

The Union Tool Corp.

UNION HOT MELT ROLLER COATER MANUAL

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INTRODUCTION TO THE UNION HOT MELT MANUAL

This manual was prepared for “standard” Union Hot Melt Roller Coaters. Union Tool provides standard machines as well as special machines for your particular application. This manual provides “in-general” information on our standard equipment. Some of the information may not pertain to your particular machine, but will provide you with a general overall lubrication and maintenance guide as well as troubleshooting.

Should your company or operator have any questions regarding this manual, please do not hesitate to contact the Union Tool Corporation, Technical Sales Department at 574/267-3211. Our hours are 8:00 A.M. through 5:00 P.M. Eastern Standard Time – Monday through Friday.

SAFETY

SAFETY INTRODUCTION:

Here you will find safety guidelines for use with Union Tool equipment. These guidelines apply to anyone working with Union Tool equipment, including operations and service personnel. These guidelines are repeated throughout the manual, along with specific warnings and cautions not included here. These safety guidelines cover:

- **Safety during Installation;**
- **Safety during Operation;**
- **Safety during Servicing;**
- **Safety when using Hot Melt Adhesives and Reactive Materials;**
- **What to do if Molten Material comes in contact with the skin.**

Failure to follow these recommendations may result in personal injury from burns or electrocution and/or equipment and property damage.

SAFETY DURING INSTALLATION:

- Electrical:**
1. A protective electrical ground connection to a reliable earth ground is essential for safe operation. Without one, all accessible conductive components (including knobs and controls that appear insulated) can render an electric shock.
 2. A disconnect switch with lockout capability must be provided between the power source and the equipment.
 3. The power supply wire gauge and insulation must be sufficient to meet the temperature and power requirements.
 4. Only fuses of the correct type voltage rating and current rating should be used. Refer to the Union Tool wiring diagram equipment parts list for fuse recommendations. Using incorrect or non-recommended fuses can present a fire hazard.

Pneumatic: Union Tool has installed a lockout, three-way, manual valve in the air supply line to the filter/regulator. This valve makes it possible to relieve air pressure and lock out the pneumatic system before undertaking maintenance or repairs.

SAFETY (Continued)

SAFETY DURING OPERATION:

DO NOT operate Union Tool equipment

under the following conditions:

1. Near volatile or otherwise explosive gases or materials.
2. Without the covers, panel and safety guards properly installed.
3. At atmospheric temperatures below 20°F (-6°C) or above 120°F (50°C).
4. In drafty areas with the coating rolls unshielded from the draft. Rapid heat dissipation due to air movement across the rolls may cause operational problems.
5. **NEVER** use Union Tool equipment as a ladder or stepping stool.

SAFETY DURING SERVICING:

1. **DO NOT** perform internal service or adjustment on any equipment unless another person capable of rendering first aid and resuscitation is present.
2. Only qualified personnel should service Union Tool equipment.
3. To avoid personal injury, never touch exposed connections and components while power is ON. Dangerous voltages exist at several points in the equipment.
4. Disconnect, lock out and tag external electrical power before removing protective panels or replacing electrical components.
5. Remove all jewelry (rings, watches, etc.) before servicing equipment.
6. If possible, stand on a rubber mat when servicing Union Tool equipment. **DO NOT** work on equipment if standing water is present. Avoid working in a high-humidity atmosphere. Cover exposed terminals and work areas with rubber sheeting to avoid accidental contact while the power is **ON**.
7. Always wear safety glasses, protective gloves and long-sleeved protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive and hot machine surfaces.

SAFETY (Continued)

SAFETY WHEN USING HOT MELT ADHESIVES AND REACTIVE MATERIALS:

Hot Melt Adhesives:

1. Use extreme care when working with molten materials. They solidify rapidly at high temperatures and present a hazard. Severe burns can occur if the molten materials come in contact with the skin. Even when first solidified, they are still hot.
2. Always wear protective clothing and eye protection when handling molten material or working near equipment containing hot melt adhesives.
3. Always be sure the work area is adequately ventilated. Avoid prolonged or repeated breathing of solvent vapors.

Reactive Materials:

When using reactive materials in this system, do not set the operating temperatures of the coater without first consulting the adhesive manufacturer and the Material Safety Data Sheet (MSDSs) concerning the storage, handling and use of these materials. Failure to follow the recommendation in the MSDS can lead to personal injury. If equipment is not operated in compliance with MSDS recommendations, Union Tool reserves the right to refuse service for this equipment.

IF MOLTEN MATERIAL COMES IN CONTACT WITH THE SKIN:

1. **DO NOT** try to remove the molten material from the skin.
2. Immediately immerse the affected area in cold, clean water. Keep the affected area immersed until the material has cooled.
3. **DO NOT** try to remove the cooled material from the skin.
4. Cover the area with a clean, wet compress.
5. In cases of severe burns, look for signs of shock. If shock is suspected, have the patient lie down, use blankets to preserve body heat and elevate the feet several inches.
6. Call a physician immediately.

INSTALLATION

Your Union Tool Hot Melt Coater is easy to install.

1. Remove the coater from the skid. The coater is very heavy so please make a note of the shipping weight and use the proper equipment. Lift from the bottom of the frame. Be sure that the lift forks are against the frame when lifting the coater from the wooden skid.
2. Place the coater in the chosen position.
3. Level the coater.
4. Hook up air exhaust to the 8" air duct opening on top of the coater. The amount of exhaust required is 500 to 1000 c.f.m., depending on the size or the coater.
5. Make the power drop to the disconnect box. The voltage should be clearly marked on the front of the disconnect box and on the electrical print inside the box.
6. Check rotation of the hot oil pump. The pump is marked as to the rotation of the pump, which is looking from the motor end of the pump, should be turning clockwise. Covers may have to be taken off to get a view of the pump rotation.
7. Make an air drop to the coater if the coater is equipped with a filter and regulator. **Please do not reduce the size of the lines of the air drop smaller than the supplied filter and regulator.**
8. Make a visual check between the coating rolls and doctor rolls; look for any loose objects that may have fallen between the rolls. Check the rotation of the coating and doctor rolls in the reverse mode. All guards and covers must be in position for the coater to operate.

EMERGENCY CLEANUP PROCEDURES

CLEANING UP HOT MELT ROLLER COATER PROCEDURES DURING POWER OUTAGES

Prior to having an actual power outage with adhesive in the machine, it would be best to have a “Plan of Action” ready so when it did happen everyone is prepared to handle the problem.

1. **Never assume that the power will come right back on.**
2. Once the adhesive starts cooling off it will start the curing processes. It is best to have a liquid cleaner ready so that you do not have to use the cleaner that would require heat to melt it.
3. The tool list would be a: Flashlight, Crescent Wrench, large pair of channel locks, rags, gloves, plastic scrapers, pair of needle nose pliers to break the chain, and Benzoflex 50 or Benzoflex 988sg (Liquid) for the liquid cleaner.
4. Follow all of the Lock-Out and Tag-Out procedures for safety; you do not want the machine to start or give you a problem during power up if the power were to come back on. You will want a lock out the electrical disconnect switch as well as on the pneumatic circuit.
5. You are going to remove or open the cover on the end of the machine that has the main drive chain to the coating rolls.
6. Once you have gained access to the drive chain, loosen up the spring tensioners and remove the springs. Then find the master link and remove the clip, then remove the drive chain.
7. Leave the coating roll(s) and doctor roll(s) together; using the large channel locks turn the coating roll on the roll journal or sprocket in reverse to take as much adhesive off of the rolls as possible. Once you have done that on the top roll, you can continue on and do that to the bottom roll until you get all of the adhesive off the rolls.
8. Pour the liquid cleaner into the machine and either try to rotate the rolls in the forward direction or begin wiping the rolls off using your trough for quantity of your cleaner to be in position. Once you have the rolls cleaned you may open the gap between the coating roll and the doctor roll making sure that all of the rolls are not touching each other.

PRODUCTS FOR CLEANING / MAINTAINING HOT MELT COATERS

1. Clean Up Materials / Plasticizer:

- A. Benzoflex #352 (for normal clean ups)
Note: Your Adhesive Company may also sell this same product.

EMERGENCY CLEANUP MATERIALS

Benzoflex 50 or Benzoflex 988sg (Liquid) for the liquid cleaner
Order from Chempoint 425-378-8582

Or

Eastman Chemical Co. Phone: 800-327-8626 x 2987
for distributor referral and questions about product

- B. Polyad Company
Product: Uniplex #260
Phone: 847-526-3322
- C. Dynaloy Inc. Dynaloy has a variety of urethane cleaning products.
Phone: 800-669-5709

2. Urethane Release Agent – Manufacturer is B & S Products Corp.

Product: Omniwax #1622
Phone: 574-537-0770

3. Pipe Sealant

Product: Loctite 567 PST
Contact: Local Vendor

4. Heat transfer oil for the machines heating system

Product: Petro-Therm
Contact: Local Vendor or call Petro Canada, Customer Service and ask
for a distributor in your area – USA 1-888-284-4572.

NOTE: The Petro-Therm heat transfer oil is comparable with Mobiltherm 43 or
you can use other heat transfer oils from other manufactures as long as there are
comparable with the oils listed.

or

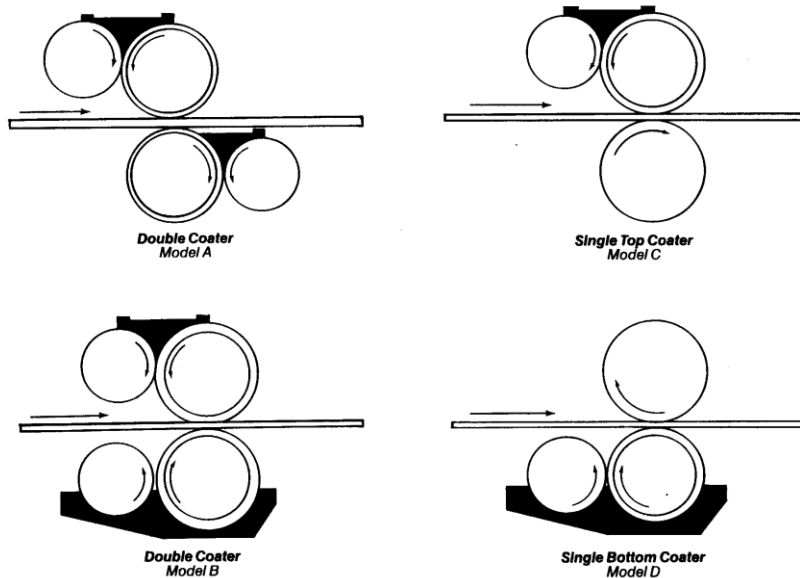
AS an alternative you can use Mobil Mobiltherm 43

Contact: Local Vendor or Mobil Oil, Customer Service and ask for a
distributor in your area – Phone: 800-662-4525. Mobile
Customer Service Department is very helpful and can tell you
the location of their distributors.

