Automatic Gravity Filler Operations Manual

V1.0

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1.1 SAFETY

1.2 GENERAL SAFETY

Apex Filling Systems, LLC (APEX) manufactures and designs all of its products so they can be operated safely. However the primary responsibility for safety rests with those who use and maintain these products. The following safety precautions are offered as a guide that if conscientiously followed, will minimize the possibility of accidents throughout the useful life of this equipment. The safety of personnel, equipment and plant facilities should be considered during equipment operation and with each changeover of product, or any machine modifications.

Only those who have been trained and delegated to do so and have read and understood this operator's manual should operate the equipment. Failure to follow the instructions, procedures and safety precautions in this manual can result in accidents and injuries.

DO NOT modify the equipment except with written factory approval. Unauthorized equipment modifications will void the warranty.

Each day walk around the equipment and inspect for leaks, loose parts, missing or damaged components, and parts out of adjustment. Perform all recommended maintenance noted in this manual.

EQUIPMENT SHOULD <u>ALWAYS</u> BE DE-ENERGIZED (POWER AND AIR) BEFORE MAKING MECHANICAL ADJUSTMENTS.

1.3 ELECTRICAL SHOCK

- ✓ To avoid electrical shock hazard, make sure this equipment is properly grounded.
- ✓ Dangerous voltages are present within the electrical enclosures. DO NOT operate this equipment with electrical covers open or removed.
- ✓ Keep all parts of the body, hand held tools, or other conductive objects away from exposed live-parts of the electrical system. Maintain dry footing and stand on insulating surfaces. DO NOT contact any portion of the equipment when adjusting or making repair to exposed live parts of electrical system.
- ✓ Attempt repairs only in a clean, dry, well-lighted, and ventilated area.

1.4 CONTACT MATERIALS COMPATIBILITY

APEX endeavors to make all contact parts compatible with buyer's products, if known. Because of the wide variety of possible products, Apex Filling Systems, LLC cannot be responsible or liable for ensuring compatibility of contact material with the products. Evaluate material compatibility prior to machine use. Failure to follow this procedure can result in machine damage, fire, operator injury or death

1.5 SAFETY COMPLIANCE LIABILITY

APEX endeavors to make machinery as safe to operate as possible. National, state and local laws related to safety in the workplace apply primarily to the responsibilities of the employer, and not the equipment manufacturer. The seller agrees to cooperate with the buyer in finding feasible answers to compliance problems. However, because APEX has little control of the many factors which may significantly affect the environment in which this equipment is installed, the seller does not warrant this equipment to be in compliance with OSHA or any like state or local laws or regulations. It is the buyer's responsibility to provide the modifications necessary to assure compliance with the laws and regulations at the point of installation.

A complete inspection of product is necessary until the machinery is proven to produce acceptable results. This should also be performed after every changeover.

1.6 CONVENTIONS

To ensure the safety of personnel which will install, adjust, maintain and operate this equipment, it is imperative that they understand the dangers, warnings and caution notices. It is important to understand the ***signal words*** that may be used throughout this manual.

DANGER	Alerts to immediate hazard, which will result in death or severe personal injury, if not avoided
WARNING	Alerts to a hazard which will result in serious injury, or death in some cases, if not avoided.
CAUTION	Alerts to a potential hazard that may result in a serious personal injury, if not avoided. It also alerts against an unsafe practice that will permanently damage equipment or property.
IMPORTANT	Indicates a suggestion as to how to use or adjust the equipment for best product results.
NOTE	Points out a proper use that will avoid damage to the equipment, or will extend the life of the parts.

2.1 MACHINE FEATURES & SPECIFICATIONS

2.2 INTRODUCTION

APEX gravity fillers are designed to be easy to setup and maintain, capable of providing years of reliable service. Versatile by design, APEX fillers can accommodate a wide variety of product and container configurations, often without the need for change parts. Modular design allows for fully automatic or semi-automatic systems. Tool-less adjustments are standard, and allow for easy and quick changeover for various product and container combinations. Operator controls are easily accessed via the front panel of the unit.

