



TyrFil Flushless Pump

FLATPROOFING TECHNICAL MANUAL

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

TyrFilTM
A **CARLISLE** BRAND

This manual is intended to assist the tire fill technician in the operation of the TyrFil Flushless Pump. 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 and general procedures for fixing the machine if problems occur. If any mistakes are found in this 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

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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™ Flushless Pumping 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 400 square feet (37 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

TyrFil Flushless Pump – Carlisle TyrFil’s original flatproofing pump was pioneered by Graco, Inc. in the early 1970’s and has had many innovations since. The Graco® pump has an excellent performance reliability record. The TyrFil Flushless Pump and replacement parts are readily available through Carlisle TyrFil. Visit www.carlisletyrfil.com to download the TyrFil Flushless Pump Catalog.

Air Compressor – The pump is air driven and requires a minimum of 21 cubic feet per minute (cfm) (.6 cubic meters). Be certain to consider other air operated equipment being used when determining if your compressor is sufficient for your flatproofing needs.

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 – Flatproofing 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. If local or insurance regulations prohibit or restrict the use of flammable solvents, Carlisle TyrFil offers a product line of non-flammable, biodegradable solvents suitable for use with the flatproofing equipment.

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. *

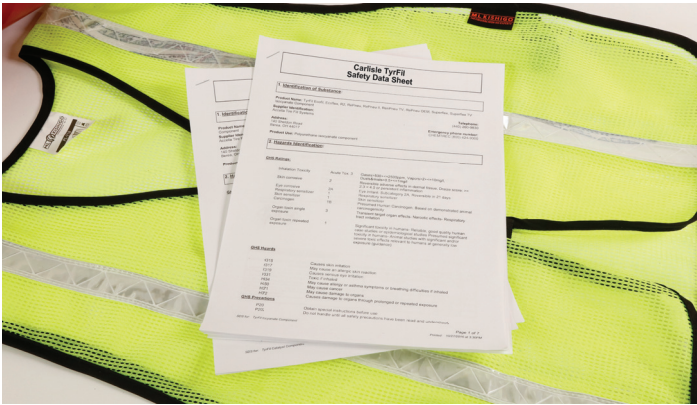
*** Be sure to follow all federal, state and local regulations when disposing of any cured or uncured material or other related items.**



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.

To reduce the risk of serious injury from moving pump parts or the splashing of flatproofing products in the eyes, always disconnect the air supply from the pump and close the release-type ball valve on the air motor when servicing the air motor or cylinder displacement unit.

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 to water and will solidify from exposure to moisture and 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 solvent 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.

Respirator- Isopropyl alcohol, the tire filling process, and clean up can produce fumes. Good ventilation is required in work areas to prevent exposure to fumes. If adequate ventilation is not available, a respiratory protection program must be implemented. All cartridge/mask selections must be conducted by a qualified individual in accordance with a written respiratory protection program. Refer to the SDS.

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

III. PREPARATIONS

Tire & Wheel Preparation

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 total vehicle 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.

6. **Air Supply** – Connect air-line to the pump. Adjust the regulator to 80 psi (550 kPa). **Note:** Adjusting the regulator to higher pressures provides only a modest increase in pump speed. Higher pressures increase the risk of premature air motor failure. The easiest way to increase the speed on the pump is to fill the tires through the largest valve stem possible. A tire with an air-water valve can be filled up to 2 times faster than a tire with a standard valve.

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. Use the following procedures when flatproofing tubeless tires (for tires with tubes, see the Miscellaneous Section).