PRODUCTS FOR CLEANING / MAINTAINING HOT MELT COATERS (Continued)

5. Mobil System Cleaner – Manufacturer is Mobil
Product: Mobil System Cleaner
Contact: Local Vendor or Mobil Oil, Customer Service – see above.
Note: The system cleaner is used in older or contaminated heating systems.
6. Oil for the Gear Box – Manufacturer is Mobil
Product: Spartan Synthetic EP 460 oil
Contact: Local Mobil Vendor or Mobil Oil, Customer Service – see above.
7. Grease for lubrication for bearings – Manufacturer is Loctite
Product: Loctite LB 8034 or any good grade of grease with a temperature rating of up to 400° F.
Phone: Local Vendor.
8. Chain Lube – Manufacturer is Loctite
Product: Loctite LB 8011
Phone: Local Vendor.
9. Window Glass Cleaner – Local (Heavy Duty All Purpose Cleaner/Degreaser)
Product: Fastball – Warsaw Chemical
Phone: 800-548-3396

This shows some of the different types of roll configurations used on Union Tool roller coating equipment.



PUSH-BUTTON CONTROL BOX (and their operations)

Note: The push button operation and layout is for the standard machines.

PB-2 Coater “**start**” push button will start the coating roll drive. The drive will start as long as the infeed and offbear clear lexan covers are in the closed position and the safety cable is in the forward or reverse position. Magnetic switches ensure that the covers must be in position for the coater to start.

PB-1 Coater “**stop**” button will stop the coating roll drive.

PB-4 Pump “**start**” button will start the hot oil recirculating pumping system. Should you press this button and the light does not stay, the selector switch SS-4 heater “**auto/ man**” may be in the auto position and should be in the manual position.

PB-3 Pump “**stop**” button will stop the hot oil recirculating pumping system. Should you press this button and the green start light does not turn off, the selector switch SS-4 heater “**auto/ man**” may be in the auto position and should be in the manual position. On most machines built after September 2001, the pump stop button will also reset the safety over-temperature controller. See Warning under MAINTENANCE FOR A UNION HOT MELT ROLLER COATER.

SS-2 Top-level selector switch controls the delivery of coating materials to the top coating head. If you turn the selector switch to the “**manual**” position, the delivery of coating materials will continue until you release the switch. Once the switch has been released, it will return to the “**off**” position. When the switch is turned to the “**auto**” position, it will remain in that position until it is manually turned to the “**off**” position. Once in the auto position, the level control photocell will automatically control the level of the coating material.

SS-3 Bottom level selector switch controls the delivery of coating materials to the bottom coating head. If you turn the selector switch to the “**manual**” position, the delivery of coating materials will continue until you release the switch. Once the switch has been released, it will return to the “**off**” position. When the switch is turned to the “**auto**” position it will remain in that position until it is manually turned to the “**off**” position. Once in the “**auto**” position the level control will automatically control the level of the coating material.

SS-I Heater “**on**” and “**off**” selector switch. When the selector switch is in the “**on**” position will allow the heat to turn on when the pump is activated. When the switch is in the “**off**” position the heater will not heat.

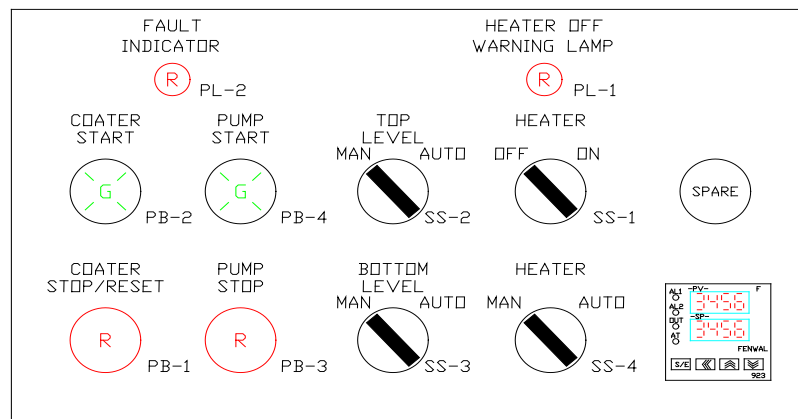
SS-4 Heater “**auto/man**” selector switch. When the switch is in the “**manual**” position, the pump must be activated manually. When the switch is in the “**automatic**” position the pump will start and stop automatically controlled by the 7-day timer.

PUSH-BUTTON CONTROL BOX (Continued)

PL-1 Pilot light heater off is a warning that the heater switch is in the “**off**” position and the machine will not heat up. This switch is normally used for maintenance.

PL-2 Pilot light fault indicator. This red light indicator is telling you that the coater drive has faulted and stopped. The reset to clear the fault is the coater stop button.

The temperature controller is a device that will control the temperature of the rolls. To change the temperature you must first press the “**set/enter**” button, then press the up or down arrow buttons until you raise or lower the setting to the desired temperature, then press the “**set/enter**” button.



HOT MELT ROLLER COATER

START UP PROCEDURE

1. **HEAT ROLLS:** Oil heater and pump should be turned on to heat the rolls. When the temperature has reached the preset setting on the digital readout the coater is ready to start coating. Depending on the temperature of the location where the roller coater is located, heat up time could take approximately one hour or more depending on the size of the coater and temperature needed to coat with.
 2. **START ROLLS "FORWARD":** Either while the rolls are heating or after they are up to temperature, the coater may be started by engaging the "**start coater**" button. To ensure proper direction, make sure reversing the lever is in "**forward**" position.
 3. **ROLL ADJUSTMENTS:** Make the proper roll adjustments using the mechanical digital indicator for each adjustment. This includes the top vertical adjustment which controls the height of the top coating assembly should be set for thickness of parts being coated. Also, one or both doctor rolls should be set for proper coating weight or thickness.
- NOTE:** During this time the drum unloader should be placed in the heat up mode. The pump of the drum unloader should be in the "**off**" position.
4. **ADD ADHESIVE:** Only when the oil temperature has reached the preset temperature and roll adjustments have been made should adhesive be added to the roller coater. Only add adhesive when ready to coat parts.

HOT MELT ROLLER COATER **CLEAN-UP PROCEDURE**

1. The most efficient way to clean the coating head is to use as much adhesive within the rolls while coating product. Any adhesive left in the rolls when production is over will be wasted. Therefore, before the end of the production run, turn off the level controls on the roller coater so no more adhesive is added to the coater. The level controls may be run manually in order to add a small amount of adhesive if needed. This will help lower the amount of waste as much as possible.
2. If both coating heads (top and bottom) were being used, you do not need to move the top vertical adjustment. If only coating the top coating head was used, raise the top coating assembly to about 3"; stop the coater and insert the cleanup pan. The cleanup pan and catch pan may be lined with plastic or paper; this will make it easier to clean up when the adhesive and plastisizer (clean up material) have cooled and hardened.
3. If you are cleaning both the top and bottom coating heads, do not make any vertical adjustments. Stop the coater by moving the reversing switch to neutral and raise lexan hood for access on the backside of the coater. Once the lexan hood is open, the machine will not be able to be started.
4. Add cleanup material to one or both coating assemblies in between the doctor and coating rolls. Close the lexan hood and move the doctor roll against the coating roll, just as you would to apply a minimum coating. Start the roller coater in the forward position. Allow the cleanup material to revolve with the adhesive for several minutes. The coating roll will be cleaned by allowing this material to dissolve.
5. After several minutes, reverse the direction of the coating rolls by moving the reversing drum switch to reverse. This will allow all material between the rolls to be squeezed out from the bottom of the rolls into the cleanup pans or catch tray.
6. Repeat #4 and #5 approximately 3 times at which time all rolls should be clean of any adhesive and only have a residue of cleanup material on them.
7. After repeating #5 for the last time, be sure to adjust doctor roll away from the coating roll to ensure they are not touching. This may be done while rolls are still revolving. Leaving roll together will cause a flat spot on rubber coating rolls.

HOT MELT ROLLER COATER - CLEAN-UP PROCEDURE (Continued)

8. Once rolls are apart and clean, stop coater by engaging "**coater off**". Raise lexan hood and remove seal plates by pulling pins and lifting seal plate out. Gloves (high temp) will have to be worn when moving seal plates. With Gloves on, clean ends of the rolls and face of seal plates using heavy shop rags.
9. Lower lexan hood and close pick-off finger table using pin to lock table shut.

NOTE: Allow approximately 45 minutes for entire cleanup. Cleanup is most important to the function of this equipment.

MAINTENANCE CHECK LIST		
1.	The two covers will need to be removed on the offbear end to gain access to the drive components.	☐
2.	Remove the seal plates from the machine.	☐
3.	The drive chain will need be removed from equipment as well as the doctor roll drive chain.	☐
4.	All idler sprocket assemblies and coating roll and doctor roll bearings need be inspected as well as lubricated. Replaced as required.	☐
5.	The drive chain needs be inspected and replaced as required.	☐
6.	Tension springs on the chain drive will need to be inspected and replaced as required.	☐
7.	If the balance of this part of the inspection has been completed, then reassemble.	☐
8.	The single handwheel adjustment – this control will be lubricated as well as checked out for moving freely and will re-zero the mechanical digital indicator so it reads out correctly with the proper gap setting.	☐
9.	The unifeed adjustment will need to be checked out for operation and wear as well. If any parts show ware replace as required. Check it for parallelism and make any adjustments as necessary and set the mechanical digital indicator to read out the gap setting for the opening of the roll.	☐
10.	On A/D coaters – you will need to check out slide plates for the upper coating head assembly as well as the backup roll and lubricate the guides and make any adjustments to these motions as required.	☐
11.	All motors will need to be blown off and cleaned up as much as possible, as well as the gearbox needs to be checked for the level of gear lube inside it.	☐
12.	Heat the machine up to the operating temperature.	☐
13.	Check the hot oil system for leaks.	☐
14.	Check to make sure the safety over-temperature controller for the hot oil heater functions properly.	☐
15.	Check the level control to confirm it is functioning properly.	☐
16.	The hot oil sight gage will need to be cleaned.	☐

YEARLY MAINTENANCE SCHEDULE		
1.	Follow the same procedures on the Maintenance Check List, as well as the following items.	☐
2.	Drain the heat transfer oil from the hot oil recirculation system (see Note 1).	☐
3.	Clean the heater, if necessary.	☐
4.	Clean the screen in the hot oil recirculation system.	☐
5.	Refill the system (see Note 1).	☐
6.	The coater drive gearbox should be drained and replenished with fresh gear lube.	☐
7.	All electrical connections on the main control panel will need to be checked out and tightened on the terminal stripes as well as the components inside the electrical box.	
8.	Heat the machine up to the operating temperature. Check that all the rolls are heating up to temperature.	☐
9.	Check system for leaks.	☐
10.	Check to make sure the safety over-temperature controller for the hot oil heater functions properly (see Note 2).	☐

Note 1: Please look at the Hot Melt Roller Coater Hot Oil System preventative maintenance.

Note 2:

WARNING

CHROMALOX HEATER SAFETY OVER-TEMPERATURE CONTROLLER:

DO NOT set the temperature of the over-temperature controller above 525°F. **An improperly set over-temperature controller may cause a fire.** Carefully look at the front indicator as it reads out in Celsius as well as in Fahrenheit. This unit is located near the heater. Should your digital temperature controller at the pushbutton station go blank, you may push the small black reset button on the front of this safety over-temperature controller or the pump stop/ reset button . Once you have enabled the reset button on the face of this unit your digital temperature controller should power backup. If this safety over-temperature controller continues to trip out and needs to be reset, the hot oil system should be checked immediately. The cause of this over-temperature alarm may be either caused by a flow problem or the heater has sludge or carbon buildup on the heating elements. There is also a “Y” strainer/filter in the suction line below the expansion tank for the pump that can get plugged and slow down the oil flow through the heater causing an over-temperature condition. Please consult your owner’s manual for more information.