2.3 FEATURES & BENEFITS

- ✓ **Easy Changeover**
  Simple mechanical adjustment for different bottle sizes. Quick to changeover, simple to use and easy to clean
- ✓ **Robust**
  Anodized aluminum and stainless steel shells, frames, legs and housings maximize the working life of your machine, and minimize maintenance costs and downtime
- ✓ **Customizable**
  Whatever the production need, APEX has a design to meet
- ✓ **Flexible**
  Versatility and Simplicity are intrinsic to the design. Many container sizes and shapes, and many products can be run on one machine

2.4 PERFORMANCE SPECFICATIONS

Filling Speed: up to 100 cpm (varies per application)
Operating Temperature: 32 to 122 Degrees F (0 to 50 Degrees C) /
10% to 95% RH (non condensing)

2.5 ELECTRICAL SPECIFICATIONS & REQUIREMENTS

Electrical Requirements: Standard - 240VAC / 50/60Hz / 3 Φ / 40A
Other voltages available per application

2.6 AIR SPECIFICATIONS & REQUIREMENTS

Compressed Air Consumption: Clean, dry (non-oiled) compressed air 80-100psi /
up to 20cfm depending on options
Refer to machine specific documentation if applicable.

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3.1 INSTALLATION & START-UP

3.2 INSTALLATION PROCEDURES

The filler assembly should be placed on a solid, level foundation, with the fill head mount bar centered over the container conveyor. The main filler frame should be leveled using the threaded leveling pads. Electrical connections should be properly terminated into the main electrical enclosure by properly trained technicians, and appropriate supply voltage, proper phase and adequate supply amperage should be verified prior to powering up the equipment.

3.3 START-UP & COMMISSIONING

This manual should be read completely before powering-up the machine. Commissioning of the machine should be performed by a trained technician only after complete understanding of the machine, and with products that match samples indicated to Apex Filling Systems, LLC if supplied. After the machine is adjusted for the bottle and product combination, the machine can be put into operation with the following steps.

- ✓ Check the machine to see that guards are in place
- ✓ Check the mechanical system for loose or missing parts

1. Ensure the E-STOP button is depressed, and the unit is clear of personnel.

Figure 3-1
Emergency Stop

2. Remove any lock-out/tag-out devices and rotate the main power disconnect clockwise to ON

Figure 3-2
Main Disconnect

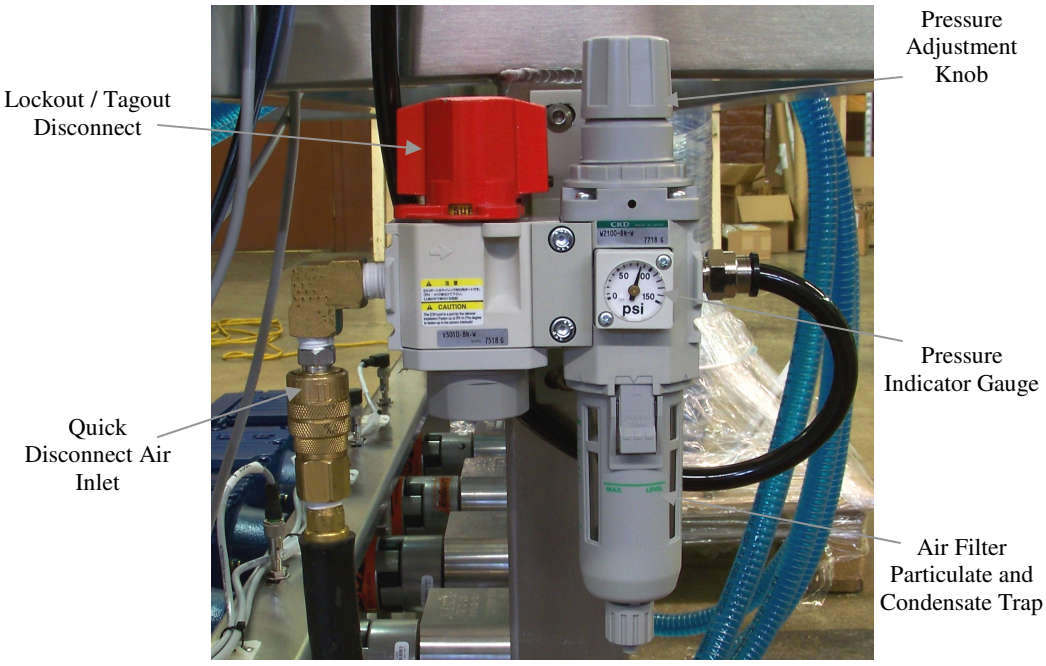

Figure 3-3
Main Air Disconnect and Filter Regulator

3. Keeping clear of any movable parts and assemblies, remove any lock-out/tag-out devices and rotate the main air disconnect clockwise to ON
4. Press the green Power Reset button to engage power to the control box