Start-up Procedures

1. Remove manifold head, mixing tube and fluid gun from the solvent container and wipe off with a rag to remove excess solvent. Visually check to ensure all the items are free of any residue. If any solvent is accidentally pumped into a tire, it will contaminate the material and could result in a failure.
2. Apply a coat of grease to all quick connects and use Teflon[®] tape at all connections (i.e. at both ends of the mixer tube and whip hose).
3. For the ½-inch mixer, insert all three mixing elements into the mixing tube. For the ¾-inch mixer, insert four mixing elements. Do not use broken elements. Note: as elements are fragile, it is important to always keep extra available.
4. Attach manifold head to the manifold handle using the quick connects. Be sure to attach the correct side up (it will read ISO and CAT). On the opposite side, the manifold head will read "this side down".
5. Connect mixing tube to the manifold head. Attach fluid gun to the whip hose. Complete assembly by attaching the whip hose to the mixing tube and tighten all connections. See the TyrFil Flushless Pump Parts Catalog for proper assembly of the manifold.
6. Adjust air supply to the pump to 80 psi. Make sure the manifold hand valve is in the off position when turning pump on.
7. Slowly open the hand valve and run 2 cycles on the stroke counter into a waste container to rid the system of any residual solvent. A cycle is one complete up and down stroke. When pumping material, make certain manifold and dispensing valves are fully open. Partially opening the valves can cause improper ratio of ISO- and CAT-side material.
8. Make sure the cylinder pressure gauges are within 50 psi of each other, when pump is operating.
9. Prepare a quality control sample sometime during the filling process. It is important to prepare a sample with each batch of tires that were flatproofed as a means of checking for a proper cure. Pump a sample [approximately ½ - 1 cycle (6-12 oz/.15-.3 kg) into a self-locking plastic bag].



Note: Write the date and lot number on the bag and lay it on the flatproofed tire during the curing process. After the cure is completed, the sample should be retained for future reference should any problems arise while the flatproofed tire is in service.

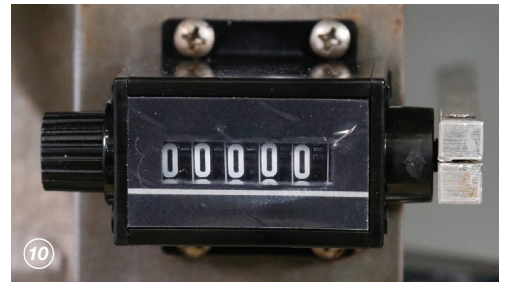
10. Reset stroke counter to zero.

Processing

Important: Never leave a pump operating unattended.

1. Position tire vertically in the tire cage with the valve stem between the 4 o'clock and 8 o'clock position, with 6 o'clock being ideal.
2. Select the proper core holder and filling adapter for the valve stem. To avoid leaks, make sure all gaskets are in place and threaded connections are assembled with Teflon[®] tape. Remember, tires with longer or angled valve stems will take longer to fill because of the increased back pressure. Whenever possible, use the largest valve stem available.
3. Remove the valve core from the tire that has been inflated for pre-stretching. It is important to keep the bead seated. Do not let air bleed excessively. See page 13 for Bead Reseating instructions.
4. Insert the valve core into the core holder and immediately connect the filling adapter to the tire valve stem. Attach the filling adapter to the fluid gun.
5. Fully open the valve on the manifold and begin filling the tire.
6. Check the internal tire pressure frequently by closing the hand valve on the manifold and opening the pressure gauge valve.
7. Continue pumping until the tire has enough pressure to keep the bead seated or tube inflated. To check the level of material in the tire, tap the casing lightly with a hammer (unfilled portion will sound louder).
8. When the venting pressure is reached, close the manifold hand valve. Insert a hypodermic needle into a tread groove at the 12 o'clock position just deep enough to vent trapped air. Stop inserting further when you start to hear air escape from the tire. For steel belted tires and thick casings (greater than 12 ply) you will need to drill a 1/8-inch hole through the tire to assist needle insertion.
9. Use of Carlisle TyrFil's specially designed SmartNeedle[™] Inserter will make needle insertion much easier, safer, and will avoid damaging the needle or your hand.

Note: After insertion of the needle, the tire pressure will drop. It is necessary to maintain at least 30% until all of the air is completely vented and the tire is full of flatproofing material.



10. Turn the manifold valve back on and continue pumping. Check the tire pressure often during the venting stage. To keep the pressure from dropping too quickly, place a finger or thumb over the needle to stop the air from escaping. *Note: while it is essential to “vent” or remove all of the air from the tire, keeping some air pressure during the flatproofing process assures the tire will keep its bead seat and remain on the wheel. If the air is released too quickly, the bead could collapse. If this happens, the flatproofing process must be stopped and the bead reseated before continuing. Bead Reseating Instructions are as stated below. The bead can be reseated using the Flushless Manifold while still attached to the tire’s valve system.*



- a. To reseat the bead, turn off the manifold hand valve and remove the SmartGauge™ from the manifold.
- b. Temporarily remove the needle from the tire and plug the hole with a nail. Insert the nail only deep enough to seal the hole, because you will be removing the nail after the bead has seated.
- c. Attach the air hose to the male quick connect on the Flushless Manifold.
- d. Open the ¼" ball valve on the SmartGauge™ stem located on the manifold to inflate the tire. After the bead has seated, add enough pressure to the tire to prevent another collapse.
- e. Close the ¼" ball valve and remove the air hose from the quick connect and replace the SmartGauge™. Turn on the manifold hand valve and continue filling the tire.
- f. Finish by removing the nail and reinserting the needle to vent the tire.