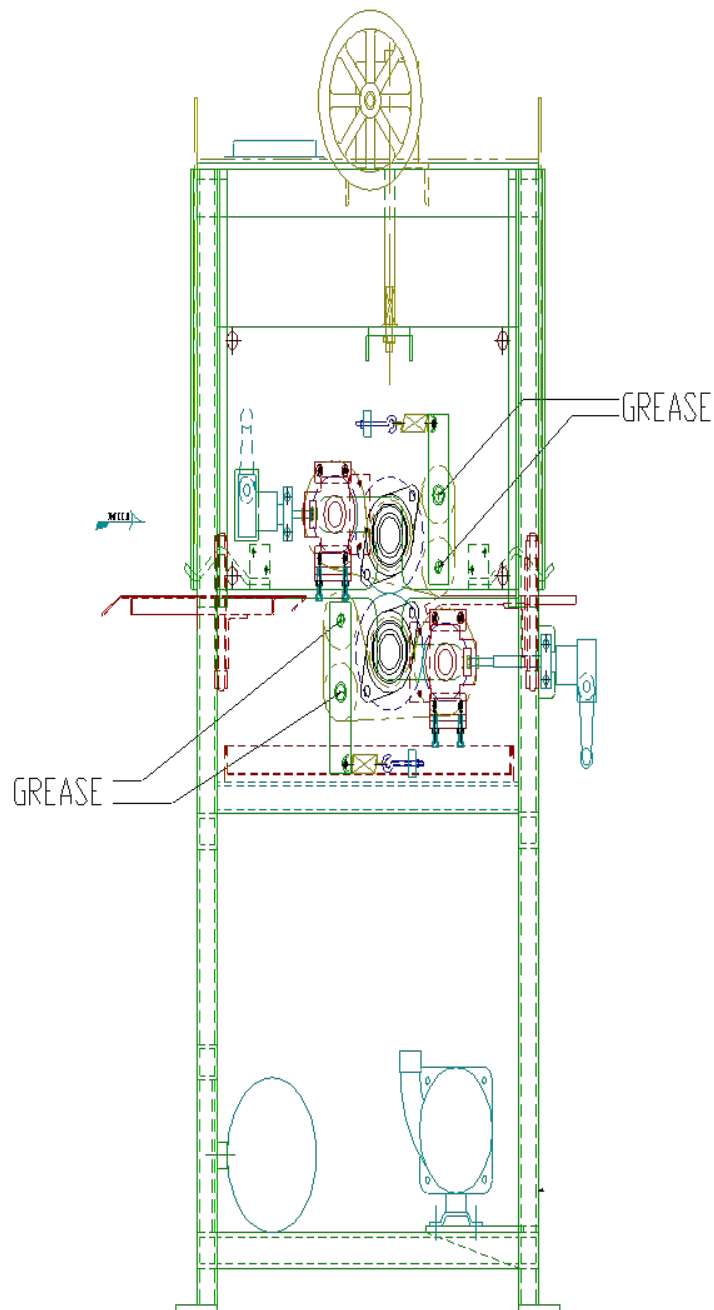
MAINTENANCE FOR A UNION HOT MELT ROLLER COATER

1. One of the first items to look for is to make sure there are 1" to 2" of oil in the sight glass in the expansion tank on top of the machine.
2. There is an air filter on the electrical control box that should be cleaned weekly.

Lubrication Guide: *(See Page 19 & 20 for Diagrams)*

NOTE: Follow the lockout and tag out procedures so no one will be injured while working on this equipment, locking out all the pneumatic and electrical connections to the machine.

- a) Open or remove the 2 covers on the offbearing side of the coater – the main drive for the coating rolls has 5 idler sprocket assemblies that need grease.
- b) There would also be 2 coating roll bearings as well as 2 doctor roll bearings.
- c) There are also 4 rotary union that may or may not require grease -- You will need to review the manual for that specific machine to determine if these rotary unions require any lubrication.
- d) Also, the electric motor has 2 grease zerts on them?
- e) There is also a gearbox that requires the oil level to be checked every time you service the machine and are greasing any of the bearings.
- f) On the opposite end of the machine there is the doctor roll drive that has 2 idler sprockets for each coating head assembly, so there would be 4 spots to grease on those idler sprockets as well as 2 coating roll bearings and 2 doctor roll bearings.
- g) In addition, there are rotary unions that may require lubrication as well.
- h) The other 2 spots on this machine to grease are the gearbox assemblies that move up and down the upper coating head for the different thickness of your products to be coated.



LUBRICATION GUIDE POINTS FOR LUBRICATION

1. MODEL A - 8 ROLL BEARINGS
MODEL C - 6 ROLL BEARINGS
2. COATER DRIVE - 5 IDLER SPROCKETS
3. DOCTOR ROLL DRIVE - 2 IDLER SPROCKETS
4. 2 POINTS ON TOP SINGLE HAND WHEEL
1 ON EACH GEAR BOX ASSEMBLY.

NOTE: ALL BEARINGS HAVE BEEN FILLED WITH
HIGH TEMPERATURE GREASE: DOW CORNING
41 EXTREME HIGH TEMPERATURE GREASE.

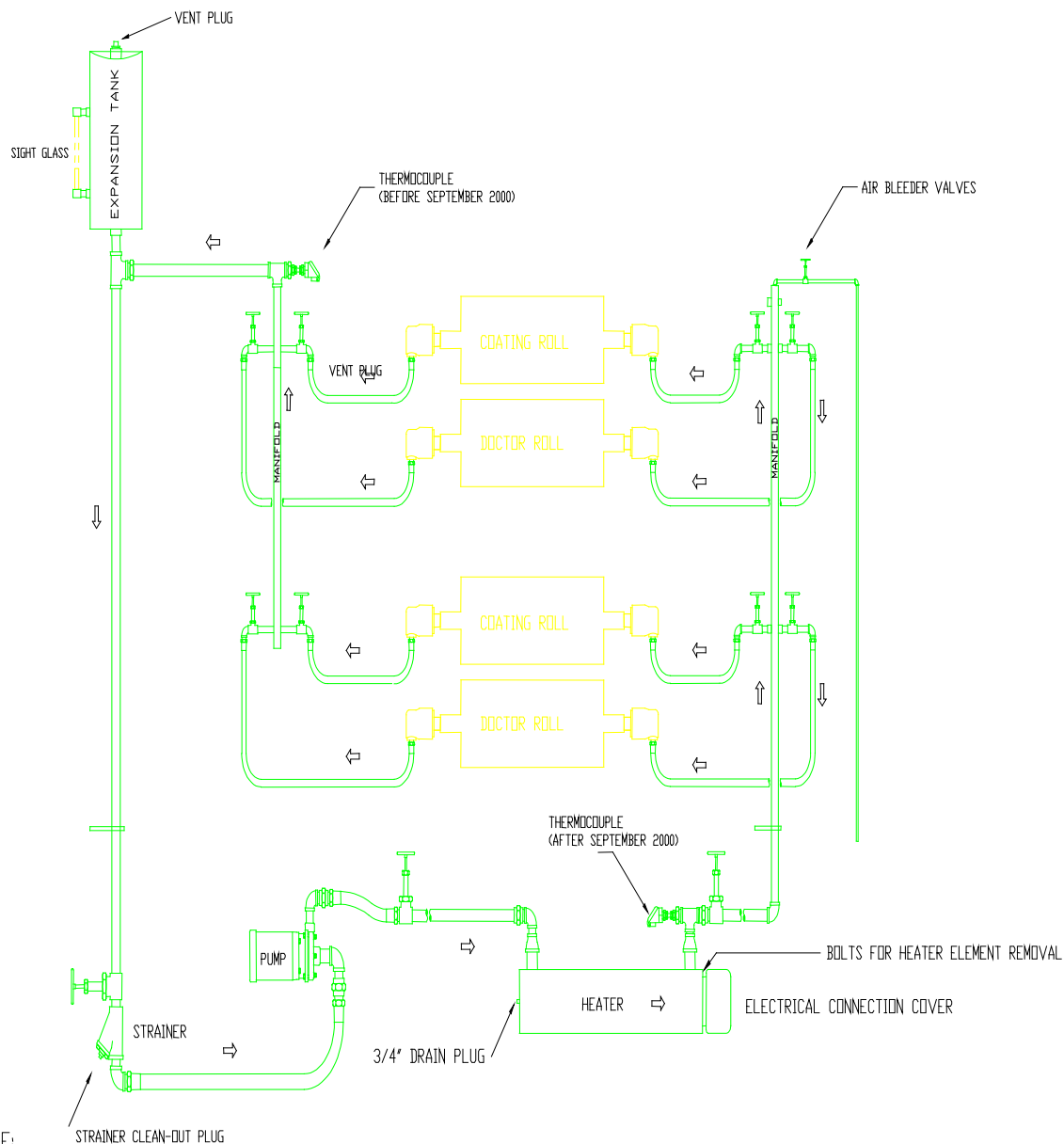
THE COATER GEAR BOX HAS BEEN FILLED
WITH EXXON SPARTAN SYNTHETIC EP 460 OIL.

LUBRICATION INTERVAL TO GREASE
BEARINGS 1 TO 4 WEEKS DEPENDING
UPON HOURS OF MACHINE RUNNING TIME.

STOCK #	ITEM	QTY.	DESCRIPTION
BILL OF MATERIAL			

☒ SURFACE FINISH PER ASA STANDARDS	DRAWN	S.K. HEMMER		SIZE C	 THE UNION TOOL CORP VARSAW IN.
	CHECKED				
TOLERANCES FRACTIONAL DECIMAL	SCALE	DATE	SHEET	DWG. TITLE	
	1=6	11/14/95	1 OF 4	DOCTOR ROLL LUBRICATION	
TOLERANCES FRACTIONAL DECIMAL	COMPANY	JOB No.		DRAWING No.	
ANGULAR 1/16"				15LUBE-C	

REV	DESCRIPTION	DATE
-----	-------------	------



OIL LEVEL GUIDE:

WARNING!! OVER FILLING OF THE RESERVOIR/EXPANSION TANK COULD RESULT IN SERIOUS BURNS.

TO LEAVE ROOM IN THE SYSTEM FOR OIL EXPANSION, A MINIMUM OF 2" AND A MAXIMUM OF 3" OF OIL SHOULD BE SHOWING IN THE SIGHT GLASS WHILE THE MACHINE IS COLD.

DO NOT TURN ON THE PUMP OR HEAT THE OIL IF THE OIL LEVEL IS NOT SEEN IN THE SIGHT GLASS.

