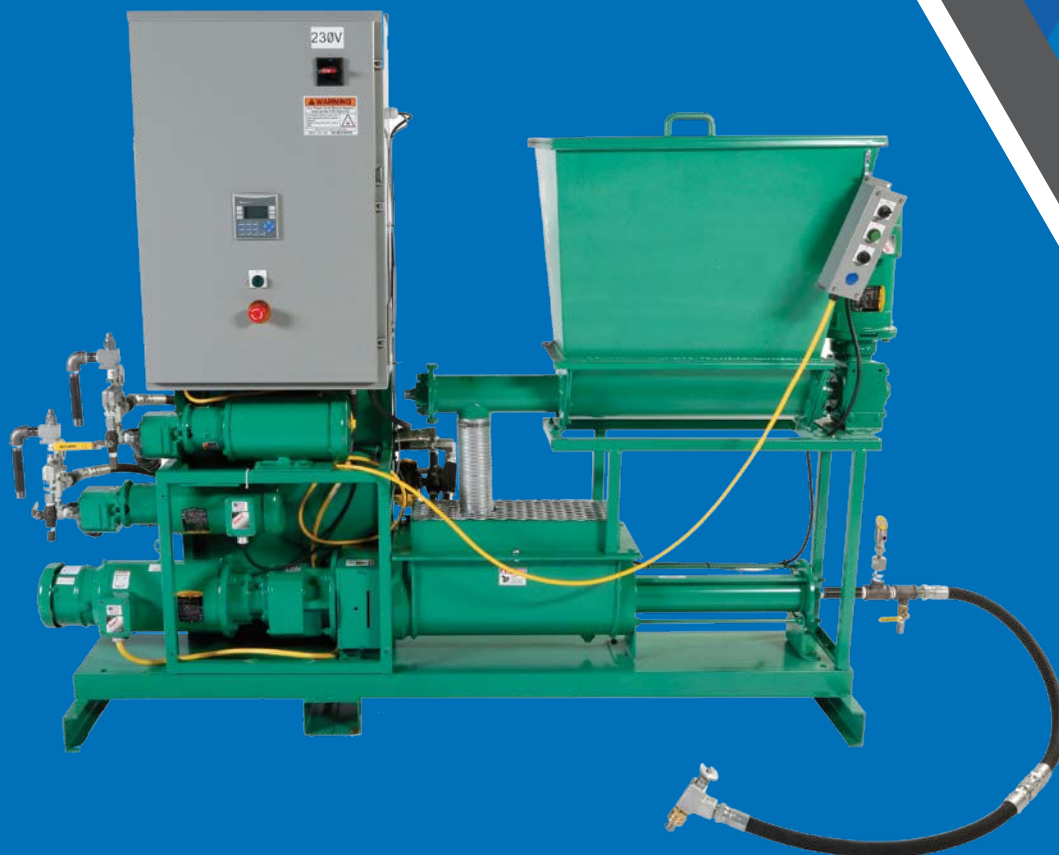




TyrFil Green Machine

FLATPROOFING TECHNICAL MANUAL

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

TyrFil  TM
A **CARLISLE** BRAND

This manual is intended to assist the tire fill technician in the operation of the TyrFil Green Machine. 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 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

The Green Machine was developed in 2009 for the Greener Planet Program. This equipment allows our customers to utilize granulated recycled TyrFil or specific rubber crumb media and blend it with various ratios of virgin TyrFil while reducing the time needed for flatproofing a tire. The process provides a cost and labor savings while reducing the amount of used TyrFil sent to the landfills. The Green Machine has been in continuous production and evolution, with each generation incorporating new, beneficial features.

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 saving, and retreadability.

The tire flatproofing process includes the following steps:

- Inspecting tires and wheels for defects
- Pre-stretching the tire carcass 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 Green Machine. 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 locations. However, a customer should not rely on such visits as assurance that it has taken all safety and other precautions.

