **Do not use cleaner on any electrical components**

- Allow the pan to cool down to within 70° F of the water that will be used to clean.
- Rinse all debris out of the fryer, pipes and filters with hot water.
- Using a Teflon scraper, loosen built up material that cannot be removed by spraying alone.

**DO NOT USE A STEEL SCRAPER.**

- Lower the hood and fill the fryer with water, add the cleaning agent.

**It is important to follow the cleaning compound supplier's recommendation as to the amount of cleaning agent to use.**

- Start the system on cleaning mode which will start the circulation pump, belts, filter system and augers.
- Add water as need to maintain the proper level.
- Start heating the solution to a temperature of 160-175° F.
- After verifying that the hood is down, the CIP nozzle valve can be opened allowing the cleaning solution to be go through the spray nozzles cleaning the hood and the pan frames.
- Let the cleaning mode run for 20-30 minutes (consult cleaning compound supplier information).
- During this time, the outside of the fryer may be cleaned.
- Once the cleaning cycle has been completed, the fryer can be drained by using the same drain valve(s) as used in the final processes of draining oil from the fryer.

**CAUTION: The heavy-duty caustic (or alkaline) cleaning product is very toxic!**

- Repeat the cleaning with water only, until the fryer is free from the cleaning product.
- The outside can be rinsed during the water-only cleaning cycle.
- Check the pH level of the fryer. If the reading is above 7, the fryer should be drained and refilled with clean water.
- Once rinsing is complete, the fryer can be drained and dried to be ready for production.

**DO NOT LEAVE THE FRYER SITTING WITHOUT OIL FOR VERY LONG. SOME RUST MAY APPEAR ON ANY SURFACE, EVEN STAINLESS SURFACES. NON-STAINLESS SURFACES MAY BECOME VERY RUSTY IF NOT SPRAYED DOWN WITH OIL AND LEFT IN THE OPEN AIR FOR VERY LONG.**

## **4.2 IMMERSION TUBE FRYER MAINTENANCE**



**WARNING: Before performing any maintenance, the electrical power supply must be disconnected at the safety disconnect switch.**

### **4.2.1 MAINTENANCE INTERVAL: DAILY**

- Cleaning as usual during section 4.1 checking the entire fryer for any damage or wear and tear

### **4.2.2 MAINTENANCE INTERVAL: WEEKLY**

- Lubricate the auger/sediment belt drive chain
- Lubricate any bearings with grease nipples and seals
- Check for wear and damage on all belts
- Full boil-out procedure

### **4.2.3 MAINTENANCE INTERVAL: MONTHLY**

- Check oil levels in any gear units
- Check and adjust belt tensions
- Check sliding surfaces for wear and damage

### **4.2.4 MAINTENANCE INTERVAL: ANNUALY**

- Change the oil in the gear units



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NOTES