HEAT TRANSFER OIL - EXXON CALORIA HT 43

STOCK #	ITEM	QTY.	DESCRIPTION
BILL OF MATERIAL			

✓ SURFACE FINISH PER ASA STANDARDS	DRAWN	S.K. HEMMER	SIZE C THE UNION TOOL CORP WARSAW IN.
	CHECKED		
TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL ±.005 FRACTIONAL ±1/64 ANGULAR ±1/2°	SCALE	1=6	SHEET 4 OF 4 DWG. TITLE HOT OIL DIAGRAM
	DATE	11/14/95	
1 UPDATED SKH 11/16/00	COMPANY:		JOB No. DRAWING No. 15LUBE-D
	REV	DESCRIPTION	

ROLL CHANGES – REMOVING OF THE COATING ROLLS:

1. Follow the lockout and tag out procedures so no one will be injured while working on this equipment, locking out all the pneumatic and electrical connections to the machine.
2. First you will need to remove the 2 covers on the offbearing side of the machine to gain access to the drive and bearings.
3. Remove the offbearing Lexan guard as well as the top cover.
4. When removing the rolls, shut off the valves shutting off all oil flow on both ends of the rolls. There is a valve connected to a flexible hose that goes to each rotary union that is attached to each one of the rolls.
5. Remove the seal plates from the machine.
6. Remove the doctor roll drive chain and sprockets. You will also need to have a bucket to catch the oil when removing the rotary unions from the end of the rolls. The threads for these rotary unions are standard right-hand threads – Clockwise is tightening and Counterclockwise would be loosening.
7. Each rotary union is removed from the roll, you should hang the hose so it will drip into the bucket and collect as much oil as possible. Also install a 1/2" pipe plug in place of that rotary union to capture the oil that is still in the roll.
8. After removing rotary unions from the rolls that you are going to remove, you will need to disconnect the main drive chain. Loosen the tension on the springs and then remove the springs. You will need to remove both coating roll drive sprockets as well as loosen the set screws in the bearing holding the roll in place. At this time, you will notice that there are set screws holding the roll into place only on one bearing on the main drive of the machine. On the doctor roll drive end of the machine, there are no set screws in those bearing; this is to allow for roll growth due to the heat expansion of the rolls. Use a hoist or forklift to pick up and support the roll from the journals and not from the rubber portion of the roll. Using a spreader bar to spread out the straps or hooks to lift the roll, as not to damage rubber on the end of the rolls. Once the roll is supported, you may then remove the bolts to remove the bearings from the rolls. Once that is complete, you will need to open the coating roll gap to approximately 4" to 5" so you can push the roll to either the left-hand side of the machine or to the right-hand side of the machine so you can cock and remove the roll out from the offbearing side of the coater.

ROLL CHANGES – REMOVING OF THE COATING ROLLS (Continued):

9. Once that is complete and you are sending these rolls back for recovering or regrounding, you should drain all of the oil from these rolls (as much as possible).
10. Repeat above procedure to reinstall the rolls using anti-seize on the shafts so they will slide freely into the sprockets as well as the bearings. This will make it easier for removal the next time you do a roll change.
11. Once you have everything back into place, you will need to align the rolls and set the gap between the two coating rolls as well as the doctor rolls in relationship to the coating rolls. This may be done with a feeler gauge.
12. There are couplings on each one of the adjustments for moving in and out of the doctor rolls, so you may parallel the rolls so that the gap is even at each end of the roll.
13. You will also need to make sure that the ends of the coating rolls are flush with the doctor rolls, as far as left to right, so no leakage will occur in the seal plates. If the seal plates are grooved deeply or damaged and have been leaking, you will need to replace the seal plates at this time.
14. There is a set screw on the mechanical digital indicator that you may reset the indicator for the gap of your feeler gauge. To loosen the set screw you may turn the hub of the indicator while holding the shaft in place until the indicator reads the feeler gauge thickness, then tighten the set screw.
15. Once you have completed all of the above steps, you will need to hook the main drive chain back up to the coating rolls as well as reinstall rotary unions. We recommend you use Loctite 567 PST as a pipe sealant for sealing the threads and locking the rotary union into position.
16. On the other side of the coater, you will reinstall the doctor roll drive sprockets as well as rotary unions following the same procedure as you did on the main drive.
17. Once this is complete, you will open all of the valves that you had previously closed allowing the oil to flow through that system. On the doctor roll drive side there is a hand valve that may be opened and closed to help work out the air in the system once you have started the pump again. Remembering that you may need to add oil to the expansion tank to keep the oil level at 2" to 3" in the sight glass.
18. Once all your covers are back in position, you may start turning the rolls, heating and working the air out of the rolls and heating system.

Preventive Maintenance

Hot Melt Roller Coater Hot Oil System Procedure:

The hot oil system should be **drained and the oil changed yearly**. The oil in the unit over a period of time can accumulate a build up of sludge or carbon build up on the heaters inside the hot oil heater. This causes the Safety Over Temperature Controller (located at the bottom right-hand corner of the front panel) to activate, which will shut off the oil heater. This Over Temperature Controller is preset at Union Tool to 525°F.

Note: If the Safety Over Temperature Controller has been tripping out and needs to be reset, the hot oil heating system should be checked immediately or you can have a fire.

The cause of this Over Temperature situation may be either an oil flow problem or the heater has sludge or carbon that has built up on the heater elements that slows the transfer of the heat from the heater elements to the oil. There is also a “Y” strainer with a screen in the plumbing system that can get plugged and slows down the oil flow through the heater causing an Over Temperature condition.

WARNING: If you raise the Safety Over Temperature Controller above the normal setting of 525°F this can cause a fire.

The following procedure for all Union Tool Hot Melt Roller Coaters is advised.

PROCEDURE – HOT MELT OIL CHANGE

We recommend that the oil be **changed a minimum of one time per year**.

DRAIN OIL

1. The cleanest way to drain the oil from the coater is to remove the covers on the front of the coater and turn the valves at the end of the hot oil heater to the “**off**” position. Remove the $\frac{3}{4}$ pipe plug at the end of the heater. Quickly install a shutoff valve with a barb fitting for a hose. Attach a hose to the shutoff valve and run the other end of the hose into a barrel or container that will hold up to twenty-five (25) gallons of oil. The hole in the container should be minimal as the oil will come out with some force. Turn the valves at the end of each heater to the “**on**” position. Then remove the plug in the top of the expansion tank. Use a reducing bushing to plumb in **filtered and regulated** air supply with a maximum air pressure of 20 to 30 p.s.i. Once the air supply is turned on you will see the oil is being pumped from the machine, this will take about 3 to 5 minutes. When the oil flow has stopped the air supply may be turned off; reinstall the pipe plug and remove the air supply.

PROCEDURE – HOT MELT OIL CHANGE – Drain Oil (Continued):

2. If you were not having any problems with the hot oil recirculation system and this is only a change of oil, you do not necessarily need to clean the heater. However, you should clean the “Y” strainer screen before adding oil to the top of the expansion tank. The coater takes approximately 15 to 25 gallons of oil.
3. If the coater has been slow heating or the Safety Over Temperature Controller has been tripping, you will need to clean the heater elements as well as the “Y” strainer screen.
4. Un-wire the heater being sure to note the connection to each wire under the cover of the hot oil heater.
5. **Note: When removing the wires for the thermocouple - white wire is positive - red wire is negative. If wired wrong you could have a fire. This thermocouple is for a safety over temperature controller.**
6. Place cardboard around the floor under the end of the heater. The removal of the heater elements is not a clean job so do not hesitate to use plenty of cardboard.
7. By loosening the eight (8) bolts at the top of the heater, the heater elements can be removed by sliding out the heater elements located in the tank heater. There is a gasket at the top of the tank. Care should be taken not to damage the seal if possible. The sludge collected on these heaters prevents the machine from heating up in a timely fashion. It restricts the flow of oil through the heater.
8. With the heater elements removed, clean the elements as needed. This may be done with a scrapper blade or wire brush, depending on the amount of sludge.
9. When the heater elements are clean, they may be placed back into the heater. A sealant such as a high temperature silicone sealant should be used with the gasket. If the gasket has been damaged the silicone sealant will work alone.
10. Tighten all eight bolts. Leave the covers off so that the bolts may be tightened again if need be.
11. Rewire the heater.
12. Open all valves and add the new oil to the top of the expansion tank located at the top of the coater. When there is 1" to 2" of oil in the sight glass **stop** filling and start the pump. Run the pump for approximately 5 minutes. If there is oil still in the sight glass, turn on the heater and heat up the coater. After the machine has cooled down you may need to add oil until there is 3" of oil in the sight glass. Air in the system can be removed through the use of the bleeder valve in the plumbing.
13. Heat the coater and inspect all plumbing. Tighten any plumbing that may have leaks.

Trouble Shooting Guide

Roll Heating Problems:

Heating the machine after servicing the heating system or roll changes.

The machine should be warmed up slowly to avoid a vapor creating a vapor lock in the rolls. After you have worked on the machine, you should follow the next few steps before returning the machine to normal operation.

1. Before you tighten the seal plates the pump should be started without the heat – start the rolls turning in reverse at full speed – run for about 15 minutes to establish oil flow and to start working the air out of the heating system.
2. Next Step – turn on the heater and set the machine temperature to 100°F for about 15 minutes, to continue working the air out of the heating system.

NOTE: You should use a metal bucket under the air bleed valve to release any air that is trapped in the manifold located on the opposite of the expansion tank.

3. Turn on the heater and set the machine temperature to 150°F and run for about 15 minutes after it is up to the set point to continue working the air out of the heating system – You can open the air bleed valve and release any air that is trapped in the manifold.
4. Turn on the heater and set the machine temperature to 200°F and run for about 15 minutes after it is up to the set point to continue working the air out of the heating system – You can open the air bleed valve and release any air that is trapped in the manifold.
5. Turn on the heater and set the machine temperature to 250°F and run for about 15 minutes after its up to the set point to continue working the air out of the heating system – You can open the air bleed valve and release any air that is trapped in the manifold.
6. Last Step – Set the temperature about 25°F about your normal running set point and just run the machine long enough to get temperature up to the set point, then you can turn off the pump – You can open the air bleed valve and release any air that is trapped in the manifold.

WARNING – You should never try to remove rotary unions, flex hoses or open the heating system if the machine has been heated. Failure to follow these recommendations may result in personal injury from burns and/or equipment and property damage.

Trouble Shooting Guide (Continued) - Roll Heating Problems

NOTE: First thing to check is whether the hot oil circulation pump is running in the correct direction (clockwise, looking from the motor end towards the pump).

Problem	Possible Cause	Corrective Action
Rolls are cold or not as hot as the others.	1. The valves to the cold roll are not opened or not fully open. 2. The one or both of the flex hoses have been kinked. 3. If the rotary union is bad, they can twist up a flex hose. 4. A vapor lock can cause rolls to be colder or have a temperature difference across the roll face – hot on one end and a lot cooler on the other end.	1. Open all valves, except air bleed valve. 2. Replace damaged hoses. 3. Replace rotary union and flex hose. 4. To fix a vapor lock: – remove the flex hose at the ball valve (at the end of the machine with the expansion tank) – The machine MUST BE cool enough to touch the rolls so as not to be burned by hot oil. – Turn off both valves to the roll that you think has a vapor lock – Remove the flex hose from the attachment closed to the ball valve – Place the hose end into a steel bucket and have someone open the valve on the opposite end of the roll and have them job the pump to push the air lock out of the roll (you can see the air bubbles exit the hose) – Close the valve and re-attach the hose and open the valves – Slowly bring the machine up to temperature.