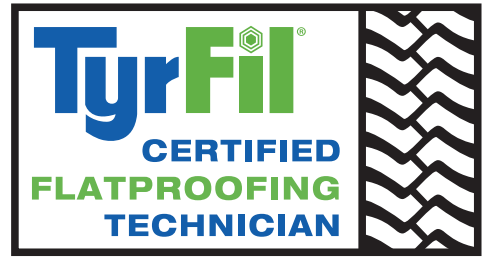
Carlisle TyrFil maintains a knowledgeable technical support staff who can assist our customers with any questions or assistance that may be needed in connection with our products. Further, Carlisle TyrFil maintains an inventory of parts, and written technical and safety data on its products.

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 900 square feet (84 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 Green Machine – The Green Machine significantly reduces carbon footprint and saves money by recycling and using up to 65% reclaimed tire fill while reducing the petrochemicals (including oil) normally required to fill an off-the-road (OTR) tire. The Green Machine processes PU grind, rubber crumb grind or rubber granules. Grinder is separate. The TyrFil Green Machine and replacement parts are readily available through Carlisle TyrFil. Visit www.carlisletyrfil.com to download the Parts Catalog.

The Green Machine requires a 3-phase electrical service hookup and can be run on 208-240VAC or 380-480VAC.

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, drum 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 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 – G-Flush is the recommended solvent for cleaning the Green Machine system. G-Flush is available for purchase in 55-gallon drums from Carlisle TyrFil. Isopropyl alcohol (99% pure) can be used for cleaning 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.

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.

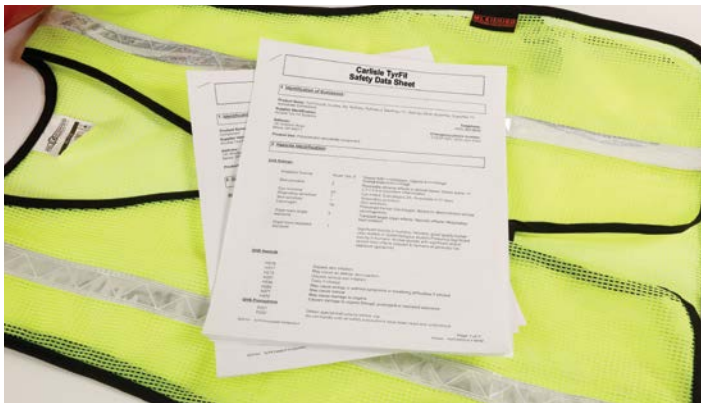
*** Be sure to follow all federal, state, and local regulations when disposing of any cured or uncured material or other related items.**



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% water, 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.

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 CAGE

Safety Supplies

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



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

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

Eye Protection- Eye protection is essential and should be worn at all times as liquids, pressurized air, and solvent can be accidentally 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.



Tire Cage- Tires should be filled in a tire cage. Tires overpressurized 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.

Respirator- Solvents, 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 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

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 prestretched before filling. Inflate new tires to maximum rated inflation pressure and maintain overnight. Tires grow during service and prestretching allows the tire to be filled to its capacity and will minimize long term carcass growth. Used tires do not need to be prestretched 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 –** Totes should be arranged with the ISO-side on the left and the CAT-side on the right. The chemical pumps of the Green Machine 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**

- Remove shipping cap. Remove foil if it is present.
- Liberal 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)
- Remove dust cap from kamlock on suction/supply hose.
- Apply grease to the tote connector and connect the kamlock to the tote connector. Lock kamlock in place by pulling back on the handles.
- 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:

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

Green Machine Screen

Jobs Select Button:
Press this button to enter the job select screen.

F1 F1: System Start

F2 F2: System Stop



Escape Button:
Pressing this key returns to previous screen and locks in selected jobs.

Enter Key: Locks in Progressive Cavity Pump Speed. Set Speed Using Numeric Keypad.

Percentages listed in the Job Numbers is by Volume. Refer to this listing for the actual weights.

