



AutoFil Recycler System

FLATPROOFING TECHNICAL MANUAL

We keep the world rolling.
No flats, smoother ride, more protection.

TyrFil™
A **CARLISLE** BRAND

This manual is intended to assist the tire fill technician in the operation of the AutoFil Recycler System. It covers the basic operation of the machine, procedures for filling a pneumatic tire and general maintenance of the machine. Inside you will find the basic steps incorporated in the control, air/water valve procedure for filling a tire, general troubleshooting if problems occur and general procedures for fixing the machine if problems occur. Like any computerized machine there is a learning curve involved depending on the operator, our experience has led us to a conclusion that the curve is anywhere from one (1) month to three (3) months. If any mistakes are found in the manual, please contact us so that we can correct them.

Your cooperation is deeply appreciated.

THANK YOU AND WELCOME TO THE TEAM,

Carlisle TyrFil

Technical Services Department

Office: (800) 821-4147

Normal Hours of Operation: 8:30 AM – 4:30 PM EST

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INTRODUCTION

Flatproofed tires must be processed correctly to provide the customer with the maximum benefits of no flat tires: full tire life, consistent internal pressure, no rim slippage, improved safety, proper tire flex, cost savings, and retreadability.

The tire flatproofing process includes the following steps:

- Inspecting tires and wheels for defects
- Pre-stretching the tire overnight
- Pumping material through the valve stem into the tire replacing all of the air
- Pressurizing the tire to the recommended inflation pressure
- Curing at the proper time and temperature to ensure optimum filled tire performance

It is a precision process and should only be performed by a Carlisle TyrFil Certified Technician. Proper training and this Manual provide the necessary information to flatproof tires. This Manual is intended for use with the TyrFil AutoFil Recycler System. As always, we remain available to assist you with all aspects of your flatproofing business. For any questions or problems, please call our **Sales and Technical Center at (800) 821-4147**.

Disclaimer

This Carlisle TyrFil Flatproofing Technical Manual contains information pertaining to flatproofing tires with our manufactured products that have been installed through the Carlisle TyrFil approved processing systems. This Manual contains information regarding the flatproofing process only, it does not contain other information which may be relevant with respect to the flatproofing process (for example, the tire manufacturer's specifications and information, workplace safety information, etc.). It is important that all flatproofing processors follow not only the safety procedures set forth in this Manual, but also standard safe operation and work conditions, and other safety procedures that may pertain to the facility in which the flatproofing is taking place, and the specific tire manufacturer's safety information.

Although this Manual has been developed for the purpose of instruction, the flatproofing processor must be properly trained in all phases of the job performance, which include, without limitation, installing TyrFil products into the tire in a safe manner, the proper use and operation of the equipment, and the proper maintenance of such equipment.

Carlisle TyrFil shall not be responsible for any injury or damage to persons or property in connection with the processing or use of our products. Further, Carlisle TyrFil shall not be responsible for any injury or damage to persons or property due to a customer's actions, the customer's disregard for the safety procedures set forth in this Manual or other safety procedures, the customer's failure to comply with the tire manufacturer's product guidelines, or due to a customer's failure to follow our instructions, verbal or written, pertaining to the flatproofing process.

Carlisle TyrFil's technical and sales staff make routine visits to its customer's locations for the purpose of reviewing processing rooms and procedures. However, a customer should not rely on such visits as assurance that it has taken all safety and other precautions.

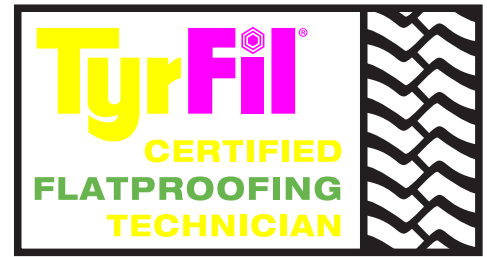
Carlisle TyrFil maintains a knowledgeable technical support staff who can assist our customers with any questions or troubleshooting that may be needed in connection with our products. Further, Carlisle TyrFil maintains an inventory of parts, and written technical and safety data on its products.

Any questions regarding information contained in this Manual, our products, or our recommended equipment should be directed to the Carlisle TyrFil Sales and Technical Center at (800) 821-4147.

I. REQUIREMENTS

Technical Training

Training by the Carlisle TyrFil Technical Department is essential to any successful flatproofing operation. All flatproofing technicians need to go through our certification process which includes training videos, demonstrations, hands-on practice, and a short quiz. All certified technicians will receive a wall plaque and uniform patches.



Floor Space

The volume of your business determines the amount of space required. Space must be provided for:

- Pumping area
- Tires and materials storage
- A temperature-controlled curing area

The minimum space required is 600 square feet (55 square meters), approximately the dimensions of a residential double garage. This area should be well-lit, well-ventilated, and heated (if necessary) to maintain a minimum of 72° F (22° C).

Equipment and Tools

AutoFil Recycler System – The Carlisle TyrFil Patented AutoFil Recycler System is the only tire fill system on the market that can recycle and reuse post-consumer oil-based tire fill. Since 2002, this machine has made it possible to keep more than 150 million pounds of tire fill out of landfills each year. Its convenient one-step process increases efficiencies and requires very little labor. It's easy to operate by a single person and clean up only takes five minutes. The AutoFil Recycler System and replacement parts are readily available through Carlisle TyrFil. Visit www.carlisletyrfil.com to download the AutoFil Recycler System Parts Catalog.

Material Handling Equipment – A forklift or pallet jack may be required to handle large tires and to move totes.

Miscellaneous Tools – Have available: a large pipe wrench, channel locks, vise grips, pliers, bung wrench, assorted screwdrivers, wrenches, hammers, and a valve core remover.



Supplies

Product – Flatroofing materials are supplied in Intermediate Bulk Container (IBC) sets. Intermediate Bulk Containers are commonly known as “totes”. A kit or set is comprised of one ISO-side and one CAT-side. Each tote set is 4,500 lb/550 gal (2045.45 kg/2081.75 l).

Solvent – Isopropyl alcohol (99% pure) is the recommended solvent for cleaning machinery and tools. It can generally be purchased locally. Solvents should be stored in UL/FM (Underwriters’ Laboratory/Fire Marshall) approved containers and handled in accordance with all federal, state, and local regulations.

Hypodermic Needles – Needles are used for venting tires during the filling process. The standard size is 12 gauge 3-inch. Other sizes are available. For your convenience, these are available from Carlisle TyrFil.