Trouble Shooting Guide (Continued) - Roll Heating Problems

Heater Technical Data:

1. First of all check to make sure that the temperature controller has an out light on indicating that the controller actually wants the temperature to raise.
2. **Note:** After step one; be sure all electrical work is performed by a qualified electrician only. Beware of **HIGH VOLTAGE** in systems with electrical equipment. **CONTACT WITH LIVE ELECTRICITY CAN BE FATAL.** Be sure all electrical work is performed by a qualified electrician only. Be sure all electrical equipment is installed and operated only in compliance with applicable codes. **MAKE SURE POWER IS DISCONNECTED WHEN SERVICING AND REPAIRING EQUIPMENT.** Have any checks, installation, or service to be performed by a qualified electrician only.
3. Open the electrical disconnect box and check the fuses. If fuses are blown this usually is an indicator of other problems in the electrical system. You will need to check wiring for loose connections or shorted wiring. Use an OHM meter to check for a shorted heater to ground. When replacing fuses only use the correct size and type of fuse.

Three phase balanced load amperes and heater OHM resistance at:

HEATER KW	240 VOLT		480 VOLT		575 VOLT	
	Amps	Ohms	Amps	Ohms	Amps	Ohms
15	36.2	5 to 8 Ω	18.1	26 to 30 Ω	15.1	38 to 42 Ω
20	48.2	4 to 5 Ω	24.1	19 to 22 Ω	20.2	28 to 32 Ω
25	60.3	3 to 4 Ω	30.2	15 to 18 Ω	25.3	22 to 25 Ω
30	73.3	3 to 4 Ω	36.2	13 to 15 Ω	30.4	18 to 20 Ω
50	120.5	1.5 to 2.5 Ω	60.3	7 to 9 Ω	50.6	11 to 14 Ω

Trouble Shooting Guide (Continued)

ADHESIVE LEVEL CONTROLS

(There are four types of level controls used on Union Hot Melt Coaters)

1. One type level control used are photo switches with optic cables and sensors looking at the level of adhesive in each coating head. Two (2) photo switches are used with individual adjustments one for each of the coating heads.
2. Another type used is one sensor that is looking at the adhesive level in the top-coating head filling the top and bottom coating heads with the same level of adhesive. This type of level control uses only one (1) photo switch and a single adjustment for the two coating heads.
3. The other type level control used is a sensor that is looking at a reflector mounted on the infeed table. This type of level control does not look at the adhesive level in either of the coating heads but dispenses adhesive any time a substrate passes between the optic cable and the reflector. The amount of adhesive that is dispensed into the coating heads is controlled by speed of the pump located in the pre melt equipment. **Note:** In some applications when using a sensor looking at the reflector an adjustable off delay timers can be used to continue pumping after the substrate has past through the coater to fill the coating heads.
4. The next type used are proximity capacitive sensors

Level Control Adjustments and Indicators

On one end of the photo switch there is a power cord, a red indicator light and a trim pot adjustment.

When the indicator light is “**on**” the photo switch the adhesive level is low.

When the indicator light is “**off**” the photo switch the adhesive level is correct.

Sensitivity Adjustment

These sensitivity adjustments are only for when the sensor that is looking at the adhesive level in the coating heads.

The sensitivity pot has a 4 turn clutch protect adjustment to increase or decrease the level of adhesive in the coating head.

Turning the sensitivity pot clockwise will increase the power of the invisible infrared beam and will lower the level of adhesive in the coating head.

Trouble Shooting Guide -- Adhesive Level Controls (Continued)

Turning the sensitivity pot counterclockwise will decrease the power of the invisible infrared beam and will raise the level of adhesive in the coating head.

Break Beam Sensitivity Adjustment

When the sensor that is looking at the reflector mounted on the infeed table if the sensitivity pot is turned clockwise and the power is increased to high the sensor will see the substrate and will not allow the adhesive to dispense.

Trouble Shooting Level Controls

Problem	Possible Cause	Corrective Action
Level control indicator light does not turn on.	1. Optic cable lens dirty. 2. The sensitivity adjustment on the photo switch is set too high. 3. Defective optic cable. 4. Defective photo switch.	1. Wipe the end of the optic with a clean, soft cloth. 2. Turn down the sensitivity adjustment on the photo switch. 3. Replace optic cable. 4. Replace photo switch.
Level control indicator light does not turn off.	1. Optic cable lens dirty. 2. The sensitivity adjustment on the photo switch is set too low. 3. Defective optic cable. 4. Defective photo switch.	1. Wipe the end of the optic with a clean soft cloth. 2. Turn up the sensitivity adjustment on the photo switch. 3. Replace optic cable. 4. Replace photo switch.
Level control indicator light is flashing on or off.	1. Optic cable lens dirty	1. Wipe the end of the optic with a clean soft cloth. 2. The optic cable may need to be raised or lowered, or put on a slight angle looking at the adhesive level. The average height of the optic cable above the rolls is 3", depending on the color of the adhesive.

Trouble Shooting Guide -- Adhesive Level Controls (Continued)

The proximity capacitive super sensor operating parameters:

1. Detection type - Capacitive
2. Sensing range - 2-20 mm or 0.0788" to 0.788"
3. Temperature range - 200° to 250°C or -328°F to -482°F

Trouble Shooting Proximity Level Controls

Problem	Possible Cause	Corrective Action
Level control indicator light on the amplifier does not turn on.	1. The sensitivity adjustment on the sensor amplifier is set too high. 2. The distance of prox sensor to the material level is too close to either of the rolls or the coating material.	2. Turn down the sensitivity adjustment on the sensor amplifier or move the sensor.
Level control indicator light does not turn off.	1. The sensitivity adjustment on the sensor amplifier is set to low. 2. The distance of prox sensor to the material level is set too faraway from the coating material.	1. Turn up the sensitivity adjustment on the sensor amplifier or move the sensor closer to the coating material.

Trouble Shooting Guide (Continued)

Adjusting and Trouble Shooting Seal Plate Problems and Leaking

Note: Running the coater with the seal plates tight, without adhesive or cleanup or coating material to lubricate the seal plates, can damage the rubber on the end of the rolls.

Problem	Possible Cause	Corrective Action
Seal plate adjustment		1. The correct tension is to hand tighten the nut or thumb screw and if needed one or two extra turns to apply more spring tension to the seal plate.
1. Seal plates leaking coating material.	1. The seal plate spring tension may be too loose. 2. You will need to check that the coating roll ends are flush with the doctor rolls, as far as left to right. 3. Check if the seal plates are grooved deeply or damaged and have been leaking, you will need to replace the seal plates at this time. 4. Check for damage on the rubber on the end of the roll. 5. Check that the doctor roll is level with the coating roll.	1. Tighten the nut or thumbscrew to apply more spring tension. 2. Loosen the setscrews in the coating or doctor roll bearings and move the roll that has shifted to the left or right; retighten the set screws. 3. Replace the seal plates. 4. Replace the coating roll. 5. There are adjustments on the doctor roll bearing gibs.

Trouble Shooting Guide (Continued)

Adjusting / Trouble Shooting Doctor Roll Drive Clutch

If the torque is too high or too low readjust torque limiter by tightening or loosening the adjusting nut as required. First straighten the tab on the lock washer before adjusting nut after adjusting the nut bend the tab on the lock washer locking the tab into place.

Problem	Possible Cause	Corrective Action
1. The doctor roll stops rotating.	1. Seal plates are too tight. 2. Clutch needs adjusting to apply more torque.	1. Loosen spring tension on seal plates. 2. Straighten the tab on the lock washer and turn the nut by hand clockwise to apply more torque.
1. The doctor roll drive chain jumping.	1. Clutch needs adjusting to apply less torque. 2. Spring tension needs to be increased on chain tightner, or the spring is broken or weak and needs to be replaced.	1. Straighten the tab on the lock washer and turn the nut counter clockwise to apply less torque.

Trouble Shooting Guide (Continued)

TEMPERATURE MEASUREMENTS OF DOCTOR & COATING ROLLS & ADHESIVE

When using hot melt roller coating equipment and using hot melt adhesives, it is important to be able to measure the adhesive temperature as well as the roll temperature, which can use different temperature measuring devices for each component.

1. If you are checking the temperature of the rolls, you should use a surface type probe. There are even some probes that have cutouts for wrapping slightly around the coating roll or the doctor roll.
2. The next style probe should be for liquid gases or semi-solid materials that may be dipped into the adhesive without flexing or bending with the rigid handle so your hands do not need to be close to the hot melt adhesive.
3. The third type is an infrared thermometer. We do not recommend using this type of device.
4. If you want to check the temperature of the adhesive in the roller coating equipment, you will need to add adhesive to the machine and let it run there for approximately 10 or 15 minutes so the adhesive would acclimate to the true temperature of the machine; not being affected by what the temperature of the adhesive being delivered. The temperature controller has offsets that can be programmed so the controller readout is the same as the adhesive temperature.
5. Our coaters only have one heating system in them so if you have a steel roll or chrome plated roll it will run at a hotter surface temperature than will a rubber covered roll. On the rubber covered roll the rubber covering acts as an insulator so the temperature will be between 30 and 50 degrees lower than the temperature of a steel roll. The temperature swing is dependent on the type of rubber compound on the roll as well as the thickness of the rubber on the roll



The Union Tool Corp.

HOT MELT ROLLER COATER

STANDARD FEATURES GUIDE

VARIABLE SPEED DRIVES



These are the AC variable speed drive controllers that control the speed of the rollers. The controllers are labeled to indicate the roll in which each controller is controlling.

OVERTEMP CONTROL



This is the high temperature overtemp alarm. This controller is wired to a thermocouple attached to the heating element inside the vessel of the circulation heater. It senses the temperature of the heat transfer fluid and will turn the heater controller off if the temperature goes above the pre-set level. If this happens, it indicates that the flow through within the circulation system is slow and the heater and Y-strainer/filter need to be cleaned, as well as, the oil changed. This is also described in the maintenance section of this manual. **IMPORTANT: Do not** raise the set point of the over temperature controller above 525° F. The over temperature alarm is re-set by pressing the “STOP” button below the “PUMP START” button.

OIL EXPANSION TANK



The oil level in the hot oil circulation system should also be visible in the sight gage. The level should always be at least 1" above the bottom level and no more than half way up the sight gage. There is a fill plug in the top of the expansion tank. The fill plug has a breather hole for pressure relief.

SLIDING WINDOW GUARDS



The sliding window guards on the front and back side of the coater are equipped with **magnetic sensors** so that the guards must be in place in order for the coater to operate. **It is important that this safety feature not be by-passed.**

E-STOP PUSH-PULL CORD



The hot melt roller coater, as with all of our coaters, is equipped with a push-pull emergency cable that extends around the perimeter of the coater. This cable can be pushed or pulled to be activated. This will stop all powered rolls and will not allow the rolls to be activated until the blue switch has been re-set to the center position. If the coater is equipped with air cylinders, the e-stop will activate air valves so that the air cylinders raise the upper coating head.

The **red pushbutton** on the safety switch can also be pushed as an e-stop in the event of an emergency.



When the emergency cable has been tripped, the blue switch will be in the off position (lowered). To re-set the emergency switch, push the blue switch to the center position. In order for the switch to stay in the middle, the tension must be correct. The tension can be adjusted by turning the turn buckle until it is tighter or looser depending on the need.