- Job 1.** 65/35 65% Grind, 35%, Virgin Material or 50/50 by Weight
- Job 2.** 50/50 50% Grind, 50%, Virgin Material or 30/70 by Weight (30% crumb, 70% Virgin)
- Job 3.** 30/70-R* 30% Rubber Grind, 70% Virgin Material by Volume
- Job 4.** 40/60-R* 40% Rubber Grind, 60% Virgin Material by Volume
- Job 5.** 50/50-R* 50% Rubber Grind, 50% Virgin Material by Volume
- Job 6.** 65/35-HV** OTR 65% Grind, 35% Virgin Material or 50/50 by Weight
- Job 7.** 50/50-HV** OTR 50% Grind, 50% Virgin Material or 30/70 by Weight (30% crumb, 70% Virgin)
- Job 8.** 100% Virgin Material
- Job 9.** Flush Cycle (For System Cleanup)

* For use with recycled rubber grind only. The actual weight will vary by density depending on the manufacturer.

** High Volume use requires a special OTR wheel and adapter.

Diagnostic Modes and Functions

The following Job numbers are used for diagnostic and testing purposes only. Tires should not be filled using these job numbers.

- Job 10.** Runs the Hopper Motor
- Job 11.** Runs the Material Pumps
- Job 12.** Runs the Progressive Cavity Pump

Start-up Procedures

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. Check the level of the filler/grind in the hopper. Add filler if needed.
4. Turn the power switch on the control panel to the ON position.
5. To select the job, press the upper left menu button once. Use the arrow key to select the appropriate job. Press the escape button to return to the main run screen.
6. Open the ball valves on the ISO and CAT-side totes.
7. You will need two 5-gallon pails during operation. One pail for priming the Green Machine on startup and one pail for clean-up. Lining the pails with a trash bag will make disposal and reclaiming material easier.
8. Remove the cap and connect the fluid gun body to the dispenser hose. If the fill gun plunger isn't already attached to the gun body, attach it now.
9. Attach the fluid gun and gauge assembly to the dispensing hose.
10. The Green Machine must be primed before tires can be filled. To prime the Green Machine, place the fluid gun over a waste container. Select Jog P.C. on the remote and press the Jog button until all the solvent has been removed from the mixing well.
11. Change the remote to System and reduce the cavity speed to 30%. To adjust the progressive cavity pump speed, press the enter key on the main control panel. The cavity speed percentage number will be highlighted.
12. Change the cavity speed to 30% then press the enter key. NOTE: For the F1 and F2 keys on the main control panel to function, the remote switch must be in the "System" position.
13. Press the "System Start" on the remote. Allow the mixing well to fill with material. This will take about a minute. Run material into the empty pail until completely full or honey pot is empty. Once the mixing well is primed, change the cavity speed to 50%.
14. You are now ready to begin filling tires.

** All speed adjustments for the progressive cavity pump are performed on the system control panel and only the progressive cavity pump speed should be changed during the tire filling operation. All other functions and filler ratios are selected by the job number.*



System Remote

Use the remote to perform some basic functions without using the control panel, including starting and stopping.

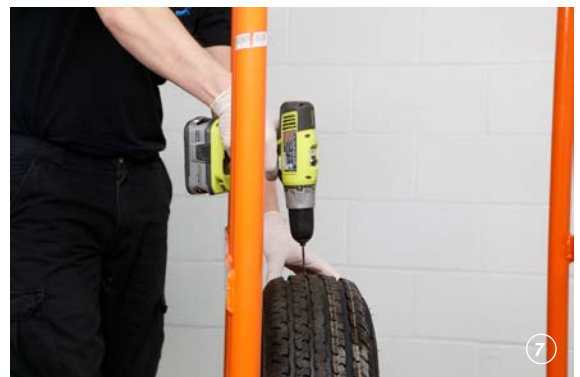
- Set to the SYSTEM position to run the Green Machine in the job mode. Pressing the “System Reset” button starts the Green Machine and will run the job number currently displayed on the control panel.
- To stop the Green Machine using the remote, move the mode switch to “Jog All”.
- Placing the system switch in the “Jog P.C.” position runs the P.C. pump only. This can be helpful if the mixing well level is too high and needs to be lowered.
- Placing the system switch in the “Jog All” position runs the chemical, grind, and P.C. pump.