Figure 3-3
Power Reset

5. Verify that sufficient containers and product to be filled are available to be supplied to the filler
6. On the operator interface, press Cycle Start (or equivalent, depending upon controller and program used) to begin the indexing and filling cycle.
7. If fill levels are incorrect, or machine indexing does not perform properly, refer to the appropriate mechanical adjustments (*Sec 4.1*) to rectify, or adjust the filling and indexing program timers (*see controller manual for detailed adjustments*)

4.1 MECHANICAL ADJUSTMENTS

4.2 THEORY OF OPERATION

APEX automatic gravity fillers utilize a container conveying system, typically a flat tabletop chained conveyor, to move containers into and out of the filling area. Container location is precisely controlled using guide rails, and indexed using either air cylinders (commonly referred as “gates” or “pins”) to stop and release containers in-line, starwheels or timing screws which use container pockets for container control.

Utilizing timers accessed through the touch screen controls, containers are automatically indexed into the fill area. ***For pin-indexing setups***, an entry gate holds back empty containers, and an exit gate holds back the containers to be filled. The process conveyor will typically be stopped while filling containers to increase the stability of the containers.

The fill cycle starts once the containers have been counted via an electrical sensor. Depending upon the equipped options, drip tray retracts, bottle neck locators extend, and a dive cylinder lowers the fill heads in to the neck of the containers. The fill heads open, and product flows from the hopper tank into the containers.

Dispensed volume is determined by several methods, depending upon the configuration and options installed. Simple timers are often sufficient to achieve accurate fills, however, more precise control can be achieved using weigh cells, utilizing scales to verify dispensed product weight. Optical fill level sensors can also be used to fill to a cosmetic level if needed.

Once the containers are full, and the fill cycle has finished, the full containers are indexed out of the fill area on to down-line operations (capping, labeling, etc), and empty containers are indexed into the fill area, ready to for the next fill cycle.