MEASURING MATERIAL THICKNESS (FOR VERTICAL GAP SETTING)



In preparation for coating substrates, the thickness of the substrates to be coated should be measured. The gap setting for the substrate to be coated is controlled by a single hand wheel that raises and lowers the upper coating head. A mechanical digital indicator will provide a continuous readout of the gap. The gap should be approximately .010" to .020" less than the thickness of the substrate to be coated.

SINGLE HANDWHEEL ADJUSTMENT



The single hand wheel adjustment allows the gap between the coating roll and lower back-up roll (or lower coating roll for a double-sided coater) to be adjusted for the thickness of the substrate to be coated. Depending on the unit, this hand wheel is tuned either clockwise or counter clockwise to open or close the gap. A mechanical digital indicator will provide a continuous readout of the gap and normally reads in five (5) digits (00.000"). The first two numbers are inches. If the rolls have been recently changed, or for some reason the gap is not parallel, paralleling the rolls can easily be done.

PARALLELING THE VERTICAL ADJUSTMENT (thickness gap)



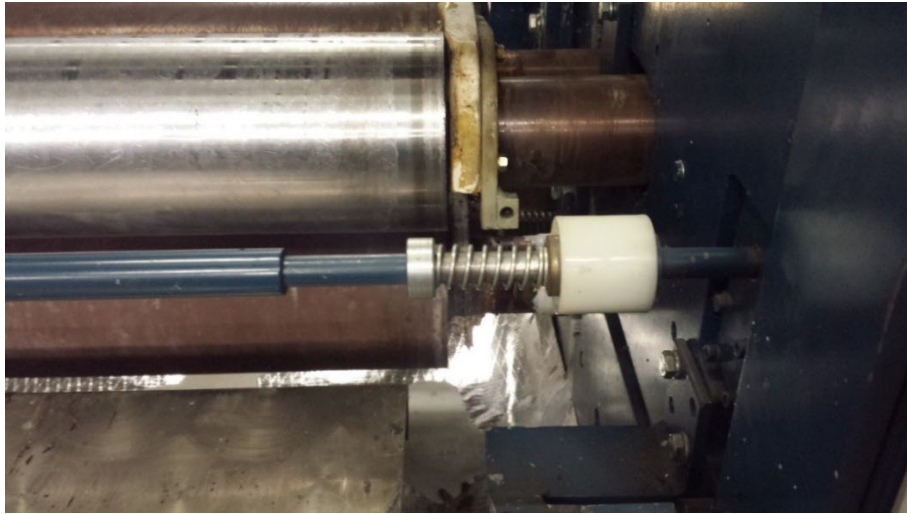
To parallel the rolls, the spring-loaded coupling that connects the shaft between the two vertical gear boxes must be pulled back. This will allow one side to be adjusted without moving the other side. It is often easier to adjust the hand wheel side so that you know how far you have opened or closed the gap to make the rolls parallel. To parallel the rolls we recommend using a .015 feeler gauge. When paralleling the rolls always make sure that the machine is turned off for safety purposes.

UNIFEED ADJUSTMENT

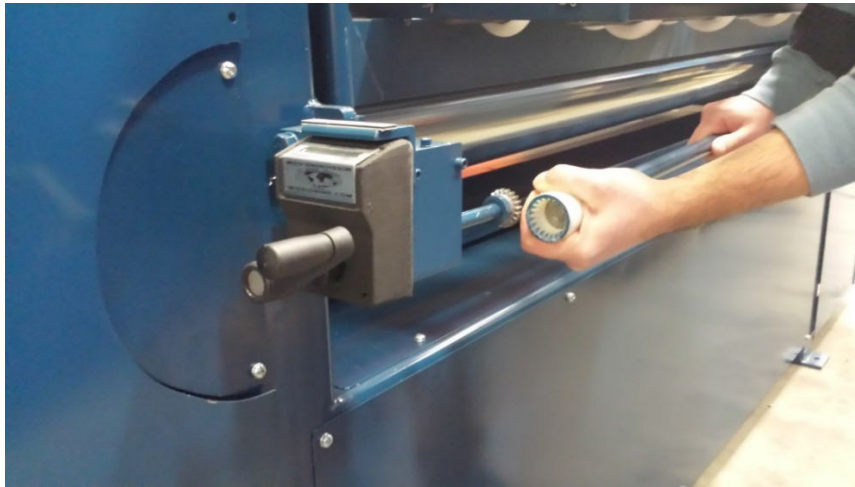


The doctor roll(s) is adjustable on a horizontal plane in relationship to the coating roll to control the amount of coating being applied. As the doctor roll is adjusted into the coating roll, less coating will be applied. As the doctor roll is moved away from the coating roll, more coating will be applied. The adjustment for the doctor roll is called a unified. It is a single hand wheel that connects two (2) gear boxes that turn a screw moving the doctor roll on a horizontal plane.

PARALLELING THE UNIFEED ADJUSTMENT (doctor roll to coating roll)



The unifeed incorporates a spring-loaded coupling just as the single hand wheel for the substrate gap does. By pulling back the coupling (pictured below), the doctor roll can be adjusted to parallel the doctor roll to the coating roll.

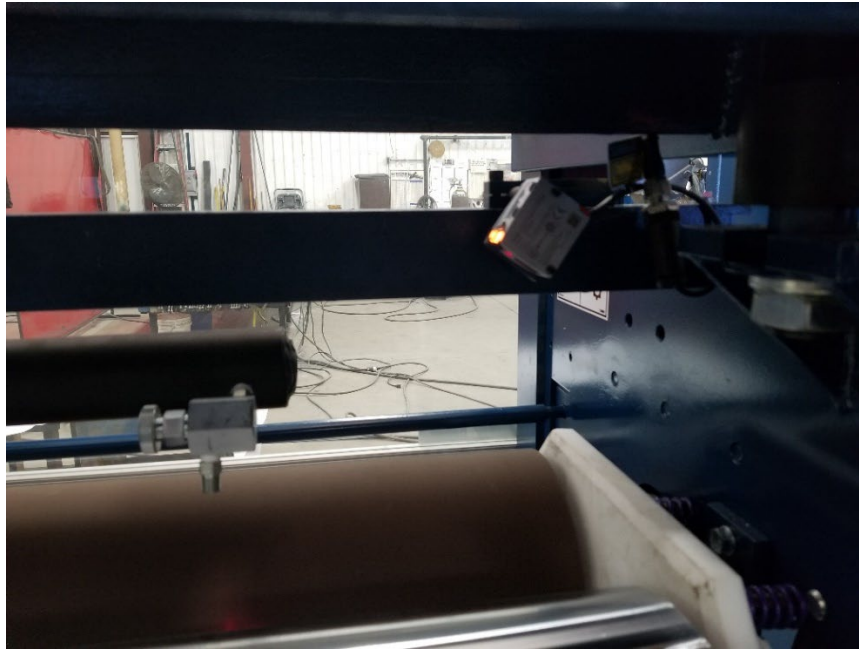


Depending on the set up of the machine, if you turn the coupling clockwise/or counterclockwise, it will move the doctor roll side that is furthest away from the unifeed handle either closer or farther away from the coating roll. Likewise, if you only turn the unifeed handle you can move the side closest to the handle either closer or farther away from the coating roll.

To parallel the rolls we recommend using a .015 feeler gauge. When paralleling the rolls always make sure that the machine is turned off for safety purposes.

Note: The two pictures above represent the unifeeds found on our model A (double sided) roller coater. The top picture is for the upper coating head and the bottom picture is for the lower coating head.

LEVEL SENSOR



The picture above is the high temperature sensor that is used to control the level of glue between the coating roll and doctor roll. The measuring height level is adjustable so that the glue level can be controlled. A signal given to the glue valve will turn on and off the flow of glue to the coating head(s).

LEVEL SENSOR ADJUSTMENT



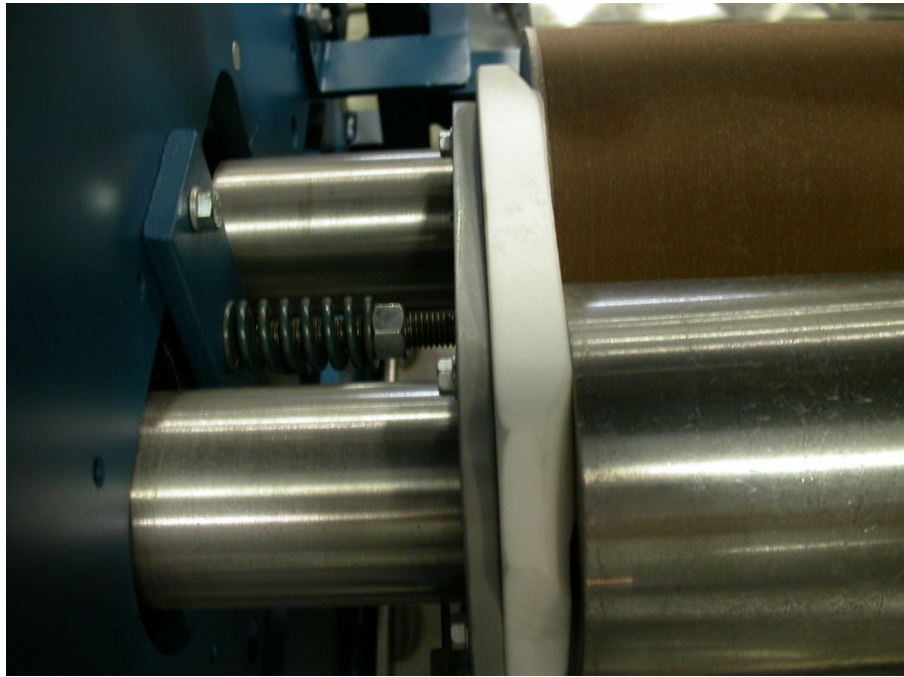
To adjust the level of glue, use the up and down arrow buttons to set the distance between the glue level and the level controller. Note: The top number displayed on the controller represents the distance from the sensor to the roll. The lower number represents the distance from the estimated glue level to the level controller.

7 DAY TIMER



The seven-day timer allows the operator the option of automatically turning the hot oil heater on or off at different pre-set times. When in the “Auto” mode the heater will turn on automatically at the desired pre-set time. When in “Manual” mode the operator will have to manually turn on and off the hot oil heater. The instructions for setting the seven-day timer are provided on the inside of the disconnect box.