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. Begin filling the tire by pressing the System Reset button on the remote or pressing the F1 key on the main panel.
3. During the flatproofing process, it is your responsibility to monitor the material levels and adjust the progressive cavity pump as needed to prevent over or under conditions in the mixing well.
4. Monitor the mixing well after the new speed values have been entered.
5. Readjust the cavity speed if needed. Gradual adjustments are recommended.
6. Check the tire pressure.
7. When you reach 20 PSI, stop filling the tire and drill a vent hole at the 12 o'clock position in the tread area of the tire. Then continue filling the tire, constantly monitoring the vent hole, and checking for escaping air.
8. Once the tire is full, air will no longer escape and material will begin flowing from the vent hole. Press F2 on the control panel or turn the mode Switch on the remote to Jog All to stop the Green Machine.
9. Insert a screw or bolt into the vent hole to seal it. Check the tire pressure reading.
10. Use the Jog All position to pressurize the tire.



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.

11. When the switch is placed in the Jog All position, press and hold the Jog button to run the material pumps, grind hopper, and PC pump.
12. Continue filling the tire until the tire manufacturer's recommended PSI has been achieved, stop filling the tire.
13. Press the plunger down and turn clockwise to reinsert the valve core.
14. To ensure proper seating of the valve core, pull back on the plunger and check the pressure on the PSI gauge.
15. The PSI gauge should read zero.
16. Disconnect the fluid gun from the gun connector.
17. Remove the gun connector from the tire.
18. Carefully lay the tire horizontally for proper curing.
19. Allow the tire fill mixture to cure inside of the tire for at least 24 to 48 hours in a climate-controlled environment with a minimum temperature of 72° F (22° C).
20. Lay the sample on the filled tire for use in checking the progress of the cure. Use a tire marker to identify weight count and psi on the tire. Document in the flatproofing log. This log is used to record processing data.



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.

21. Place rim stickers on the wheel.

Note: Flatproofing materials should be at a minimum of 72° F (22° C)



Tire Pressurization

Overpressurization - Do not overpressurize tires. In addition to the potential danger of bursting the tire, overpressurization 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 overpressurized 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.

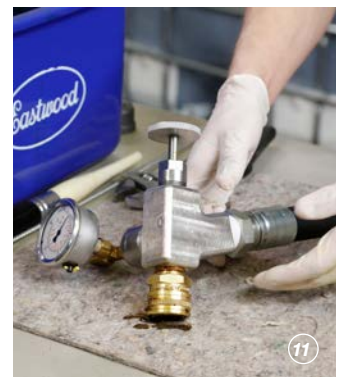
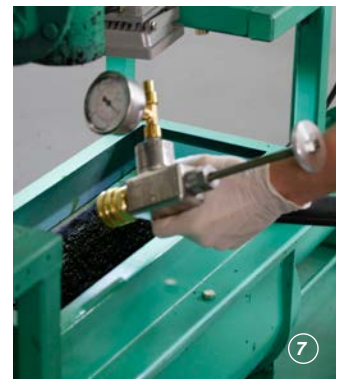
Underpressurization - Do not underpressurize the tire. This can cause excessive flexing of the casing and material, which may lead to overheating and eventual tire failure. Unlike a tire filled with air, virtually a complete loss of pressure can result from the leakage of only a very small amount of material from the tire after it is filled. If leakage is observed, the tire may need to be repressurized and resealed.