4.3 FILLER COMPONENT OVERVIEW

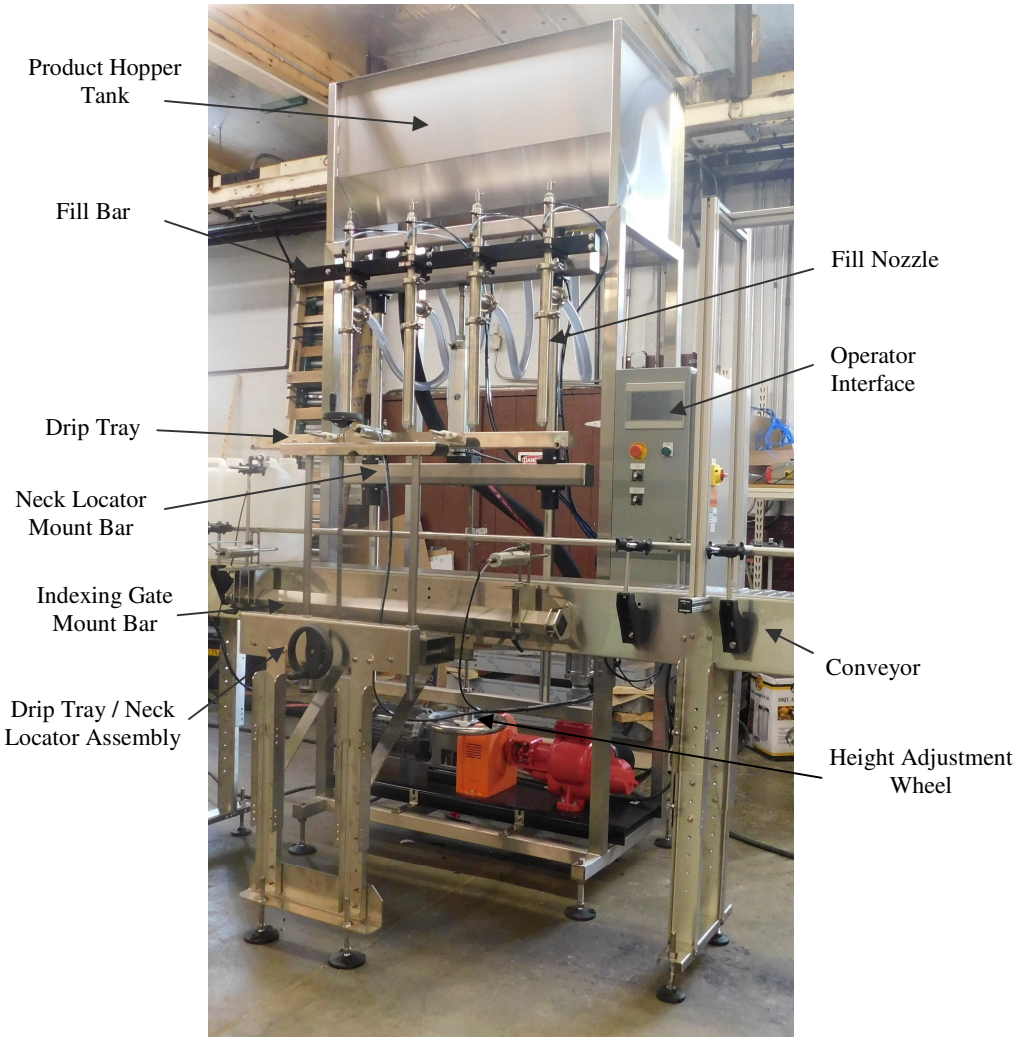

Figure 4-1
Filler Component Overview

Many typical filler assembly components are shown in *Figure 4-1* for reference. In the picture above, there are a number of optional components shown, such as a drip tray and neck locator assembly, diving head assembly, and other optional components. Modular components vary per application requirements.

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4.4 CONTAINER GUIDE RAIL AND INDEXING GATE ADJUSTMENTS

For containers to move properly down the conveyor, guide rails must be adjusted so that containers move smoothly, without binding, in a uniform manner. Guide rails will typically be set toward the base of the container for best results. Difficult-to-control containers may require an alternate setup (multiple rails, special containment, etc) to effectively control the location and movement of the containers. Guide rails are typically adjusted in/out and up/down with turnbuckles which hold the guide rail rods in place, as shown in *Fig 4-2*.

Figure 4-2
Guide Rails and Indexing Gates

Figure 4-2 shows a typical (left-to-right) set up of guide rails and indexing gates. Containers are situated in the fill area by the **Entry Gate** and **Exit Gate** locations. The **gates** or **pins**, are mounted in place with L-brackets mounted to a sliding mount rail as shown, and are positioned and locked into place with standard nuts and bolts.

The **exit gate** is set so that it extends over more than half of the container diameter, so the containers are positively stopped during the indexing cycle. The **entry gate** only extends far enough to hold back incoming (empty) containers from moving past it, without affecting their position when extended, as shown in *Fig 4-3*.

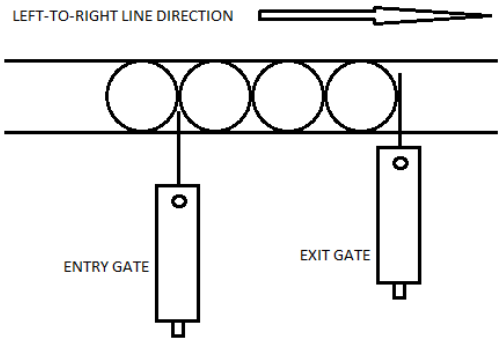

Figure 4-3
Indexing Gate Positioning

Air cylinders are typically equipped with air flow control valves to adjust the speed which the cylinders will operate. Turn clockwise to slow the extension or retraction, counter-clockwise to speed.

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4.5 CONTAINER SENSOR ADJUSTMENTS AND LOCATIONS

Sensors are positioned along the container path on the conveyor (such as shown in *Fig 4-4*) to count and/or verify the container position. A variety of sensors can be utilized, depending upon the type of container to be sensed (clear glass, plastic bottle, metal can, etc.) Sensors located prior to the fill area count the proper number of containers entering the fill area and verify sufficient containers are available prior to the fill area. Sensors located downstream from the fill area will sense if a backup has occurred, and will pause the fill operation until the backup or jam has cleared.