11. Continue pumping until material flows from the hypodermic needle and then turn off the hand valve. Remove the needle slowly from the tire and plug the hole with a roofing nail or a sheet metal screw. *Note: needles are reusable if properly cleaned with solvent.*



12. Check tire pressure. Turn on the hand valve and pressurize the tire to its recommended psi. Remember, all tires, especially small tires, will pressurize fast. Always pressurize to the manufacturer’s specifications.



Caution! There is a fundamental difference between pressurizing a tire with air and pressurizing a tire with flatproofing materials. Gasses are compressible, while liquids are incompressible. Pressurizing a tire with air is a gradual process with pressure building slowly from the initial introduction of air. With TyrFil flatproofing materials, the tire is vented during the filling process so there is very little pressure build-up until the tire is totally filled. Then the pressure builds rapidly, with the pumping of a very small additional amount of material stretching the carcass.

13. Depress the plunger on the fluid gun and reinstall the valve core by turning clockwise making certain the valve core is securely seated. Pull back on the plunger and check the pressure gauge. If the tire has been sealed, the pressure gauge will read zero. Then disconnect the fluid gun and place over a waste container.

14. Lay the filled tire on its side and place on a pallet. Handle tires with tubes carefully, as some tubes split easily. Do not cure tires in an upright position. Upright curing can create an air pocket on top and a flat spot on the bottom.

15. Lay the sample on the filled tire for use in checking the progress of the cure. Use a tire marker to identify stroke or weight count and psi on the tire. Document in the flatproofing log. This log is used to record processing data and customer warranty information.

Note: It is very important to keep accurate records as this ensures adequate warranty documentation in the unlikely event that the need arises. In the Flatproofing Log, you should include: date of processing, customer name, pumper's name, type of tire, product used, lot #, final tire pressure and pounds of material. All entries should be in ink and a copy should be made of each entry sheet. Flatproofing log sheets are available through Carlisle TyrFil for your convenience.

16. Put rim stickers on the wheel.

Note: Warmth speeds the cure. Tires flatproofed with materials at 72° F (22° C) and placed in a warm room [minimum 72° F (22° C)] will cure 70% in 24 hours and 100% in 72 hours. Tires can go into service 24-48 hours after processing.



Tire Pressurization

Over-pressurization - Do not over-pressurize tires. In addition to the potential danger of bursting the tire, over-pressurization will cause “crowning” (extreme tread wear at the center of the tire) and possible splitting of the carcass upon impacting curbs, potholes, etc. Once the material has cured, there is no way to correct this problem. If a tire becomes over-pressurized during the filling process, close the manifold valve and open the drain valve. Pressure inside the tire will force the flatproofing material out through the drain valve. Close the drain valve and check pressure again.

Under-pressurization - Do not under-pressurize the tire. This can cause excessive flexing of the casing and material, which may lead to overheating and eventual tire failure. Unlike a tire filled with air, a complete loss of pressure can result from the leakage of only a small amount of material from the tire after it is filled. If leakage is observed, the tire may need to be re-pressurized.

Re-pressurization - Voids or air pockets are created when uncured material escapes from a newly flatproofed tire. Once the flatproofing material has cured, a tire with voids can be re-pressurized by injecting additional material through the sidewall. Contact the Carlisle TyrFil Technical Department prior to sidewall injection.

Clean-Up Procedures

Proper shutdown and cleaning of the pump and equipment is vital. When you have finished processing tires, the equipment must immediately be cleaned of all reactive materials. If left in the machine, they will cure, become insoluble and clog the equipment.

1. Open the hand valve over a waste container until the pistons are in the down position. This allows the piston rods to be submerged in the throat seal lubricant. Then close the manifold hand valve.
2. Turn off the air supply to the air motor by closing the ball valve at the regulator.