Repressurization - 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 repressurized 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. After the last tire has been filled and you are ready to shut down the Green Machine, change the mode select switch to “Jog P.C.” on the system remote.
2. Place the fluid gun over an empty lined 5-gallon pail. Press and hold the “Jog” button. This will run the cavity pump only, removing the mixed flatproofing material from the mixing well, progressive cavity pump, and the dispensing hose. Release the “Jog” button when the material has been purged.
3. Run ten pumps of grease using the grease gun through the grease fitting located on the line pressure gauge. Note: this step is not required if equipped with the digital pressure gauge.
4. Pour the pail of solvent into the mixing well (approximately 2.5 to 3-gallons).
5. Press the jog button on the remote and run half the solvent into the waste pail.
6. Check solvent level in mixing well and add solvent if necessary. Solvent level should be above the auger flights.
7. Place the fill hose over the mixing well and press the Jog button on the system remote. Allow material to circulate for 30 seconds through the system.
8. Purge the pressure release ball-valve during the flush process.
9. Remove the PSI gauge from the gun assembly. Clean the diaphragm thoroughly with a brush in 99% isopropyl alcohol. Store in a safe place.
10. Clean the fill gun plunger.
11. Thoroughly clean the gun body and stem connector, rinse and store all parts in alcohol.
12. Shut off both tote valves and turn off at the main power source.



To ensure that the material does not solidify between uses, the Green Machine needs to be run once per week.

V. GRINDER

WARNING: These instructions must be followed to ensure safe and proper installation, operation, and maintenance of the Green Machine Grinder. They should be brought to the attention of all persons who install, operate, or maintain this equipment. In selecting a location for the Grinder, consideration should be given to the working environment and ventilation. The free flow of air around the Green Machine Grinder should not be obstructed. High voltage and rotating parts can cause serious or fatal injury. The use of electrical machinery, like all other utilization of concentrated power and rotating equipment, can be hazardous. Installation, operation, and maintenance should be performed only by qualified electrical and mechanical maintenance personnel familiar with NEMA safety standards, the National Electrical Code and sound local practices. The manual is to be studied thoroughly by personnel responsible for the installation and maintenance of this equipment before installation is begun. Personnel must be familiar with the potential hazards involved. Keep this document for future reference.

Introduction

The grinder was designed to process used urethane (TyrFil) only. Do not attempt to grind tires, retread components, or natural or synthetic rubbers. Use of unapproved materials will void the warranty and possibly damage the equipment. Used urethane must be cut into pieces no larger than 10-inches in length and no thicker than 6-inches. The urethane must be scanned prior to grinding with the metal detector (provided) and inspected for debris. To scan the chunk with the metal detector, turn on the metal detector and keeping a 2-inch gap between the wand and the chunk, run the wand around a full 360 degrees. If the metal detector alarms, this piece contains metal and should be inspected further. All debris, especially metal, must be removed from the chunks selected for grinding. Keep in mind that other debris such as wood or plastic may be imbedded in the urethane. These chunks should be discarded.

The amount of used urethane that you can grind per hour will vary based on the grinder model and the actual hardness of the used urethane. Typical results are 1,000 lbs (453 kg) of grind per hour using models GR-GN1 thru GN-GN3 and 700 lbs (318 kg) with the HD-GN1. Medium to harder urethanes give the best results. HD-GN1 is suitable for grinding rubber imbedded TyrFil material.

Soft durometer materials such as TyrFil Flex can be processed but should be mixed in a ratio of 1 to 4 with harder durometer materials. Example; 1 chunk of TyrFil Flex with 4 chunks of harder material. If TyrFil Flex is all you have, then only attempt to grind 2 pieces at a time to avoid overfeeding. Safety glasses should always be worn when operating the grinder. Turn on the main power switch on the control panel. Make sure the E-stop button is not depressed. Rotate the selector switch to the FWD position then press the start button. To stop the grinder, turn the selector switch to the OFF position. To reverse the grinder, rotate the selector switch to the REV position then press the START button.

Never change the rotation direction without first bringing the grinder to a complete stop!



General Operation (Green Machine Grinder HD-GN1)

Grinding

Place an empty receiving pail or suitable receptor under the discharge chute, then start the grinder in the forward direction. Load the hopper with no more than 6 chunks of material. Thereafter, allow 20 to 30 seconds of time between each additional chunk. When the receiving pail is full of grind, turn off the grinder and empty the pail. Resume grinding with an empty pail. It is recommended to prepare a bin where you can store the grind for later use in the Green Machine. **Do not attempt to operate the grinder and the Green Machine at the same time.** Your attention should be directed at monitoring the Green Machine's progress and the tire you are flatproofing.