Figure 4-4
Typical Container Sensor

IMPORTANT The container count sensor is positioned so that it reads empty containers on the conveyor at least one full cycle's worth of containers prior to the entry gate.

4.6 STARWHEEL ASSEMBLY AND ADJUSTMENTS (OPTIONAL)

Figure 4-5
Starwheel Assembly

The starwheel assembly is mounted to the side of the conveyor so that the starwheel pockets gently control the containers against the back conveyor guide rail. On the underside of the assembly, there are locking knobs which can be loosened to adjust the starwheel in and out to achieve the proper tension against the containers. The location of the containers on the conveyor can be adjust forward or backward by loosening the lock knobs and sliding the assembly up or downstream as needed.

When the Starwheel Stop Cylinder releases the starwheel to rotate, the Count Pins rotate past the Pin Sensor and are counted to the number set in the controller, at which point the Stop Cylinder extends, stopping the starwheel from rotating.

4.7 FILL BAR ADJUSTMENTS

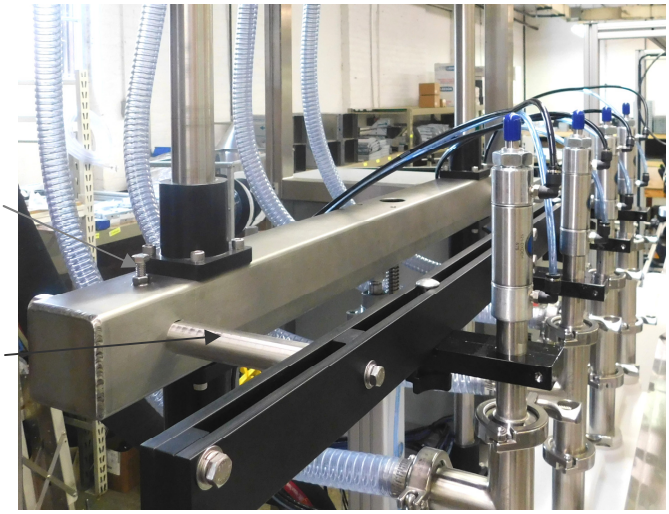

Figure 4-5
Fill Bar Horizontal Adjustment

The fill bar should be centered over the container conveyor so the fill heads line up above the container necks. The fill bar is adjusted forward and backward by loosening the hex head lock nut and bolt which locks the horizontal mount shaft.

4.8 FILL HEAD SIDE TO SIDE ADJUSTMENT

Fill heads can be adjusted side to side by loosening the adjustment knobs and sliding the heads so they are aligned with the container necks. Likewise, if equipped, the neck locator fingers can be adjusted to positively contain the container necks against the neck rail.

Figure 4-6
Nozzle Side-to-side Adjustment

4.9 FILL BAR / FILL HEAD / DIVING HEAD HEIGHT ADJUSTMENT

The fill bar assembly can be adjusted up or down for different containers with the crankwheel located at the bottom of the machine assembly. A power height jack or manual crank height jack is provided to adjust the fill bar, diving head assembly, and fill head assemblies for different height containers.

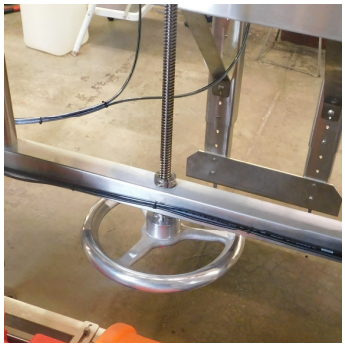

Figure 4-7
Height Adjustment
Crankwheel

4.10 DRIP TRAY ADJUSTMENT

The height of the drip tray in relation to the fill bar is adjusted via the height adjustment crank. The drip tray height should be adjusted so that the drip tray, when extended, is just below the bottom of the raised fill nozzles.