TEFLON SEAL PLATES

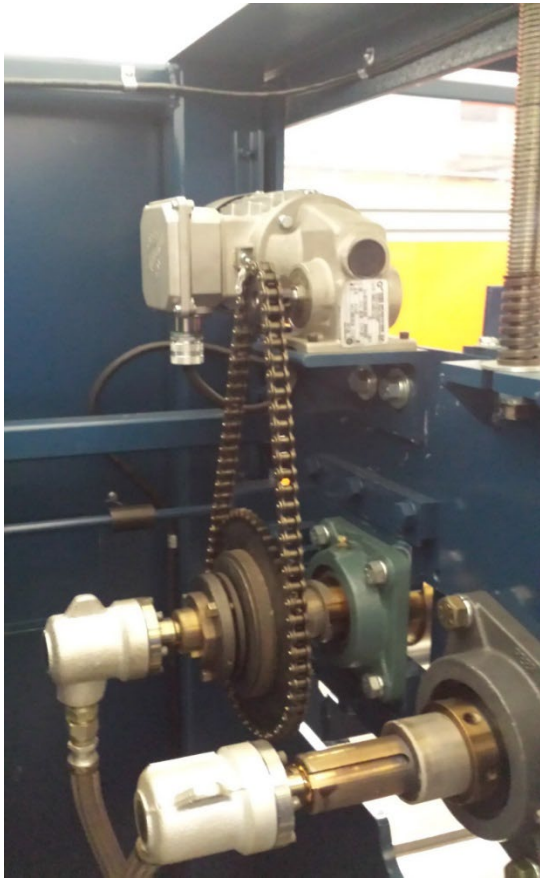


The teflon seal plates are spring loaded to compensate for any expansion of the rolls due to heat. The teflon portion of the seal plate is a wear item and is screwed to the metal backer plate by self-tapping screws.

The springs are to be hand tightened so that they are not too tight against the rolls.

The metal core of the coating roll and of the doctor roll should be parallel and square so that the teflon seals the ends of the rolls. The coating roll and doctor roll bearings have set screws in the bearings on the drive end of the rolls and **DO NOT** have set screws in the idler end of the rolls, so that the rolls are not restricted with regard to expansion. If a straight edge is not flush against the steel cores of both the coating roll and doctor roll, one roll will need to be moved horizontally, so that the steel ends are flush.

DOCTOR ROLL CLUTCH

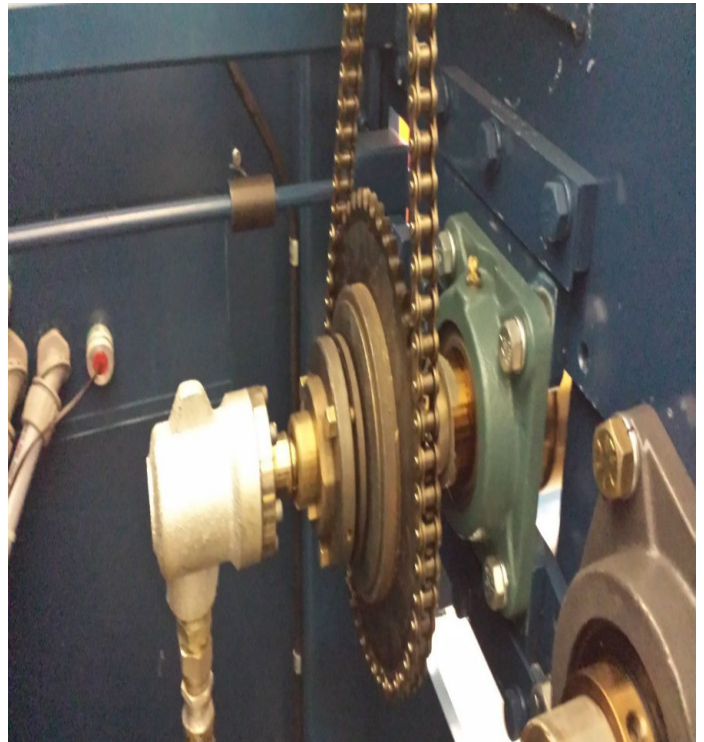


The doctor roll drive allows the speed of the doctor roll to be changed and eliminate the lines on the coating roll when the doctor roll turns too fast. The slower the doctor roll turns, the smoother the coating is on the coating roll. A lighter coating can also be achieved when the doctor roll is turning slower.

The drive incorporates a friction clutch so that the clutch can be set with just enough friction to turn the roll using the motor, but light enough to allow the doctor roll to free wheel during clean-up when the doctor roll is against the coating roll with a good amount of friction.

The clutch is adjusted by loosening the set screw that holds the outside tightening ring in place and then screwing the outside ring tighter.

The set screw must be tightened when the adjustment is complete.



It is important to maintain all safety devices and features of this coater!

Contact The Union Tool Corporation with questions regarding the operations and maintenance of this Union Hot Melt Roller Coater.



680363-00 MOBILTHERM 43

MATERIAL SAFETY DATA BULLETIN

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1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBILTHERM 43
SUPPLIER: EXXON MOBIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA 22037
24 - Hour Health and Safety Emergency (call collect): 609-737-4411
24 - Hour Transportation Emergency:
CHEMTREC: 800-424-9300 202-483-7616
LUBES AND FUELS: 281-834-3296
Product and Technical Information:
Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 613-228-1467
MSDS Internet Website: <http://emmsds.ihssolutions.com/>

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: BASE OIL AND ADDITIVES
GLOBALLY REPORTABLE MSDS INGREDIENTS:
None.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).
EMERGENCY OVERVIEW: Clear, Lt. Yellow Liquid. DOT ERG No. : NA
POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation.

For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.

SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area. (See Section 16 - Injection Injury)

INHALATION: Not expected to be a problem. However, if respiratory irritation, dizziness, nausea, or unconsciousness occurs due to excessive vapor or mist exposure, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or mouth-to-mouth resuscitation.

INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.

SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.

SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None.

COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.

Flash Point C(F): > 200(392) (ASTM D-92).

Flammable Limits (approx.% vol.in air) - LEL: 0.9%, UEL: 7.0%

NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:

LAND SPILL: Shut off source taking normal safety precautions. Take

measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.

WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.

ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.

PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.

STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.

SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.

EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:

When mists/aerosols can occur, the following are recommended: 5 mg/m³ (as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m³ (as oil mist) - ACGIH Short Term Exposure Limit (STEL), 5 mg/m³ (as oil mist) - OSHA Permissible Exposure Limit (PEL)

VENTILATION: If mists are generated, use adequate ventilation, local exhaust or enclosures to control below exposure limits.

RESPIRATORY PROTECTION: If mists are generated, and/or when ventilation is not adequate, wear approved respirator.

EYE PROTECTION: If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.

SKIN PROTECTION: Not normally required. When splashing or liquid

contact can occur frequently, wear oil resistant gloves and/or other protective clothing. Good personal hygiene practices should always be followed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.

APPEARANCE: Liquid

COLOR: Clear, Lt. Yellow

ODOR: Mild

ODOR THRESHOLD-ppm: NE

pH: NA

BOILING POINT C(F): NE

MELTING POINT C(F): NA

FLASH POINT C(F): > 200(392) (ASTM D-92)

FLAMMABILITY (solids): NE

AUTO FLAMMABILITY C(F): NA

EXPLOSIVE PROPERTIES: NA

OXIDIZING PROPERTIES: NA

VAPOR PRESSURE-mmHg 20 C: < 0.1

VAPOR DENSITY: > 2.0

EVAPORATION RATE: NE

RELATIVE DENSITY, 15/4 C: 0.88

SOLUBILITY IN WATER: Negligible

PARTITION COEFFICIENT: > 3.5

VISCOSITY AT 40 C, cSt: 30.3

VISCOSITY AT 100 C, cSt: 5.2

POUR POINT C(F): < -9(16)

FREEZING POINT C(F): NE

VOLATILE ORGANIC COMPOUND: NE

DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only

NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.

CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.

INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000

mg/kg). ---Based on testing of similar products and/or the components.

DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.

INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.

EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.

SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.

OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral and synthetic oils, such as those in this product, have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---

No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.

---CHRONIC TOXICOLOGY (SUMMARY)---

Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and/or granuloma formation. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.

---SENSITIZATION (SUMMARY)---

Not expected to be sensitizing based on tests of this product, components, or similar products.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS:

In the absence of specific environmental data for this product, this assessment is based on information for representative products.

ECOTOXICITY: Available ecotoxicity data (LL50 >1000 mg/L) indicates that adverse effects to aquatic organisms are not expected from this product.

MOBILITY: When released into the environment, adsorption to sediment and soil will be the predominant behavior.

PERSISTENCE AND DEGRADABILITY: This product is expected to be inherently biodegradable.

BIOACCUMULATIVE POTENTIAL: Bioaccumulation is unlikely due to the very low water solubility of this product, therefore bioavailability to aquatic organisms is minimal.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.

RID/ADR: NOT REGULATED BY RID/ADR.

IMO: NOT REGULATED BY IMO.

IATA: NOT REGULATED BY IATA.

STATIC ACCUMULATOR (50 picosiemens or less): YES

15. REGULATORY INFORMATION

US OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this product is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives. EU labeling not

required.
 Governmental Inventory Status: All components comply with TSCA,
 EINECS/ELINCS, AICS, METI, DSL, and PHILIPPINES.
 U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
 This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
 SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
 This product contains no chemicals subject to the supplier notification
 requirements of SARA (313) toxic release program.

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
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*** NO REPORTABLE INGREDIENTS ***
--- REGULATORY LISTS SEARCHED ---
1=ACGIH ALL  6=IARC 1    11=TSCA 4    16=CA P65 CARC  21=LA RTK
2=ACGIH A1   7=IARC 2A   12=TSCA 5a2   17=CA P65 REPRO 22=MI 293
3=ACGIH A2   8=IARC 2B   13=TSCA 5e    18=CA RTK      23=MN RTK
4=NTP CARC   9=OSHA CARC 14=TSCA 6     19=FL RTK      24=NJ RTK
5=NTP SUS    10=OSHA Z    15=TSCA 12b   20=IL RTK      25=PA RTK
                                           26=RI RTK
  
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Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: Heat transfer fluid

NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES
 ARE NOT FORMULATED TO CONTAIN PCBS.

Health studies have shown that many hydrocarbons pose potential human
 health risks which may vary from person to person. Information provided
 on this MSDS reflects intended use. This product should not be used for
 other applications. In any case, the following advice should be
 considered:

INJECTION INJURY WARNING: If product is injected into or under the skin,
 or into any part of the body, regardless of the appearance of the wound
 or its size, the individual should be evaluated immediately by a
 physician as a surgical emergency. Even though initial symptoms from
 high pressure injection may be minimal or absent, early surgical
 treatment within the first few hours may significantly reduce the
 ultimate extent of injury.

INDUSTRIAL LABEL

Under normal conditions of intended use, this product does not pose a
 risk to health. Excessive exposure may result in eye, skin or
 respiratory irritation. Always observe good hygiene measures. First
 Aid: Wash skin with soap and water. Flush eyes with water. If
 overcome by fumes or vapor, remove to fresh air. If ingested do not
 induce vomiting. If symptoms persist seek medical assistance. Read
 and understand the MSDS before using this product.

 For Internal Use Only: MHC: 1* 1* 1* 1* 1*, MPPEC: A, TRN: 680363-00,
 CMCS97: 97X505, REQ: PS+C, SAFE USE: L
 EHS Approval Date: 04APR2003

Legally required information is given in accordance with applicable Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending any license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users. Use or re-transmission of the information contained herein in any other format than the format as presented is strictly prohibited. Mobil neither represents nor warrants that the format, content or product formulas contained in this document comply with the laws of any other country except the United States of America.