Service & Maintenance

The gearbox is factory filled with lubricant. The factory fill lubricant is suitable for use at all output speeds and in ambient temperatures from 10° F to 105° F (-12° C to 41° C). No initial oil change after break-in is needed. The initial factory oil fill is good for up to 10,000 hours or 3 years of service, whichever comes first, in normal industrial environments. Normal operating conditions are defined as steady loads not exceeding normal ratings and running conditions. Oil quantity and levels should be checked at frequent intervals, depending on usage. Oil changes are required after 10,000 operating hours, or three years, whichever comes first. The period can be extended 20,000 operating hours, or six years, if the synthetic lubricant is used.

Every 6 months lubricate the rotor bearings with 4 shots of synthetic grease from a handheld grease gun. Do not over lubricate. Check the oil through the sight glass on the gearbox housing. The oil level should be in the middle of the sight. Top off when needed. The electric motor is fitted with sealed bearings and does not require lubrication.

Depending on your specific model the grinder is equipped with an overload relay or a manual motor protector. The overload relay provides overload and thermal trip protection while the motor protector provides overload and short circuit protection. The overload relay is automatic and will auto reset after it has cooled down. The manual motor protector requires a manual reset.

When the motor protector trips, the rotary switch goes to the "TRIP" position on the rotary dial to indicate tripping. To reset the motor protector, turn the rotary actuator to 0 before switching it to the 1 in order to set the mechanism back to standby. The current rating value has been factory set, do not adjust. To test the motor protector, insert a slot screwdriver (e.g. 0.5 x 2.5 mm) into the test opening and gently push it backwards. The motor protector's rotary switch will indicate "TRIP". Reset the motor protector as indicated above.

If the electric motors stalls during grinding, immediately press the stop button. Run the grinder in the reverse direction for about 20 seconds then stop the grinder. Run the grinder in the forward direction to resume grinding. If the grinder stalls again, repeat this reverse/forward operation a second time. If these steps fail to free the rotor, then excess material in the hopper will need to be cleaned out manually (Refer to Manual Clean Out).

Manual Clean Out

Turn off the electric power at the service disconnect and place a lockout tag on the panel. Remove the bolts securing the hood to the hopper. Use a forklift and a chain or heavy-duty strap to remove the hood using the eyehooks located on the top. Care should be taken not to damage the safety switch and the exposed rotor blades are very sharp. With the hood off, remove the larger pieces of material first. Smaller pieces and grind can then be scooped out if needed. On the back of the grinder near the bottom is a small panel cover, this is a clean out hatch for also removing debris. Once you have removed most of the material in the hopper, replace the hood and restore the electric power. Lightly load the hopper with material and continue grinding. Discontinue use if any metal to metal noise can be heard from the hopper. *NOTE: The grinder will not operate with the hood removed or the clean out hatch door removed.*

VI. GREEN MACHINE GRINDER PARTS LIST

Parts List for the Green Machine GrinderPhase 60HZ	
Description	Part Number
HD-GN1 Breaker Bars	353521
Contactor Set Assy (FWD/REV)	2010
HD-GN1 Screen	353407
Start Button	353174
Function Switch, Selector	353426
E-Stop	353217
Main Power Switch (On/Off)	353351
24VDC Power Supply (480V AC 3-Phase)	353201
Safety Switches (Hood/Chute)	353419
Bearings, Main Auger (Front, Motor Side)	353253
Bearings, Main Auger (Discharge Side)	353383

Specifications	
Model Number	HD-GN1/GR-GN1~GN3
Motor	20HP/1750 RPM
Voltage	380~480VAC 208~240VAC 3-Phase 50/60HZ
Current	380~480VAC 33A/27A - 20 ~240VAC 60A
Gearbox	56:1/31.25 RPM
Gearbox	36:1/48.8 RPM (GR-GN1~GN3)
Lubrication	EP 220

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:

- 1. Drain Hoses** – The clear supply hoses connecting totes to the pump contain more than a gallon of usable material. Switch to the Liquid Motor job setting and run the pump until all liquid material is purged out.
- 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.
- 3. Position totes** – Correctly position the new material and connect to supply hoses.
- 4. Cycle Machine** – Place fluid gun over waste container and cycle machine until old material flowing from gun is clearly replaced by new material.
- 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 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.