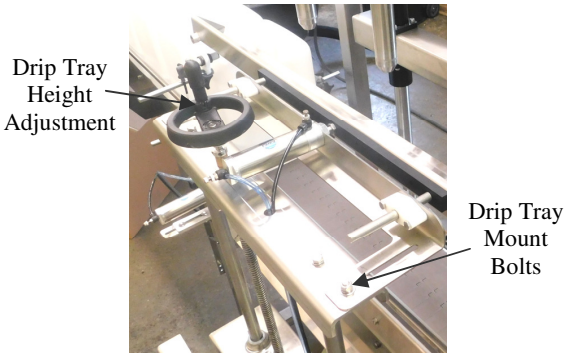

Figure 4-8
Drip Tray
Adjustments

4.11 DIVE HEIGHT AND STROKE ADJUSTMENT (OPTIONAL)

CAUTION

Adjusting the dive stroke exposes pinch points which can cause serious injury. Ensure that all personnel are clear of the equipment when making adjustments. Verify no electrical cords or pneumatic tubing is in the path of the cylinder or bearings.

Figure 4-10
Upper Diving Head Stop

On each upright (vertical) support/slide shaft is a locking collar which sets the highest point which the fill bar will raise between fills. Each collar should be set at the same height to avoid binds.

To set the proper dive height and stroke:

1. Raise the Fill Bar with the adjustment wheel high enough so containers can pass under the nozzle tips
2. Ensure the fill area is clear of containers and any other obstructions.
3. Ensure containers are present under each fill head, and the fill heads are aligned above the containers
4. If equipped, ensure the drip tray is retracted, and extend the neck locators
5. Manually dive the Fill Bar through the operator interface
6. Using the Manual Crank Jack, lower the fill heads to the desired depth into the container
7. If installed, set each locking collar above the top of each vertical shaft bearing at the distance which the cylinder will need to dive into the containers
8. Manually raise the dive cylinder through the operator interface so the nozzles rise from the containers
9. Ensure that both locking collars are at the same height (the slide bearings should contact them at the same time)
10. Ensure that containers are able to freely move underneath the nozzle tips while nozzles are raised

5.1 LIQUID HANDLING

5.2 FLOAT SYSTEM

Figure 5-1
Product Float Switches

Inside the hopper tank is a dual float system which maintains the product level to feed the fill process pump. When the product is supplied to the hopper tank up to the level which the Main Float Switch moves to its upper stop, the product inlet will close and/or the supply pump will turn off. During normal use, only the Main Float should be used. In the event of a sensor, solenoid or valve failure which causes extra product to be provided to the hopper tank, the Backup Float should be activated, causing a fault on the operator interface, and stop the filling and indexing process, so the error can be corrected.

IMPORTANT

Float switches are reversible. If the float ball is removed, and re-installed upside-down, it will send reversed signals to the controller, causing a fault, or possibly overflowing the hopper tank. It is important to verify proper orientation after cleaning or disassembly to avoid problems.

5.3 SUPPLY PUMP

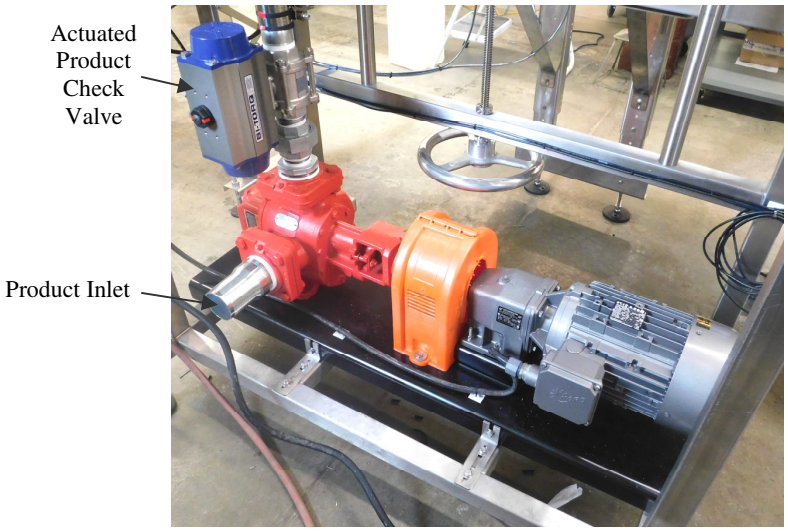

Figure 5-2
Supply Pump Assembly

Feeding the hopper tank to maintain consistent levels is generally achieved using a pump to feed product into the hopper. Occasionally, if bulk product is located above the level of the hopper tank, gravity feed may be utilized instead. Most importantly, the supply must be able to match the speed of the fill, so that a constant level of product is maintained in the hopper tank.