3. Open the manifold valve to release the pressure inside the cylinders and hoses. Close the manifold valve when the pressure on the cylinders is zero.
4. Remove the manifold head from the handle over a waste container and allow excess material to drain.
5. Rest the manifold on the ground or breakdown on a table for easier disassembly and clean-up. Close the pressure gauge valve and remove the pressure gauge.
6. Remove the whip hose and mixing tube from the manifold head.
7. Wash the manifold head in solvent. Open ball valve on the manifold and rinse the gauge port with solvent. Store manifold head in the solvent when clean.
8. Eject the mixing elements from the mixing tube and wash the elements in the solvent. Store mixing elements in a safe place to avoid breakage. Clean mixing tube with a steel brush and place mixing tube in the solvent container.
9. Wipe off any excess material from the manifold handle with a clean rag and place on hanger.
10. Thoroughly clean and store tools in their proper place.
11. Clean all mixed material off floor and machine.



V. PUMP MAINTENANCE

Proper maintenance is critical to long equipment life, reliability and efficiency. This section covers the maintenance to the TyrFil Flushless Pump. Flatproofing does not have to be a dirty business as long as the pump is kept clean and in good working order.

Fluid Gun and Manifold – Clean after each use with 99% isopropyl alcohol.

High Pressure Hoses – Replace ISO-side hose once a year under normal operating conditions. Normal refers to the equipment being used at least once per week. For long term storage, the high pressure hoses should be removed and lower cylinders sealed with airtight plugs.

Pressure Gauge – Replace if cross contamination occurs.

Lower Cylinders – Seals should be replaced if line pressures fall below the normal operating range or if excessive cup seal leakage occurs.

Suction Side Hoses – Replace ISO-side hose once a year. Replace CAT-side hose when damaged. If cross contamination occurs, all hoses must be replaced. For long term storage, remove suction hoses and the lower cylinders sealed with air tight plugs.

Wet Seal Cups – During initial setup, the wet seal cups should be filled ¼ full with throat seal liquid (TSL) oil. This oil provides critical lubrication to the piston rods and also serves as a moisture barrier for the Teflon® packings. TSL oil is consumed during normal operation and therefore it should be checked on a weekly basis even when the pump has not been used. Do not run cup seals dry as seal damage will result.

The cup seals require periodic adjustment. Use the spanner wrench supplied with the pump to tighten if they are loose. Packing should be hand tightened only.

With normal use the TSL oil will change color as flatproofing material slowly penetrates the seals. ISO-side material will begin to harden once it has accumulated in the cup. When ISO-side material begins to solidify in the cup, scoop out the jelled material. Once the cup has been cleaned, refill with clean TSL oil and double check the seal to see if it is tight.

Replacement parts are available through Carlisle TyrFil. See our TyrFil Flushless Pump Parts Catalog found at www.carlisletyrfil.com.



VI. MISCELLANEOUS

Bias Tires with Tubes (under 12 ply)

Tires in this category can be flatproofed in the same manner as filling a tubeless tire with one exception, never allow the pressure to drop to less than 30% of the final pressure.

Tires with Tubes (12 ply and above or radial)

These tires require some extra precautions but are not difficult to flatproof if the following procedures are used. A pilot hole must be made in the tire to make the insertion of the needle easier. Care must be taken not to damage the tube when drilling the tire. It is the needle that should puncture the tube, not the drill bit. Below are three methods that you can use:

Method 1: If the tire and tube are mounted and pre-drilling is required (12 ply or greater/radial tire) a vacuum must be applied to the tube with a tube deflator before the tire can be safely drilled. This will prevent the tube from being torn by the drill bit. When the tube is deflated, drill a pilot hole at the 12 o'clock position in the tread groove. After drilling the hole, the tube must be expanded before flatproofing. To do this, replace the valve core and inflate the tube. This step will ensure that the tube will fill properly. The tire can now be flatproofed. Follow flatproofing guidelines for a regular tube-type tire.

It is recommended that the Flatproofing Technician practice with an unmounted tube before performing this procedure in the tire. The vacuum device will make a distinct sound when all of the air has been removed from the tube. It is important that you can identify this sound. If not, you will not know when the tire can be safely drilled.