Nails or Screws – A nail or sheet metal screw is used to plug the venting hole. A #10 ribbed roofing nail is recommended and can be found at any hardware store.

Self-locking plastic bags – These are used for retaining liquid batch samples while they cure.

Waste Container – Empty 5-gallon pails are useful for collecting waste material. Using a plastic liner makes disposal easier. *

Cleaning Rags – keep plenty of rags on hand for clean-up. A clean pumping operation is essential for proper tire processing. *

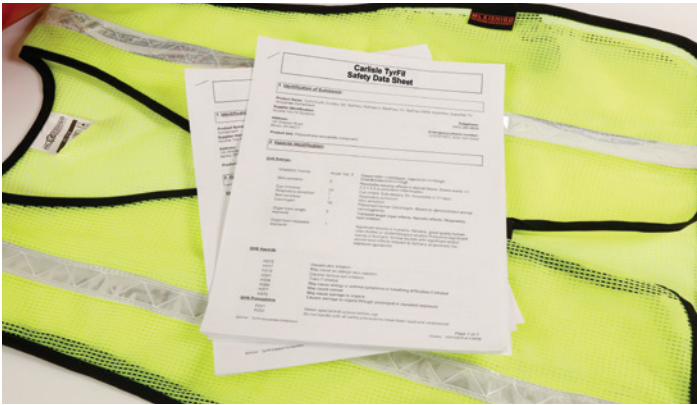
*** Be sure to follow all federal, state, and local regulations when disposing of any cured or uncured material or other related items.**



II. SAFETY

General Precautions

SAFETY SHOULD BE YOUR NUMBER ONE PRIORITY. IN ORDER TO PROMOTE SAFETY, CARLISLE TYRFIL WANTS TO EMPHASIZE THE FOLLOWING:



Safety Datasheets (SDS) identify the properties of ISO-side and CAT-side products and the precautions that should be taken when handling them. Safety Datasheets have been prepared in accordance with the U.S Department of Labor and the Occupational Safety and Health Administration (OSHA) for each product. Please read them carefully. In accordance with Federal law, these must be available to all employees on-site. If you do not have a copy, call immediately to have one faxed and/or mailed.

Operators must wear eye protection when using equipment. Gloves rated to withstand the chemical hazards are to be worn to prevent skin contact anytime a risk of exposure exists. Exposure to fumes must be limited using methods of control including proper ventilation.

Use extreme care when disconnecting any material supply hoses. Be sure to release the pressure and loosen the couplings slowly before disconnecting completely.

Spilled material must be cleaned promptly for easier clean up and to avoid falls. Cured urethane is extremely difficult to remove from concrete floors. Use a barrier such as cardboard or roofing felt in your flatproofing area to protect the floor and replace as needed.

In case of a liquid spill, soak up the spilled material with an oil absorbent, such as sawdust or vermiculite. Sweep it into a waste container and neutralize it with a decontamination solution (95% waste, 3% ammonia, 2% detergent). Spilled solvent (isopropyl alcohol) is a fire hazard and should be cleaned up promptly. Smoking, grinding, or open flames should not be permitted in the work area. Be sure to handle spills, clean-up, and disposal in accordance with all federal, state, and local regulations.

For a chemical emergency (spill, leak, fire, exposure or accident): call Chemtrec – day or night – from the United States or Canada (800) 424-9300.

Minor spills or leaks (less than five (5) gallons) can be cleaned up according to instructions in the SDS.

The fluid output pressure of the pump is 5 times the input pressure. This output pressure can exceed the burst pressure for most tires. Therefore, extreme care must be taken to ensure the tire is not pressurized beyond the manufacturer's recommendations.

Be sure to inspect all rims, lock rings, wheels, and associated restraining bolts for structural defects prior to filling. While filling, use a safety cage, or other OSHA approved restraining device to protect yourself. Flatproofing equipment should never be left unattended while the pump is in operation. Please refer to other reference materials, such as from the Tire Association of North America (TANA) and OSHA, on proper tire preparation and handling.

Material Precautions

The ISO-side (isocyanate) is especially sensitive and will solidify from the slightest exposure to moisture or humidity. A desiccant is required on the ISO-side.

Material temperature should be at least 72° F (22° C) while processing. Cold materials become thick, which slows pumping and can result in inadequate mixing and poor/slow cure.



Safety Supplies

Signs- “No Smoking” signs should be posted due to hazards presented by chemicals.

Tire Cage- Tires should be filled in a tire cage. Tires over-pressurized with air or liquid can fail with explosive force. Cages are mandatory when working on wheels with split rim or lock ring assemblies. Position tires with the lock ring facing away from the operator and work area.



Fire Extinguisher- Extinguishers should be within easy reach as isopropyl alcohol is flammable and poses a fire hazard.

Eye Protection- Eye protection is essential and should be worn at all times as liquids, pressurized air, and solvents can accidentally be splashed in the eyes. Personal protective equipment requirements are described in the SDS.

Gloves- Natural rubber, latex, or neoprene gloves should be used to reduce skin contact and potential irritation caused by sensitization to flatproofing materials. Personal protective equipment requirements are described in the SDS.



Industrial First Aid Kit- Kits should be properly stocked and readily accessible for emergencies.

Note: Compliance is unique at each pumping location and should be in accordance with all local, state, and federal regulations.

III. PREPARATIONS

Any pneumatic tire can be flatproofed regardless of pressure or rated load specifications. New tires provide the best long-term value, although used tires are often flatproofed.

All new tires should be pre-stretched before filling. Inflate new tires to maximum rated inflation pressure and maintain overnight. Tires grow during service and pre-stretching allows the tire to be filled to its capacity and will minimize long term carcass growth. Used tires do not need to be pre-stretched and typically take 15-20% more material than new tires.

Tires, especially used tires, should always be inspected prior to flatproofing. Flat tires should be repaired. To be effectively flatproofed, tires must be able to hold air for at least three hours and be free of cuts or other defects that reduce casing strength.

Wheels should be inspected for cracks, metal fatigue, and corrosion. Damaged or rusted wheels are a safety hazard and should be avoided.

Tires and wheels have recommended load carrying capacities. The load carrying capacities should not be exceeded. When calculating the load weight, take into consideration the extra weight of the flatproofing material.

A tire or wheel with a defect should not be used in flatproofing, as it could result in a premature tire or wheel failure. Allow time for drying if washing is required.