The actuated product check valve (shown in *Fig. 5-2*) is a pneumatically (typically air-to-open, spring-to-close) controlled ball valve which positively stops the flow of product into the tank when the primary float is satisfied, or the backup float is activated, and opens when the primary float calls for product and the backup float is not activated.

5.4 TANK DRAIN

Mounted on the bottom of the hopper tank is a valve to assist with cleanout of the tank. Typically a manual valve is used (as shown in *Fig. 5-5*), but may optionally be controlled via the operator interface utilizing a pneumatically controlled valve.

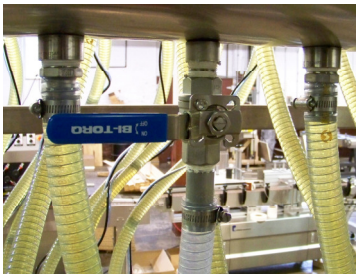

Figure 5-5
Manual Tank Drain

6.1 ELECTRICAL

6.2 FRONT PANEL CONTROLS

Typical controls available to the operator are shown in *Fig 6-1*

The primary operator interface touch screen, Emergency Stop button, Conveyor Controls, and Reset Power Button are generally mounted on the front panel.

Other toggles (such as Power Height option) may be present, depending upon the configuration, please refer to machine specific documentation for custom configurations.

Figure 6-1
Front Panel Controls

6.3 AIR SOLENOIDS

Air solenoids, typically mounted to the side, or rear, of the main control box, provide pneumatic logic control for the machine operation. An electrical signal, sent from the PLC, activates the solenoid attached to the air valve, switching the air pressure from one port to the other, extending or retracting the connected air cylinder (indexing gates, dive cylinder, drip tray cylinder, etc)

Solenoids may be manually activated by pressing the orange button located on the face of the solenoid assembly to assist with troubleshooting.

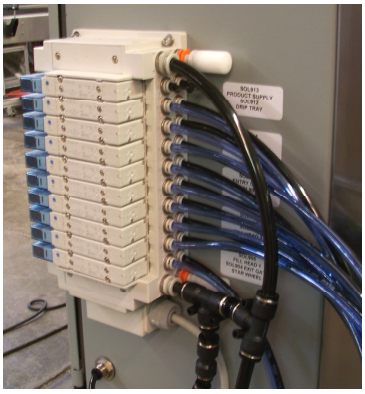

Figure 5-5
Air Solenoids

7.1 TROUBLESHOOTING

7.2 GENERAL TROUBLESHOOTING

SYMPTOMS	POSSIBLE RESOLUTIONS
Machine does not power-up	Verify inlet power is active
	Verify Main Disconnect is rotated to ON
	Check Main Fuses or Circuit Breakers
	Check control transformer (220VAC to 110VAC) and connections
Fill levels are inconsistent	Check that float system is properly supplying the hopper tank
	Verify sufficient air pressure is available
	Verify fill nozzles have no clogs, clean if needed
Unit powers, but will not cycle	Check that the line backup sensor is located properly, and clear of obstruction
	Check that E-Stop is pulled out
	Check that Reset Power button has been engaged (if equipped)
No product in supply tank	Check for proper air supply
	Check pump motor starter relay in control box (if equipped)
	Check supply control valve on supply tank
	Check float switches for proper operation
	Ensure tank drain valve is closed
	Check that product supply is enabled in the Operator Interface

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8.1 SERVICING

8.2 CLEANING PROCEDURE

It is important that the machine is kept clean of dirt, broken glass, sand, etc. as these will reduce the wear life of the air cylinders and pump seals, o-rings, etc. The machine should be cleaned with water or soap at regular intervals. Stronger detergents are often used in the food industry and can be corrosive on the machine components. Therefore, the machine should be washed down thoroughly immediately after cleaning with any harsh detergents.

WARNING: When using a high-pressure pistol with cold and hot water, or steam for cleaning, do not spray near any electrical enclosures.

If the machine is to sit dormant for more than 48 hours (or less, depending upon the product) it is good practice to completely flush the product lines, pumps, and fill heads with clean water. If solvent is needed to dissolve product effectively, it is equally important to flush with clean water after cleaning product residue. Harsh detergents and solvents can harm seals and tubing and should be cleared from the system.

9.1 FACTORY CONTACT INFORMATION

9.2 CONTACT APEX DIRECTLY

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