Caution: *If the tube is not expanded before flatproofing, pressure can build up rapidly inside the tire resulting in an over-pressurized condition or possibly burst the tire casing, causing injury. Also, failure to keep pressure in the tube during the venting process could cause the tube to sag allowing the needle to puncture another hole or rupture the tube.*

Method 2: Mark the 12 o'clock position on the tire with tire chalk and dismount it. With the tube removed, drill a hole at the 12 o'clock mark. Remount the tire and tube and proceed with processing.

Method 3: Mark and drill the tire before mounting. This third option only works if you have prior knowledge that the tire will be flatproofed.

IMPORTANT: ALWAYS USE THE PROPER SAFETY DEVICES WHEN FILLING TIRES WITH TWO PIECE RIMS OR LOCK RINGS.

Step 1: Position the tire in the normal filling position.

Step 2: Remove the valve core and fill the tire as you normally would.

Step 3: When 30% of the final desired pressure has been reached, insert the needle in the vent hole and puncture the tube.

Step 4: Continue filling the tire, maintaining 30% of the final desired pressure in the tube. Regulate by covering and uncovering the needle with your finger. This pressure will keep the tube seated in the tire.

Step 5: The tire is filled when material flows from the needle.

Step 6: Remove the needle and insert a nail into the vent hole to seal the tire. Remember, the nail must also be long enough to penetrate the tire and tube.

Step 7: Pressurize the tire and then lay it flat to cure.

Common Problems When Flatproofing Tires with Tubes

Tubes Tearing – Tubes can tear when being vented to release air, or when being sealed. Use nails when plugging tube-type tires as screws may tear the tube.

Trapped Air – One-piece rims may trap air between the tire and tube.

Difficulty Sealing – Vent holes through the tire and tube are sometimes difficult to align and difficult to reseal.

Helpful Steps for Tires with Tubes

Reinforce – Bond a 2" x 4" reinforcing patch to the tube where it will be punctured to vent air.

Mark Tread – To position the hypodermic needle, mark the tire tread to locate the patch on the tube. With large tires, predrill the vent hole before assembling tire and tube.

Lubricate – Lubricate the hypodermic needle with grease before puncturing tire and tube. When tire is full, seal it with a lubricated nail.

Changing Products

Different types of TyrFil™ can be pumped interchangeably through the same equipment. If the material is changed over prior to pump start-up, follow normal start-up procedures after changing totes. If during processing, use the following procedure to change from one product to the other:

- Step 1. Drain Hoses** – The clear supply hoses connecting totes to the pump contain more than a gallon of usable material. To avoid wasting this, run approximately 6-8 strokes into a scrap container to clear the hoses.
- Step 2. Change Totes** – Disconnect supply hoses and temporarily hang them, open-end-up, on the pump. Immediately clean up any material spilled when disconnecting or reconnecting supply hoses.
- Step 3. Position Totes** – Correctly position the new material and connect to supply hoses.
- Step 4. Cycle Machine** – Place fluid gun over waste container and cycle machine until old material flowing from gun is clearly replaced by new material (approximately six to eight strokes).
- Step 5. Continue Processing** – Begin processing as before, using new material. Although different types of TyrFil can be used without a problem in the same equipment, if you run out of one product during processing never add a different product to the same tire. Poor tire performance will result. Tote sets do not always empty identically. However, they should empty at approximately the same rates. Avoid allowing air from an empty container to be pumped into the system. Change to full totes before the old ones are completely empty.

Cross Contamination

Cross contamination occurs when the ISO- and CAT-side hoses are accidentally switched and connected to the opposite side. This can happen when switching empty totes or changing from one product to another. Unfortunately, when this happens, it is not usually realized until it is too late. In most cases, you will need to replace the lower cylinder unit, material supply hoses, line gauges, pressure gauge and manifold hoses. If this mistake is realized before the pump is operated, it can be simply corrected by reconnecting the supply hoses to their proper sides.

On-Site Flatproofing

Carlisle TyrFil does not recommend on-site flatproofing, however for reasons of convenience and efficiency, it can be done if:

1. The site can meet the 72° F (22° C) temperature requirements for storing the material, pumping the material and curing the processed tires.
2. An adequate compressed air supply is available.
3. All necessary safety precautions are followed.
4. The required auxiliary equipment (tire cage and necessary tools) are available.