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 8 and 54 totes can be picked up at one time, usually within 5 business days following entry of the pick-up request by the return logistics department. 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. GREEN MACHINE SPECIFICATIONS

These specifications cover Green Machine models GM-GN1 thru GM-GN4 AC Induction Motors*.

Model GM-GN1 thru GM-GN3 208-240 Volts 3 Phase 60HZ					
Motor/Section	HP Rating	Voltage/FLA	Phase	RPM/Finale/Ratio	Controls
Crumb	1.5/3	208-240/6.1/8.1	3	1750/0-233/7.5:1	PLC/User Programmable
Chemical	3.0	208-240/8.1	3	1750/0-1750/1:1	PLC/User Programmable
Cavity Pump	5.0	208-240/12.0	3	1750/0-155/11.25:1	PLC/User Programmable
Brake	-	208-240	1	-	VFD programmed Control with manual release

Model GM-GN1 thru GM-GN3 380-415 Volts 3 Phase 60HZ					
Motor/Section	HP Rating	Voltage/FLA	Phase	RPM/Finale/Ratio	Controls
Crumb	1.5/3	380-480/3.3/4.5	3	1750/0-233/7.5:1	PLC/User Programmable
Chemical	3.0	380-480/4.5	3	1750/0-1750/1:1	PLC/User Programmable
Cavity Pump	5.0	380-480/6.0	3	1750/0-155/11.25:1	PLC/User Programmable
Brake	-	240-380	1	-	VFD programmed Control with manual release

Model GM-GN4 208-240 Volts 3 Phase 60HZ					
Motor/Section	HP Rating	Voltage/FLA	Phase	RPM/Finale/Ratio	Controls
Crumb	3.0	280-240/8.1	3	1750/0-233/7.5:1	PLC/User Programmable
Chemical	2.0x2	208-240/5.8/11.6	3	1750/0-1750/1:1	PLC/User Programmable
Cavity Pump	5.0	208-240/12.0	3	1750/0-155/11.25:1	PLC/User Programmable
Brake	-	208-240	1	-	VFD programmed Control with manual release

Model GM-GN4 380-415 Volts 3 Phase 60HZ					
Motor/Section	HP Rating	Voltage/FLA	Phase	RPM/Finale/Ratio	Controls
Crumb	3.0	380-480/4.5	3	1750/0-233/7.5:1	PLC/User Programmable
Chemical	2.0x2	380-480/2.7/5.4	3	1750/0-1750/1:1	PLC/User Programmable
Cavity Pump	5.0	380-480/6.0	3	1750/0-155/11.25:1	PLC/User Programmable
Brake	-	240-380	1	-	VFD programmed Control with manual release

The mixing auger and progressive cavity pump's helical gear unit is splash lubricated and filled with mineral oil. The lubricant should be replaced every 10,000 operating hours or after two years. These periods can be doubled for synthetic products. Shorter lubricant replacement intervals are advisable in case of extreme operating conditions, e.g. high humidity, aggressive environments, and large temperature fluctuations. It is advisable to combine lubricant replacement with thorough cleaning of the gear unit. After changing the lubricant, and in particular after initial filling, the oil level may change during the first few hours of operation, as the oil galleries and cavities only fill gradually during operating. The oil level is still within the permissible tolerance. Note: Do not mix synthetic and mineral oils.