Tire contaminants, such as water, sealants, glycol, calcium chloride, soaps, waxes, or even dirt, must be removed before flatproofing.

For tube type tires, always use new properly sized tubes. Wheels that require the use of flaps to protect the tube during inflation and operation must be filled with the flap in place. If you remove the flap, the tube has a greater chance of rupturing during the flatproofing and curing process.

Tire and wheel assemblies should be at a minimum of 72° F (22° C) before processing. Cold tires will slow the curing process.

Equipment Set-up

1. **Arrange Totes and Drums** – Totes should be arranged with the ISO-side on the left and the CAT-side on the right. The lower cylinders of the pump are labeled as to which hose goes to which side. When moving the pump, be sure to keep tote hoses on their proper side. It is a good idea to place roofing felt in the pumping area, especially under the tire being filled, for easier clean-up.



2. **Assemble Tools and Supplies** – Make certain all necessary tools (valve core remover, extra valves, screws, hammer, screwdriver, pliers, bags, etc.) are on hand. If possible, stage the tires to be filled in the vicinity of the pump.

3. **Prepare Totes**

- a. Remove shipping cap. Remove foil if it is present.
- b. Liberally grease the threads on the tote connector and screw it onto the tote's ball valve and hand tighten. **(DO NOT TIGHTEN WITH A WRENCH)**
- c. Remove dust cap from kamlock on suction/ supply hose.
- d. Apply grease to the tote connector and connect the kamlock to the tote connector. Lock kamlock in place by pulling back on the handles.
- e. Connect the supply/suction hose to the king combo on the intake side of the pump and tighten hose clamp.
- f. Repeat for both ISO- and CAT-sides.



4. **Install Desiccant Cartridge** – It is essential that a desiccant is used on the ISO-side tote as the material is moisture sensitive. The CAT-side tote will need to be vented.

To Install the Desiccant Cartridge:

- a. Remove the white 2-inch center bung on the ISO-side tote.
- b. Apply grease liberally to the threads on the desiccant holder. This will make removal easier.
- c. Remove the seal on ends of the desiccant canister.
- d. Loosen top hose clamp on desiccant sleeve and insert desiccant container with inspection window facing forward and the arrow pointing down.
- e. Tighten hose clamp.



Note: It is essential to change the cartridge when the desiccant in the inspection window turns from blue to pink, as moisture will contaminate the material.

5. **Connect Hoses** – Connect 1 ½" clear supply hoses from the pump to the tote connectors. Make certain that the ISO-side hose is connected to the ISO-side tote and that the CAT-side hose to the CAT-side tote. Fully open ball valves when pumping. Ball valves should be closed when not in use.

IV. TIRE FLATPROOFING PROCESS

Flatproofed tires are pressurized not with air, but with flatproofing material. It is important that before processing, you know the operating pressure of the tire. Refer to the manufacturer's data for the tire you are filling or the current Yearbook by the Tire and Rim Association, Inc., ETRTO Standards Manual or the JATMA Yearbook to determine proper pressurization for each tire. Tires must be correctly pressurized for optimum performance in ride, footprint, and durability. In no case should a tire be pressurized above the maximum pressure indicated on the tire sidewall.

In addition to the pressure, you should know the estimated pounds of flatproofing material necessary to fill the tire. Carlisle TyrFil has a Flatproofing Weight Chart in addition to a Computerized Flatproofing Estimator on www.CarlisleTyrFil.com to help you to approximate weights and costs for flatproofing tires.

Note: These provide only an estimate of the amount of pounds required to fill each tire.

V. MACHINE SAFETY WARNINGS



VI. PRECAUTIONS

Precautions When Operating the AutoFil Recycler System

1. When working on the machine other than polyurethane filling a tire, make sure the “EMERGENCY STOP” is pushed in or the machine is powered down.
2. When you are not using the foot pedal, make sure it is out of the way so that you do not accidentally step on it and cause the machine to run.
3. The blades in the main hopper are very sharp and can cause very bad cuts, use extreme caution when working in this hopper. It is recommended that you use hand protection.
4. The flights on the injector auger are sharp, use extreme caution when working with this auger. It is recommended that you use hand protection.
5. Do not place hands inside the injector hopper when machine is running.
6. Keep hands, loose clothing, rags, etc., away from moving parts.
7. It is recommended that eye protection is used when polyurethane filling a tire. A full-face shield offers the best protection.
8. If polyurethane is splashed into the eyes, flush immediately with water. If irritation persists, seek medical attention.
9. It is recommended that hand protection be worn when working with polyurethane as it can cause skin irritation.
10. Make sure your tote valves are open before running the machine as air pockets in the lines can cause damage to the pump.
11. Be careful that nothing other than polyurethane filling material goes through the injector hopper or main hopper.
12. When using the foot pedal, caution should be observed. When using the foot pedal normal safeguards are bypassed, operate with caution.
 - a. Final Pressure is ignored (over-pressurization is possible)
 - b. Final Weight is ignored (over-pressurization is possible)
13. A foot pedal was added for the convenience of topping off tires and spares to force the machine to run in the event of problems or maintenance. It must be kept in a safe place when working on the machine.

Warm Weather Precautions (85° F and above)

Due to the fact the machine induces heat into the barrel and fill unit by pushing dry regrind into these components, the following precautions should be taken:

1. If running at a ratio of 65/35 and the barrel and gun start getting too hot, you can switch down to 40/60 ratio for about 5 minutes and these components will cool down (this is more prevalent in the larger tires).
2. In larger tires, it is more common to run 55/45 during hot and humid days.
3. Fill hose, fill gun and I/C mixer system should be cleaned daily and kept in alcohol overnight, except for plastic mixer.
4. Desiccants must be used on ISO-side tote in humid weather.
5. All recycled material must be properly handled, stored, and kept dry at all times.

Winter Precautions (71° F and below)

1. TyrFil totes and regrind materials must be brought up to a minimum of 72° F.
2. Totes should be stored off the ground.
3. TyrFil that is not above 72° F will cause the pump pressure to be increased, causing the machine to go into reset modes.
4. If totes are not above 72° F, the mix ratios that can be used are 40/60 high and all low mix ratios only. 65/35 high and 55/45 high are not recommended.
5. Filled tires must be cured at a minimum temperature of 72° F. Tires require longer cure times at lower temperatures.
6. Tires require pre-stretching before filling.