Carlisle TyrFil does not recommend flatproofing tires mounted on a vehicle. Except for unusual circumstances, it has proven to be far more convenient and efficient to transport the tires to a dedicated pumping location for flatproofing. If it is necessary to flatproof tires mounted on a vehicle, contact your Technical Representative to discuss the specific application.

Changing from Another Supplier

Carlisle TyrFil marks its isocyanate component as the ISO-side. Not all manufacturers follow this practice. Some mark the isocyanate as the “B” side. ***If you are changing to our products from another supplier, contact our Sales and Technical Center for assistance.***

Tote Maintenance

Totes should always be stored indoors, both when full and empty. It is important to always replace all bungs and dust caps when a tote is not in use. This is especially important after the tote is emptied and put aside for retrieval by Carlisle TyrFil or one of its agents. Below are some helpful hints for maintaining totes:

Storage Full – Should be stored indoors and heated to 72° F (22° C) before use.

Storage Empty – All bungs and dust covers should be replaced and they should be stored indoors or in a weather protected area.

Handling – Totes are very heavy and should only be moved by a certified forklift driver. Take care not to dent the cage, damage the pallet, or puncture the bottle when moving the totes.

In Use – Do not spill material on or around the totes. This makes for a dirty work area and the material is difficult to clean off of totes.

Pick-up – Between 4 and 54 totes can be picked up at one time, usually within 72 hours. Empty totes should not be stored for more than 60 days. For any questions regarding the tote pick-up program, call your Carlisle TyrFil regional sales manager.

Drainage – Drain totes completely before disconnecting and starting with a new tote. It is important to properly drain totes for many reasons and it is a simple thing to do. When the material in the tote is low, simply prop the rear of the tote up with a 4-foot length of a 4" x 4" piece of wood. This will ensure that the tote drains all of its material into the pump. Only completely empty totes can be returned.

Waste Disposal

Protection of the environment should be a primary concern of everyone. Proper procedures must be in compliance with local, state and federal waste disposal regulations. Should materials become contaminated, and thus not usable, they will have to be handled as hazardous waste and disposed of according to local, state and federal regulations.

Solvent Containers – See the SDS for disposal of empty isopropyl alcohol containers.

Liquid Waste – In most states (check your local, state and federal regulations), liquid waste containing flush and alcohol must be kept in a closed drum, labeled “FLAMMABLE WASTE”, in an approved solvents storage area until delivered to a licensed disposer.

Salvaging Rims

Flatproofed tires mounted on wheels with split rims can be removed with a hydraulic press. All other flatproofed tires can be removed from rims by the following procedure:

1. Use Reciprocating Saw – Grind teeth off saw blade to create a knife edge.
2. Cut Casing – Cut through the sidewall, around both sides, near the rim. Then make one or more cuts across the tread, from one sidewall cut to another.
3. Remove Tread – Peel off casing to expose the cured material inside.
4. Remove Core – Cut across cured material from side-to-side and pry away from the rim.
5. Remove Sidewall – Pry remaining bead off the rim.

VII. TROUBLESHOOTING

Our flatproofing process has been the industry standard for decades. Most problems that occur are easy to troubleshoot and correct. See the following chart for the most common situations. Contact Carlisle TyrFil's Sales and Technical Center for any solutions not included in this section.



DIRECTIONS FOR READING THE TROUBLESHOOTING SECTIONS

PROBLEM	PROBABLE CAUSE	SOLUTION
1. Identify the problem you are having from the list in this section. Once you have located your problem proceed to probable cause.	2. Probable causes are listed in the order of highest probability. Start with the "a" statement first. If this case seems unlikely, then go to the next letter "b", "c", etc. Proceed to solution.	3. This section indicates a solution to the problem. If REFER TO THE SERVICE SECTION is indicated, you will find the repair procedures listed there.