Castrol	FUCHS	Klüberoil	Mobil	Shell	Total
	Renolin CLP 220 Or CLP 220 Plus	GEM 1-220N	Mobilgear 600 XP 200	Omala S2 G 220	Carter EP220 Carter XEP220

* We reserve the right to make technical changes or modify the contents of this document without prior notice.

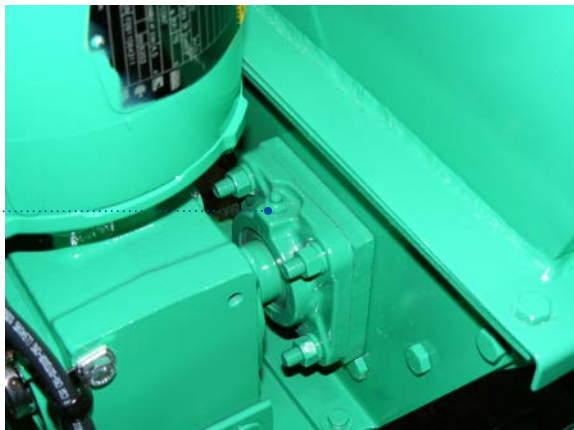
VIII. PUMP MAINTENANCE

Pump Maintenance - Proper maintenance is critical to long equipment life, reliability, and efficiency. This section covers the maintenance to our Green Machine Recycler System.

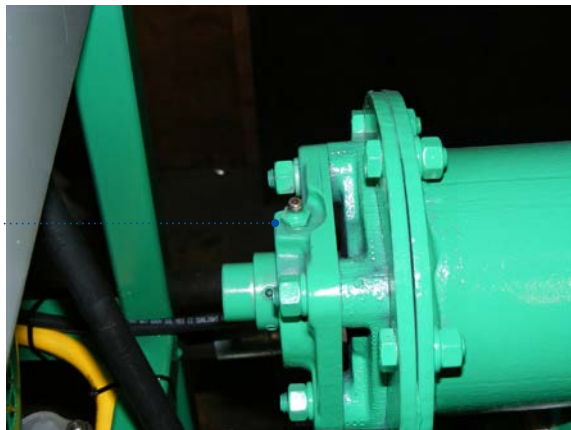
Weekly - Take apart check valves and soak and clean. Manually clean mixing well.

6 Months - Check gear boxes and refill if needed. Clean the air filter on the control panel chassis with compressed air.

Annually - Locations are identified in the image below. Grease fittings get 4 shots of grease each year. Use a high-quality synthetic grease for all fittings. Change the gearbox oil every two (2) years. Use Shell Omala S2 G 220 or equivalent. Refer to guide on page 21 for compatible replacements.



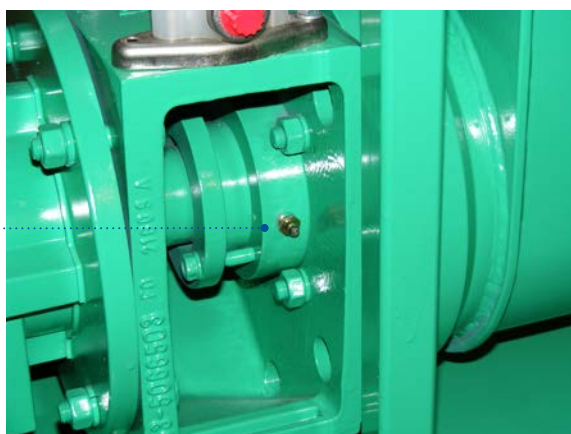
- Grease fittings on hopper auger. One of Two lubrication points. Grease fittings get 4 shots of grease each year. Use a high-quality synthetic grease.



- Grease fittings on hopper auger. Two of Two lubrication points. Grease fittings get 4 shots of grease each year. Use a high-quality synthetic grease.



- Change the gearbox oil every two (2) years. Use Shell Omala S2 G 220 or equivalent. Refer to guide on page 21 for suitable replacements.



- Stuffing Box seal lubrication point. Grease fitting gets 4 shots of grease each year. Use a high-quality synthetic grease.

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

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

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