Precautions to be Taken Before Loading Polyurethane Fill Chunks into Grind Hopper

1. No metal should be allowed to get into the Grinder Hopper. Metal can cause the following problems depending on the size:
 - a. Large Metal Pieces
 - i. Torque hub, rear gearbox, motor inverter, and grinder screw can be damaged
 - ii. Screen plate could be severely damaged
 - b. Small Metal Pieces
 - i. Damage to screen plate or injector screw if allowed to pass through screen plate
 - ii. Plugged valve stem or needle causing backups into hopper of liquid
2. All chunk should be visually checked for metal of any type.
3. Chunks should be checked with a metal detector. We have found the Garrett Metal Detector shown in the photo to be very effective for checking chunk.
4. Use only clean, non-reverted material.
5. Recommend separating LOW, MID, and HIGH durometer materials.
6. Do not use water-based fills in the AutoFil Recycler System.



VII. MACHINE CONTROL BUTTONS

Select or Navigation Screen

Startup	AB	Safety	Run
Shutdown	Injector	General	Jog
Filling	Grinder	Spare	Totals
Glossary	Backflow	Glossary 2	Glossary 3



Reset Button – This button resets the inverters to recover from a fault. If the machine shuts down unexpectedly, a message will display below pressure reading, indicating which function of the machine caused the shutdown. This message indicates a problem with the machine, and it should be immediately addressed. Correct the problem before resetting the machine.

Causes of Possible Shutdown:

- Plugged outlets or lines
- Overloading the grinder

Pushing the Reset Button will reset the machine.

Stop – Start – Jog – Reset Buttons



Emergency Stop Button



STOPS ALL OPERATIONS OF THE MACHINE AND PLACES THE INVERTERS INTO EMERGENCY STOP MODE.

USED FOR AN EMERGENCY THAT THREATENS THE OPERATOR OR EQUIPMENT.

Safety Feature:

- Operator must twist the button to the right to release it.
- Machine must be reset after emergency stop.

Operation Buttons



Start Button – This button starts the filling process. The grinder, injector, and the I/C pump start together. All operations continue until either STOP, JOG, or FOOT PEDAL is pressed.



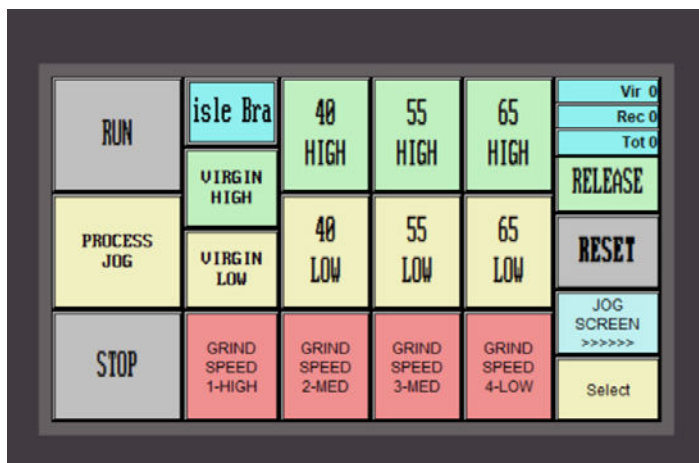
Jog Button - This button allows the machine to operate as long as the button is pressed. When released, all operations stop.



Stop Button - This button stops all processes instantly.

VIII. MACHINE SCREENS

Run Screen



Mix Ratio Buttons

*** Fill speeds and mix ratios can be changed while machine is running***

Mix Ratio Buttons – High Speed

- Virgin High – No reclaimed material is being used, 12 lbs. per minute being pumped.
- 40 High – 40% reclaimed material and 60% virgin material, 20 lbs. per minute being pumped.
- 55 High – Most common fill speed. 55% reclaimed material and 45% virgin liquid, 20 lbs. per minute being pumped.
- 65 High – 65% reclaimed material and 35% virgin liquid, 25 lbs. per minute being pumped.

Mix Ratio Buttons – Low Speed

- Virgin Low – No reclaimed material being used, 10 lbs. per minute being pumped.
- 40 Low – 40% reclaimed material and 60% virgin material, 10 lbs. per minute being pumped.
- 55 Low – Most common fill speed. 55% reclaimed material and 45% virgin liquid, 10 lbs. per minute being pumped.
- 65 Low – 65% reclaimed material and 35% virgin liquid, 10 lbs. per minute being pumped.

Grind Speed Buttons –

Grind 1 = Fastest, Grind 4 = Slowest

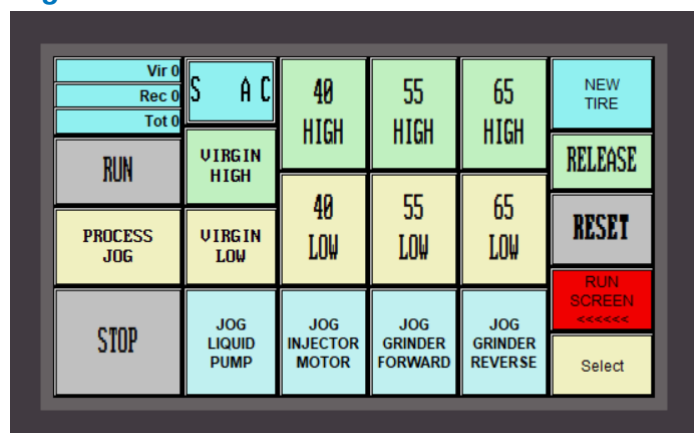
- Grind Speed 1 – High
- Grind Speed 2 – Med
- Grind Speed 3 – Med
- Grind Speed 4 – Low

When the operator presses mix ratio/speed button, it sets the grinder to a slightly higher speed than is required by the injector and will light one of the four grinder speed buttons indicating the speed at which the grinder is running.

IF HOPPER IS FILLING TOO FAST, SELECT SLOWER GRIND SPEED.