TRUBLESHOOTING CURING

PROBLEM	PROBABLE CAUSE	SOLUTION
Slow Curing (More than 24 hours)	<p>a) Processing temperature is too cold</p> <p>b) Improper material ratio</p>	<p>a) Warm the room. A minimum of 24 hours is needed at 72° F (22° C). If correct temperature conditions cannot be maintained, a longer time will be needed for full cure.</p> <p>b) Verify the pump has the correct ratio. REFER TO SERVICE SECTION on lower cylinders.</p>
Soft Spots (Tire does not fully cure and low temperature is not suspected)	<p>a) Contamination in the tire carcass. Contamination sources: water, calcium chloride, sealants and bead lubricants</p> <p>b) Improper mixing of product</p>	<p>a) Small areas can be re-pressurized using a Carlisle TyrFil approved sidewall injector. Larger areas where the whole tire is affected, will require dismounting, removal and reprocessing.</p> <p>b) Check mixer. Replace missing, dirty or broken elements. Always use the correct number of mixing elements.</p>
Flat Spots (compression set) Tire is fully cured but soft spots are noticed later during service	Tires were not fully cured when put into service	Small sections can be re-pressurized by using a Carlisle TyrFil sidewall injection.
Product does not cure [24 hours at 72° F (22° C) or above]	<p>a) Improper mixing of product</p> <p>b) Improper material ratio</p>	<p>a) Check mixer. Replace missing, dirty or broken elements. Always use the correct number of mixing elements.</p> <p>b) Verify pump has correct ratio. REFER TO SERVICE SECTION on lower cylinders.</p>

TROUBLESHOOTING PUMP

PROBLEM	PROBABLE CAUSE	SOLUTION
Pump fails to operate (fluid gun is not attached to the tire)	<ul style="list-style-type: none"> a) Inadequate air supply b) Clogged fluid hose c) Broken valves or seals 	<ul style="list-style-type: none"> a) Check air supply at regulator. Verify 80 psi (6 bar). b) Remove Flushless manifold from fluid hoses. Place fluid hoses in a 5-gallon pail. Set regulator to 20 psi (1.5 bar) and open the air motor ball valve. Check for fluid output. c) Replace air motor. CALL CARLISLE TYRFIL FOR AN EXCHANGE.
Pump operates slowly on the up and/ or down stroke but runs faster when the manifold head is removed	<ul style="list-style-type: none"> a) Low air pressure b) Long or angled valve system c) Material is cold d) Restriction in one or both fluid hoses 	<ul style="list-style-type: none"> a) Verify 80 psi (6 bar) at regulator. b) This is normal. Replace with a less restrictive valve if possible. c) Material must be 72° F (22° C). d) Dislodged valve core. Replace fluid hoses.
Pump is operating and suddenly seems to stop	<ul style="list-style-type: none"> a) Valve core is blocking valve stem 	<ul style="list-style-type: none"> a) Turn off hand valve on the manifold. Relieve any pressure in the tire. Disconnect fluid gun from valve stem and reload the valve core. Continue processing.
Erratic or accelerated operation (gauges may be erratic)	<ul style="list-style-type: none"> a) Ball valve is closed on totes b) Depleted totes c) Malfunctioning of cylinder piston or intake ball check 	<ul style="list-style-type: none"> a) Open ball valves. b) Replace tote set. c) REFER TO SERVICE SECTION on lower cylinders.

Servicing Lower Cylinders

This test is only possible with our TyrFil Flushless Manifold.

1. Reduce the regulator setting to 40 psi. Open the ball valves on the ISO- and CAT-side totes.
2. Turn on the ball valve at the air motor.
3. This test will dispense several pounds of material. Make sure your waste container can handle this volume.
4. Over a waste container, position the body of the Flushless manifold so that you can observe the material streams flowing into the waste container. Slowly open the hand valve and observe the material streams for several cycles. The material streams should be even on both the ISO- and CAT-sides as the pump cycles up and down. If one side is absent, note which direction the yoke is moving (either up or down) and which side is absent. EXAMPLE: On the down stroke, you notice the ISO-side has no stream. On the up stroke, both ISO and CAT have a stream, so the ISO-side intake ball check has a malfunction.
5. Repeat step 4 to verify your results.
6. Refer to the chart below for analysis.

YOKE DIRECTION	OBSERVATION	CONDITION
Up Stroke	ISO-side Fluid CAT-side Fluid	Normal operation
Up Stroke	ISO-side No Fluid CAT-side Fluid	ISO-side piston ball check malfunction Normal operation
Up Stroke	ISO-side Fluid CAT-side No Fluid	Normal operation CAT-side piston ball check malfunction
Down Stroke	ISO-side Fluid CAT-side Fluid	Normal operation
Down Stroke	ISO-side No Fluid CAT-side Fluid	ISO-side intake ball check malfunction Normal operation
Down Stroke	ISO-side Fluid CAT-side No Fluid	Normal operation CAT-side intake ball check malfunction

VIII. SERVICE

Servicing a Freezing Air Motor

When air is compressed and released quickly it creates a cooling effect. The TyrFil Flushless Pump is no exception. Under certain conditions, the air motor could slow down, freeze or stop completely. When filling tires through an air/water valve, the pump operates quicker, taking in and releasing compressed air at a much greater rate. If enough moisture is present in the air lines, it will condense and accumulate inside the air motor, freeze and block the air valves and exhaust ports.