Can be changed while machine is running

Jog Screen

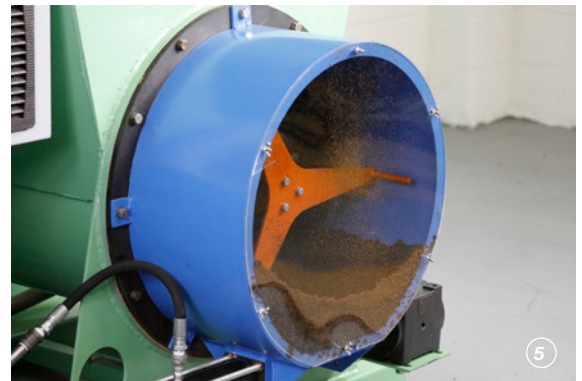
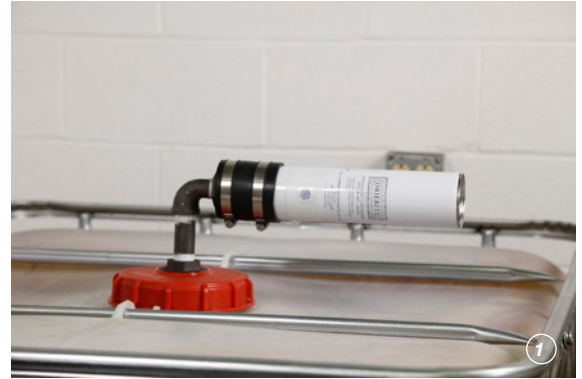


Jog Buttons:

- **Jog Liquid Pump** - This button when pressed will run the I/C pump forward. Only operates I/C pump as long as button is pressed.
- **Jog Injector Motor** - This button when pressed will run the injector forward at the last set speed. Only operates injector as long as button is pressed.
- **Jog Grinder Forward** - This button when pressed runs the grinder forward at the last set speed. Only operates grinder as long as button is pressed.
- **Jog Grinder Reverse** - This button when pressed runs the grinder in reverse at the last set speed. Only operates grinder as long as button is pressed.

IX. SET-UP GUIDE

1. Check the inspection window on the desiccant holder. If the window is blue, proceed. If the window is pink, replace the cartridge.
2. The inside of the tire must be cleaned and dried. Water, sealants, glycol, calcium chloride, soaps, bead lubricants, and dirt must be removed from the tire.
3. Used tire fill chunk should typically be cut into 12-inch sections. Inspect the chunk fill prior to depositing it into the machine to ensure no metals are present.
4. Fill the hopper area with chunk up to the top of the front side of the AutoFil Recycler System.
5. Turn the machine on and select Grinder. When at least half of the front hopper is filled with granulate, turn the machine off at the control panel.
6. Remove the manifold head, mixing components, and fluid gun from the solvent container and wipe off any excess solvent with a dry rag.
7. Using the ½-inch mixing tube, insert 3 elements. Position the mixing tube with the tapered end down and insert the flat end of the first element into the mixing tube stopping one-inch from the top. Next insert the second element into the notch of the first element and push down. Repeat for remaining elements.
8. Dry the solvent from the ends of the mixing tube and whip hose and apply Teflon tape to the threads.
9. Attach the mixing tube to the coupler on the manifold head and tighten.
10. Attach, the whip hose and tighten all connections.
11. Apply a coat of grease to the quick connects on the manifold handle.



12. Holding the manifold handle in one hand, pull up on the female quick connects. Attach the manifold end to the handle and press down until it locks in place. Put the manifold in the open position.

13. Attach the whip hose to the injector barrel. Tighten this connection with a wrench.

14. Open the white 2" bung to vent the CAT-side tote.

15. Open the ball valves on the ISO- and CAT-side totes.

16. Turn the machine on and choose the 40/60 mix ratio.

17. Jog the grinder for 15 seconds using the jog grinder forward button and run or jog the mixture through the injector until it flows freely. Ensure that both granulate and virgin TyrFil are extruding properly into a container. Then stop the AutoFil by pressing the Stop Button.

18. Connect the sample valve assembly to the injection barrel.

19. Connect the fill hose to the sample valve assembly. Hand tighten only. It is important not to overtighten the fill hose.

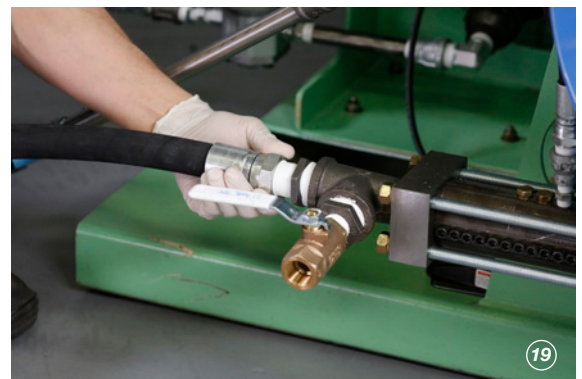
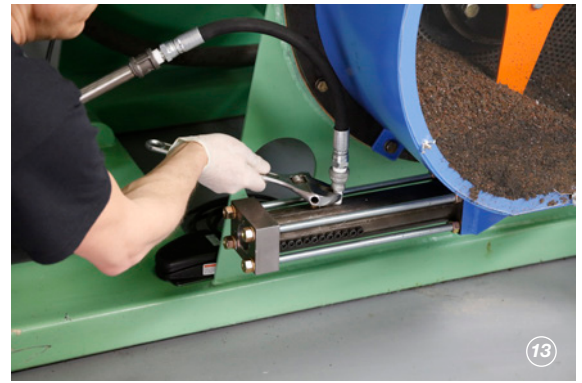
20. Place a disposable container under the sample valve assembly.

21. Connect the gun body to the other end of the hose. If the fill gun plunger isn't already attached to the gun body, attach it now.

22. Next attach the gauge assembly.

23. Hold the fill hose over a suitable container and run the mixture through the entire fill hose and gun to ensure proper flow. Here we used the foot switch to run the machine.

You are now ready to begin filling tires.



X. PROPER FILLING PROCEDURE FOR PNEUMATIC TIRES

1. Place tire in a safety tire cage.
2. Position the tire to be filled securely at the end of the length of the fill hose. Be sure you know how many pounds are required and to what pressure the tire must be filled.
3. Follow recommended procedures for pneumatic (standard air) filling such as checking the lock ring periodically and not over-pressurizing.
4. Attach the fill hose to the fill gun. Position the tire with the valve stem at the six o'clock position to ensure filling the tire from the bottom up. Relieve valve stem pressure by supporting the hose as necessary.
5. Select your recycle ratio and running speed. For example, 65/35 high would mean that you would be pumping 65% recycled material and 35% virgin material at a rate of 25 pounds per minute. These settings can be changed while the machine is running. The 55/45 and 40/60 pound speeds are to be used with air/water valves for most of the filling time and the 55/45 and 40/60 low speeds are to be used for small tires.
6. DRILL YOUR RELIEF HOLE IN THE TIRE! Refer to the manufacturer specification as to the exact placement of this relief hole.
7. Feed the main grinder as necessary to maintain one-third to two-thirds of grind in the sight window. Do not allow the sight window to go over or under these limits as each will create a separate problem. You can maintain these levels in several ways.
 - a. By varying the grinder speed with number one being the fastest and number four being the slowest.
 - b. By the size of chunk you put in the hopper (the smaller it is, the faster it will be ground up).
 - c. By the rate you throw the chunk into the hopper.



- d. By the running ratio and the grinder speed you select. Selecting 65/35 and grinder speed two (2) will allow the hopper to catch up while 65/35 and grinder speed of (4) will empty the hopper quickly.

This level is maintained by the operator, and it has many variables.

THE CHUNK MUST BE INSPECTED BY THE OPERATOR TO THE BEST OF HIS ABILITY. REJECT ANY CHUNK THAT IS OF A GREASY OR SLIMY NATURE. ALSO REJECT ANY CHUNK THAT SHOWS SIGNS OF FOREIGN OBJECTS, ESPECIALLY METAL, THAT CANNOT BE EASILY REMOVED. THE MACHINE CANNOT GRIND METAL!

8. Make it a habit to frequently check the CAT-side and ISO-side totes for equal draw and the gauges for even pressure readings while running the machine. This will help you catch problems early. If you forget to switch from clean to run, the left gauge will read almost zero and the right gauge will read high. Also, the CAT-side tote will empty and the ISO-side will not.
9. On larger tires with long run times (500 pounds or more), you will periodically need to open and close the sample valve for one or two seconds while the machine is running to keep it from setting up and to confirm that the mix looks good. Opening the sample valve changes the pressure and flow characteristics in the mix chamber producing a spotty mix at high recycled material concentration. This is normal.
10. The operator must change the recycle ratio to 40/60 as soon as or slightly before the tire cavity is full. It is essential for the main line to be full of 40/60 for the pressure gauge to read quickly and accurately. It helps to reduce the recycle ratio to 60/40 a little before the cavity is full. On a 4.80-8 you may need to pump the whole tire with a 40/60 mix to allow the fill line to be fully purged of stiff material because the tire only takes about 20 pounds of fill, and the line holds 10 to 15 pounds of fill depending on the hardware and the length of the hose.
11. When the cavity is full, allow the pressure to build for three or four-seconds for the air to be completely purged from the tire. You can help this process by re-drilling the same relief hole. Be sure that the relief hole is kept clear during the fill process.
12. When you are satisfied that all the air is purged from the tire, stop the machine, plug the relief hole and read the pressure.
13. If the pressure is too great, open the sample valve and close it periodically to read it. If the pressure falls too low, select a 40/60 mix ratio and run the machine a few seconds. Stop the machine and re-read the pressure.
14. If you filled the tire completely with 65/35, you cannot get the pressure to go low enough or cannot get an accurate pressure reading because the mixture is too stiff to flow backwards and out of the sample valve.

15. When you are satisfied that the correct pressure has been reached, pull the sidewall needle out correctly or re-core the air/water valve.
16. Disconnect fill hose from the tire.
17. Remove the tire from the cage.
18. Carefully lay the tire horizontally for proper curing. Allow the TyrFil mixture to cure inside the tire for at least 24 to 48 hours in a climate-controlled environment with a minimum temperature of 72° F.
19. Put rim stickers on wheel.



XI. ACCURATELY DETERMINING TIRE PRESSURES

Procedures

1. After plugging the weep hole, lean the mixture out to 40/60 or pure virgin for about the last 2 to 5 minutes.
2. Stop the machine or press the jog pedal.
3. Wait for the pressure to stabilize.
4. Read pressure.
5. Restart the machine or press the jog pedal if more pressure is needed and repeat until pressure is attained. If pressure is too much, the sample valve can be opened to bleed off pressure.

XII. POLYURETHANE TIRE FILLING FOR USING AIR/WATER VALVES

CAUTION: When Polyurethane Tire Filling, Be Sure to Wear Proper Safety Equipment!!!

1. Goggles or face shield
2. Rubber gloves
3. Long sleeve shirts
4. Safety shoes

Air/water valves are the only valves that can be used with our machine and fill gun, no curved valves or thin style valves.

Step 1. Remove the air/water valve.

Step 2. Attach the gun connector to the base of the air/water valve stem.

Step 3. Press the air/water valve into the gun and pull back on the plunger.

Step 4. Attach the fluid gun to the gun connector.

NOTE: ALWAYS FILL TIRES FROM THE BOTTOM UP.

Step 5. This is how the fill gun should look like when properly attached to the tire.

Step 6. Select fill ratio.

Step 7. Press start to start machine for tire filling.

Step 8. Drill weep hole.

Step 9. When tire fill starts flowing out of weep hole continuously, plug weep hole with screw or nail.

Step 10. Check pressure.

WARNING: DO NOT LEAVE GAUGE OPEN DURING PUMPING, DAMAGE COULD OCCUR TO THE GAUGE.

Step 11. Continue checking pressure until you are within 5 to 10 psi of tire pressure.

Step 12. Select either 40/60 or virgin only to fill the tire to desired pressure.

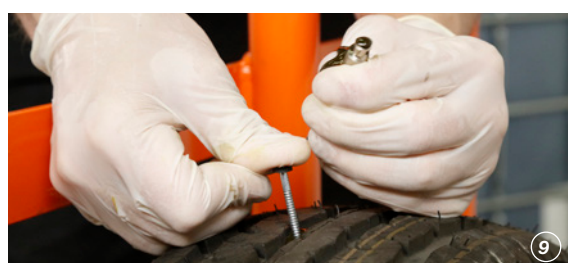
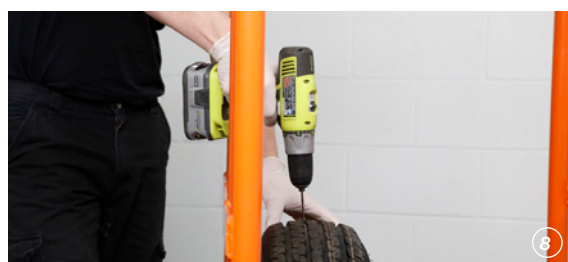
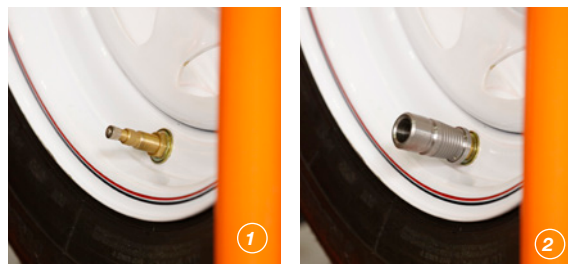
Step 13. Once the recommended PSI has been achieved, stop the AutoFil machine and press the plunger down to reinsert the valve core.