If you develop problems from frosting or freezing, here is a suggestion you can try to correct the situation:

1. Install a water filter, part number 353476 (available from Carlisle TyrFil), between the regulator and the air inlet on the TyrFil Flushless Pump. Water filters should remove most of the moisture in the system, but they are not by themselves 100% effective. If you are still having problems after you have installed a water filter, additional filters may be needed elsewhere on the air lines.

Note: Do not use heat lamps on the TyrFil Flushless Pump. This approach may seem effective, but excessive heat will damage the air motor O-ring and could result in a total pump failure. If you have any questions regarding this problem, please call our Technical Center.

Lower Cylinder & Air Motor Exchange

Carlisle TyrFil offers a lower cylinder and air motor exchange for our customers. These parts can be shipped regular ground or next day air via UPS. The part number for the lower cylinder set is 353394 and the air motor part number is 353387. Lower cylinders are sent out as a complete ISO and CAT set and both cylinders should be replaced at the same time. Air motors are shipped without the regulator. A core fee is added to your account when the order is placed. This fee is removed once the old part is sent back to Carlisle TyrFil and has been received. Contact Carlisle TyrFil at (800) 821-4147 for cost information and to order parts.

Priming Instructions

Once you receive the lower cylinder replacement set and have it installed on the pump, it must be primed with TyrFil material and oil added to the wet cups before it can be operated at rated pressures. Proper priming will prevent excessive heat buildup of the PTFE packings.

1. Connect the air supply hose to the air regulator input fitting on the air motor.
2. Adjust the regulator to 30 psi.
3. Completely open the manifold hand valve and position the manifold over a waste container (such as a 5-gallon pail) to catch the material run out. If possible, have someone hold the manifold over the container.
4. Open the ISO- and CAT-side tote ball valves.
5. Turn on the air motor by opening the ball valve located between the air motor and the regulator.
6. The pump should begin to cycle. If the pump fails to cycle, slowly increase the regulator pressure at 5 psi increments until the pump starts to cycle.
7. Observe the ISO- and CAT-side fluid output from the manifold quick connect fittings. Fluid output from the manifold should begin after about 10 cycles. The pump's cycle rate will slow once the material has filled the cylinders. If the pump stalls, increase the regulator pressure 10 more psi.

8. Continue running the pump and observing the fluid output until material is present on both the up and down stroke. You should get solid fluid streams. Some air pockets are expected to work themselves out.
9. When material output from the manifold handle is even, close the manifold hand valve. Increase the regulator pressure to 50 psi and completely open the manifold hand valve again over the waste container and confirm fluid output at the higher regulator setting is even. The lower cylinders are now primed.

The manifold head and mixer can be assembled if you have tires to fill. Remember the manifold hand valve must be completely open during the priming operations.

If the fluid output is not even, **do not** fill any tires until you are certain the pump is functioning properly and on ratio. A quality control sample should be taken during the next flatproofing session. Mark the material levels on the totes with a Sharpie, or a similar marker, and monitor the fluid levels when you are filling tires. The levels should drop evenly. If the material levels were off previously, measure the distance between the starting and ending levels on both totes then compare your readings. For example: if the material level dropped 4-inches on the ISO-side, there should be an equal drop of 4-inches on the CAT-side.

The cup seals should be checked and retightened with a spanner wrench after the first use. Failure to tighten the cup seals may result in ISO or CAT leakage.

Returning Used Cores

Lower cylinders and air motors must be returned to receive proper credit. Lower cylinders should be as empty as possible and placed inside the plastic bag (*included in the shipping container with your exchange*) to prevent leakage of any TyrFil material. Cores should be returned in the original shipping container. The return shipping address is:

Carlisle TyrFil
140 Sheldon Road
Berea, OH 44017

Visit www.CarlisleTyrFil.com for specs, weight charts, and more!

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

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