Step 14. To ensure proper seating of the valve core, pull back on the plunger and check the pressure on the PSI gauge. The PSI gauge should read zero.

Step 15. Disconnect the fill gun from the air/water valve.

Step 16. Place fill gun body over bucket.

Step 17: Your tire is now filled.



XIII. CLEANING OF THE AUTOFIL RECYCLER SYSTEM AFTER USE

Basic Machine Shut Down

1. Begin by pressing the emergency stop button.
2. Put the manifold handle in the closed position. Next, hook up an air-hose to the manifold.
3. Then place the fill hose into a waste container.
4. Slowly open the gauge ball valve on the manifold to blow mixed TyrFil material from the mixing tube, barrel, fill hose, and fill gun.
5. Remove the fill hose from the sample valve and allow it to drain into a suitable container.
6. Remove the sample valve from the injection barrel.
7. Next, release the emergency stop on the control panel. Run only the grind and injector until you have dry material exiting the barrel. Then press the emergency stop and turn the machine off at the main power source.
8. Thoroughly clean the sample valve with a brush and store in alcohol.
9. Remove the PSI gauge from the gun assembly. Clean the diaphragm thoroughly with a brush in 99% isopropyl alcohol. Store it in a safe place.
10. Clean the fill gun plunger and the gun body, rinse and store all parts in alcohol.
11. To clean the fill hose, put a cap on one end and fill with alcohol. Next put a cap on the other end of the hose.
12. With a cleaning motion, move the hose back and forth to agitate the alcohol inside. After a minute of agitation, remove one of the capped ends and drain the hose. Then refill the hose a 2nd time with alcohol. Replace the cap and store in a safe place for future use.
13. Remove the I/C delivery whip hose from the injection barrel.
14. Disconnect the mixing tube from the manifold head, leaving the coupler on the head.
15. Remove the whip hose from the mixing tube, then disconnect the mixing tube from the manifold head, leaving the coupler on the head.



16. With the ejection rod, remove the mixing elements from the tube.
17. Lay the whip hose in solvent and clean the sample drain valve with a brush. Make sure the sample drain valve is open.
18. Clean the mixing tube and store in solvent.
19. Clean the mixing elements in the solvent and store them in a safe place to avoid breakage.
20. Open the manifold head pressure gauge valve and clean the manifold head connectors. Store the manifold head in the solvent.
21. Clean the gun stem connector and store in solvent.
22. Thoroughly clean the I/C hand check valve using a brush to clean the inside of the connectors.
23. Grease the ISO-side connector and cover with a cap.
24. Shut off both tote valves and turn off at the main power source.
25. To ensure that the material does not solidify in the hoses and cylinders between uses, the pump needs to be operated once a week.



You have successfully shut down and cleaned the AutoFil Recycler System. These important steps will allow you to be prepared and ready for the next time you fill a tire.

XIV. TROUBLESHOOTING MACHINE PROBLEMS

Problems that Could Occur While Polyurethane Filling a Tire

Problem #1: Blockage in the fill hose

- The fill hose becomes pinched by a sharp bend that causes a collapse of the fill hose wall
- Fill hose is plugged by solidified material

Solution:

- Move the tire further away so that the hose lies in a gentle curve or a straight line
- Replace fill hose

Prevention:

- Fill hoses that are pinched create weak spots in the hose and should be replaced
- Clean fill hose with alcohol after every daily use

Problem #2: Blockage at valve stem

- Piece of metal or other hard substance lodged in the valve stem
- Valve stem too small

Solution:

- Open the bleed (sample) valve to relieve pressure on the hose, disconnect the fill valve and clean valve stem. Once cleaned re-connect fill valve and resume pumping
- This machine uses only large bore valves (valve stem bore = 1/4" or larger)
- Valve core inserter on gun not pulled back

Prevention:

- Metal detect all chunk before placing in the machine. Note: Foreign material can cause damage to machine components
- Use only large bore valves
- Make sure valve core inserter is pulled back to its farthest point

Problem #3: Bullet comes out of tire (SIDE-WALLING)

- Drill hole is too large
- Wrong bullet for sidewall thickness
- Wrong service application for side-walling
- Bullet pulled out too far

Solution:

- Large bullets require a $27/64$ " drill bit, small bullets require a $21/64$ " drill bit
- On thin walled tires, it is recommended that the small bullet be used
- On very rough service duty tires, it is recommended that valve stem filling be used
- Push bullet in by hand further or replace bullet with new one

Prevention:

- Make sure you are using proper drill bits
- Make sure application of tire is correct
- When pulling bullet out, make sure you pull out to where the end of the needle is exposed

Problem #4: Bullet and needle will not go into tire

- Drill hole is too small
- Bullet and needle not lubricated
- Bent needle

Solution:

- Large bullets require a $27/64$ " drill bit, small bullets require a $21/64$ " drill bit
- Lubricate needle with liquid polyurethane fill from scrap bucket
- Replace needle

Problem #5: Gauge not working when checking pressure

- Gauge left open while filling a tire
- Rubber on gauge bad
- Improper cleaning of gauge
- Liquid missing in gauge face
- Tire pressure too low for accurate reading with 65/35

Solution:

- Ensure the gauge is closed when filling the tire
- Diaphragm needs replaced or gauge replacement
- Make sure gauge is wiped with alcohol only at end of use
- Replace gauge

Potential Failures That Could Occur

Problem #1: Backup into Hopper Area

- a. Plugged valve stem
- b. Plugged fill hose
- c. Injector screw has material buildup on flights
- d. Injector screw worn or damaged
- e. Injector barrel worn or damaged
- f. Too much time taken between pressure readings (run cycle) on large capacity tires
- g. Too much time taken between pressure readings (run cycle) on high pressure tires
- h. Regrind in hopper too fine
- i. Injector screw run with liquid only, no regrind in system

Solution:

- a. Remove problem parts and clean entire hopper and injector system
- b. No polyurethane fill should be attached to any part of the injector screw, barrel and screw area of hopper or bearings after cleaning
- c. Replace worn parts and clean entire hopper and injector system
- d. Reduce time
- e. Too soft of chunk, mix with 75% hard and only 25% soft, problem with grinder flight spacing to screen plate
- f. Fill hopper and jog injector to place ground chunk into barrel

Problem #2: Noisy Injector Screw

- a. Injector screw or injector barrel worn or damaged
- b. Coupling spider bad
- c. Injector bearings bad
- d. Injector spacers worn
- e. Couplings loose
- f. Alignment between couplings bad

Solution:

- a. Replace worn or damaged parts
- b. Tighten and align couplings

Problem #3: Regrind in Hopper Too Fine

- a. Chunks being placed into grind area are too small
- b. Clearance between grinder screw and screen plate is wrong (CLEARANCE SHOULD BE NO GREATER THAN 1/32")
- c. Screen plate worn
- d. Grinding only soft chunks (8-10 durometer fill)

Solution:

- a. Regrind chunks should be approximately 12" x 12" as the smallest
- b. Weld grinder screw area on face of flights and grind down to create allowable clearance allowed between grinder screw and screen plate
- c. Inspect screen plate if damaged, open holes by drilling and reverse if one side is good
- d. Mix chunks so that 75% is hard chunk with 25% being soft chunk

Problem #4: Loss of Pressure at CAT or ISO-Side of Pump

- a. Defective gauge
- b. Tote valves not opened
- c. Tote supply lines plugged
- d. Tote lines to pump are empty or have air bubbles present
- e. Defective pump

Solution:

- a. Replace gauge
- b. Open totes and make sure that there is no air in the supply lines
- c. Supply lines should be replaced every year
- d. Replace pump

Problem #5: Too High of Pressure at I/C Pump Causing Machine to Go Into I/C Pump Reset

- a. Plugged mixer tube
- b. Plugged I/C hose
- c. Defective check valves
- d. Plugged I/C system
- e. Clogged injector barrel at I/C hose connection
- f. Check valves backward if recently changed

Solution:

- a. Clean entire I/C system from pump to injector barrel
- b. Check or replace check valves
- c. Liquid should be kept at 72° F as per manufacturer specifications

Problem #6: Hopper Will Not Keep Up with Fill Rate

- a. Grinder empty
- b. Hopper empty
- c. Hopper grind speed set too low
- d. Using chunks that are either too large or too small in the grinder area
- e. Grinding only soft durometer fill
- f. Plugged screen plate
- g. Problems in grind screw area (not usually a problem)
 - a. Torque hub
 - b. Grind screw gearbox
 - c. Grind screw motor
 - d. Inverter

Solution:

- a. Stop machine before hopper is completely empty or back flow will occur. Fill grinder area and manually fill hopper to about 3/4 full
- b. Increase grind speed – remember 1 is fastest and 4 is slowest
- c. Chunk normal size should be approximately 12" x 12"
- d. Machine should be run with approximately 75% hard chunk and 25% soft chunk
- e. Repair screen plate
- f. If problem is in grind screw area, contact manufacturer

Problem #7: Grinder Screw Will Not Turn or Grinder Goes into Reset Mode

- a. Metal in grind hopper causing screw to jam
- b. Using chunks that are too small in the grinder area
- c. Defective torque hub
- d. Defective gearbox
- e. Defective motor
- f. Defective inverter or inverter is in alarm state
- g. Loss of phase

Solution:

- a. Remove front of machine
- b. Chunk normal size should be approximately 12" x 12"
- c. If torque hub, gearbox, or motor suspected, contact manufacturer
- d. Check incoming power or inverter power to motor

Problem #8: Injector Will Not Run and Inverter Goes into Alarm

- a. Using too small of air valves
- b. Valve is plugged
- c. Material has setup in system, waiting too long between tire fillings
- d. Forgetting to set the I/C system to run mode at the run/clean valve
- e. Metal jamming the screw
- f. Loss of liquid causing only dry fill to flow through
- g. Defective coupling
- h. Defective spider in coupling
- i. Gearbox problem
- j. Injector in reset mode
- k. Inverter problem
- l. Motor problem
- m. Loss of phase

Solution:

- a. This machine requires that you use only big bore valves or air/water valves
- b. Remove blockage from machine and clean
- c. If a long time is required between tires, it is recommended that you run a clean cycle
- d. Inspect injector screw area for metal and damage
- e. Inspect and clean I/C system if required
- f. Inspect, repair and/or replace couplings
- g. Inspect, repair and/or replace gearbox
- h. Check inverter for alarm and compare to inverter troubleshooting section
- i. Check motor. If there is a problem, contact manufacturer
- j. Check incoming power or inverter power to motor

Problem #9: Machine Will Not Run After Start Button is Pushed

- a. Emergency stop activated (RELEASE)
- b. Fill ratio not selected
- c. Reset mode on machine or inverters
- d. Keyboard bad
- e. PLC defective

Solution:

- a. Release emergency stop and select fill ratio
- b. Check inverter for alarm and compare to inverter troubleshooting section
- c. If keyboard or PLC is suspected, contact manufacturer

Problem #10: No Lights on Keypad or Inoperative Keypad

- a. Emergency Stop activated (RELEASE)
- b. Loose cable
- c. Bad keypad
- d. PLC problem

Solution:

- a. Release emergency stop and select fill ratio
- b. Check cable between PLC and keyboard
- c. If keyboard or PLC is suspected, contact manufacturer

Problem #11: Foot Switch Inoperative

- a. Bad foot switch
- b. Bad cable
- c. PLC problem

Solution:

- a. Check footswitch and cable using meter, normal state is n/o
- b. If PLC is suspected, contact manufacturer

Problem #12: Machine Runs Very Slowly or Intermittently

- a. Incoming power problem
- b. Inverter problem

Solution:

- a. Check for incoming power that all three phases are good and voltage is not too low
- b. Check inverter for alarm and compare to inverter troubleshooting section

Problem #13: Motor Overheat

- a. Incoming power problem
- b. Phase loss
- c. Inverter problem

Solution:

- a. Check for incoming power that all three phases are good and voltage is not too low
- b. Check inverter for alarm and compare to inverter troubleshooting section
- c. Check motor with proper meters or contact manufacturer

Problem #14: Gearbox Overheat

- a. Oil problem (change oil)
- b. Defective gearbox

Solution:

- a. Change oil
- b. Repair or replace gearbox

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