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7415445-00 SPARTAN SYNTHETIC EP 460

MATERIAL SAFETY DATA BULLETIN

-

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: SPARTAN SYNTHETIC EP 460

SUPPLIER: EXXON MOBIL CORPORATION

3225 GALLOWS RD.

FAIRFAX, VA 22037

24 - Hour Health and Safety Emergency (call collect): 609-737-4411

24 - Hour Transportation Emergency (Primary) CHEMTREC: 800-424-9300
(Secondary) 281-834-3296

Product and Technical Information:

Lubricants and Specialties: 800-662-4525 800-443-9966

Fuels Products: 800-947-9147

MSDS Fax on Demand: 613-228-1467

MSDS Internet Website: <http://emmsds.ihssolutions.com/>

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: BASE OIL AND ADDITIVES

GLOBALLY REPORTABLE MSDS INGREDIENTS:

None.

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).

EMERGENCY OVERVIEW: Clear Amber Liquid. DOT ERG No. : NA

POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use,
this product does not pose a risk to health. Excessive exposure
may result in eye, skin or respiratory irritation.

For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.

SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area. (See Section 16 - Injection Injury)

INHALATION: Not expected to be a problem. However, if respiratory irritation, dizziness, nausea, or unconsciousness occurs due to excessive vapor or mist exposure, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or mouth-to-mouth resuscitation.

INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.

SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.

SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None.

COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.

Flash Point C(F): > 246(475) (ASTM D-93).

Flammable Limits (approx.% vol.in air) - LEL: 0.9%, UEL: 7.0%

NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:

LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.

WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If

permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.

ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.

PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.

STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.

SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.

EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:

When mists/aerosols can occur, the following are recommended: 5 mg/m³ (as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m³ (as oil mist) - ACGIH Short Term Exposure Limit (STEL), 5 mg/m³ (as oil mist) - OSHA Permissible Exposure Limit (PEL)

VENTILATION: If mists are generated, use adequate ventilation, local exhaust or enclosures to control below exposure limits.

RESPIRATORY PROTECTION: If mists are generated, and/or when ventilation is not adequate, wear approved respirator.

EYE PROTECTION: If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.

SKIN PROTECTION: Not normally required. When splashing or liquid contact can occur frequently, wear oil resistant gloves and/or other protective clothing. Good personal hygiene practices should always be followed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.

APPEARANCE: Liquid

COLOR: Clear Amber

ODOR: Mild

ODOR THRESHOLD-ppm: NE

pH: NA

BOILING POINT C(F): > 371(700)

MELTING POINT C(F): NA

FLASH POINT C(F): > 246(475) (ASTM D-93)

FLAMMABILITY (solids): NE

AUTO FLAMMABILITY C(F): NA

EXPLOSIVE PROPERTIES: NA

OXIDIZING PROPERTIES: NA

VAPOR PRESSURE-mmHg 20 C: < 0.1

VAPOR DENSITY: > 2.0

EVAPORATION RATE: NE

RELATIVE DENSITY, 15/4 C: 0.85

SOLUBILITY IN WATER: Negligible

PARTITION COEFFICIENT: > 3.5

VISCOSITY AT 40 C, cSt: 460.0

VISCOSITY AT 100 C, cSt: NE

POUR POINT C(F): -54(-65)

FREEZING POINT C(F): NE

VOLATILE ORGANIC COMPOUND: NE

DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only

NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

----- **10. STABILITY AND REACTIVITY** -----

STABILITY (THERMAL, LIGHT, ETC.): Stable.

CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.

INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

----- **11. TOXICOLOGICAL DATA** -----

---ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.

DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.

INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the

components.

EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.

SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.

OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral and synthetic oils, such as those in this product, have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---

No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.

---CHRONIC TOXICOLOGY (SUMMARY)---

Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and/or granuloma formation. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.

---SENSITIZATION (SUMMARY)---

Not expected to be sensitizing based on tests of this product, components, or similar products.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS:

In the absence of specific environmental data for this product, this assessment is based on information for representative products.

ECOTOXICITY: Available ecotoxicity data (LL50 >1000 mg/L) indicates that adverse effects to aquatic organisms are not expected from this product.

MOBILITY: When released into the environment, adsorption to sediment

and soil will be the predominant behavior.
PERSISTENCE AND DEGRADABILITY: This product is expected to be inherently biodegradable.
BIOACCUMULATIVE POTENTIAL: Bioaccumulation is unlikely due to the very low water solubility of this product, therefore bioavailability to aquatic organisms is minimal.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.
RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.
STATIC ACCUMULATOR (50 picosiemens or less): YES

15. REGULATORY INFORMATION

US OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this product is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.
EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives. EU labeling not required.
Governmental Inventory Status: All components comply with TSCA.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III: This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains no chemicals subject to the supplier notification requirements of SARA (313) toxic release program.

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
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*** NO REPORTABLE INGREDIENTS ***

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: INDUSTRIAL GEAR OIL

NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES ARE NOT FORMULATED TO CONTAIN PCBS.

Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:

INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

INDUSTRIAL LABEL

Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation. Always observe good hygiene measures. First Aid: Wash skin with soap and water. Flush eyes with water. If overcome by fumes or vapor, remove to fresh air. If ingested do not induce vomiting. If symptoms persist seek medical assistance. Read and understand the MSDS before using this product.

For Internal Use Only: MHC: 1* 1* 1* 1* 1*, MPPEC: A, TRN:

7415445-00, CMCS97: 97Q316, REQ: PS+C, SAFE USE: L

EHS Approval Date: 06DEC2001

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Material Safety Data Sheet



PETRO-THERM™

1. Product and company identification

Product name	: PETRO-THERM™
Code	: PTHERM, 490-189
Material uses	: Petro-Therm is a heat transfer fluid recommended for non-pressurized, liquid-phase, closed heat transfer systems.
Manufacturer Lubricants Inc.	: Petro-Canada 2310 Lakeshore Road West Mississauga, Ontario Canada L5J 1K2
<u>In case of emergency</u>	: Suncor Energy: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).

2. Hazards identification

Physical state	: Viscous liquid.
Odour	: Mild petroleum oil like.
WHMIS (Canada)	: Not controlled under WHMIS (Canada).
OSHA/HCS status	: While this material is not considered hazardous by the OSHA Hazard While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.
Emergency overview	: No specific hazard.
Routes of entry	: Dermal contract. Eye contact. Inhalation. Ingestion.
<u>Potential acute health effects</u>	
Inhalation	: No known significant effects or critical hazards.
Ingestion	: No known significant effects or critical hazards.
Skin	: Slightly irritating to the skin.
Eyes	: Slightly irritating to the eyes.
<u>Potential chronic health effects</u>	
Chronic effects	: No known significant effects or critical hazards.
Carcinogenicity	: Not listed as carcinogenic by OSHA, NTP or IARC.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: No known significant effects or critical hazards.
Developmental effects	: No known significant effects or critical hazards.
Fertility effects	: No known significant effects or critical hazards.
Medical conditions	: Repeated or prolonged contact with spray or mist may produce chronic eye irritation and
aggravated by over-	severe skin irritation. Repeated skin exposure can produce local skin
exposure	destruction or
See toxicological information (section 11)	dermatitis.

3. Composition/information on ingredients

<u>Name</u>	<u>CAS number</u>	<u>%</u>
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	Mixture	-

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

The base oil may be a mixture of the following CAS#s: 8042-47-5, 64742-46-7, 64742-47-8, 64742-53-6, 64742-54-7, 64742-55-8, 72623-84-8, 72623-85-9, 72623-86-0, 72623-87-1, 178603-64-0, 178603-65-1, 178603-66-2, 445411-73-4

4. First-aid measures

Eye contact	: Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
Skin contact	: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
Inhalation	: Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Ingestion	: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Protection of first-aiders	: No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
Notes to physician	: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5. Fire-fighting measures

Flammability of the product	: May be combustible at high temperature.
<u>Extinguishing media</u>	
Suitable	: Use an extinguishing agent suitable for the surrounding fire.
Not suitable	: None known.
Special exposure hazards	: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Products of combustion	: Carbon oxides (CO, CO ₂), nitrogen oxides (NO _x), sulphur oxides (SO _x), smoke and irritating vapours as products of incomplete combustion.
Special protective	: Fire-fighters should wear appropriate protective equipment and self-contained breathing
Equipment for fire-fighters	apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Special remarks on fire Hazards	: Low fire hazard. This material must be heated before ignition will occur.
Special remarks on explosion hazards	: Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6 . Accidental release measures

- Personal precautions** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
- Environmental precautions** : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
- Methods for cleaning up**
- Small spill** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

- Handling** : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Storage** : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Ingredient	Exposure limits	
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	ACGIH TLV (United States). Notes: TWA: 5 mg/m ³ 8 hour(s). STEL: 10 mg/m ³ 15 minute(s).	(oil mist)

Consult local authorities for acceptable exposure limits.

Recommended monitoring : If this product contains ingredients with exposure limits, personal, workplace atmosphere or

Procedures biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour filter.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: neoprene, nitrile, polyvinyl alcohol (PVA), Viton.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure : Emissions from ventilation or work process equipment should be checked to ensure they comply

Controls with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	: Viscous liquid.
Flash point	: Closed cup: 212°C (413.6°F) [Pensky-Martens.] Open cup: 225°C (437°F) [Cleveland.]
Auto-ignition temperature	: 351°C(663.8°F)
Flammable limits	: Not available.
Colour	: Colourless to light yellow.
Odour	: Mild petroleum oil like.
Odour threshold	: Not available.
pH	: Not available.
Boiling/condensation point	: Not available.
Melting/freezing point	: Not available.
Relative density	: 0.8648 kg/L@15°C(59°F).
Vapour pressure	: Not available.
Vapour density	: Not available.
Volatility	: Not available.
Evaporation rate	: Not available.
Viscosity	: 35.8 cSt @ 40°C (104°F), 5.66 cSt @ 100°C (212°F), VI=95.
Pour point	: -18°C(0°F).
Solubility	: Insoluble in water.

10 . Stability and reactivity

Chemical stability	: The product is stable.
Hazardous polymerisation	: Under normal conditions of storage and use, hazardous polymerization will not occur.
Materials to avoid	: Reactive with oxidizing agents, acids and reducing agents.
Hazardous decomposition	: May release COx, diphenylamine, alkenes, smoke and irritating vapours when heated to
Products	decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result Exposure	Species	Dose
Mixture of severely hydrotreated and	LD50 Dermal	Rabbit	>2000 mg/kg
hydrocracked base oil (petroleum)	-		
	LD50 Oral	Rat	>5000 mg/kg
	-		
	LC50 Inhalation 4 hours	Rat	>2500 mg/m ³
	Dusts and mists		

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

11 . Toxicological information

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available..

Reproductive toxicity

Conclusion/Summary : Not available.

12. Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any byproducts should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	Not regulated.	-	-	-		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15. Regulatory information

United States

HCS Classification : Not regulated.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products

15. Regulatory information Regulations.

EU regulations

Risk phrases International regulations

International regulations

- Canada inventory** : All components are listed or exempted.
United States inventory (TSCA 8b) : All components are listed or exempted.
Europe inventory : All components are listed or exempted.
International lists : **Australia inventory (AICS)**: All components are listed or exempted.
China inventory (IECSC): All components are listed or exempted.
Korea inventory: All components are listed or exempted.
Philippines inventory (PICCS): All components are listed or exempted.

16 . Other information

Hazardous Material Information System (U.S.A.)

Health	1
Flammability	1
Physical hazards	0
	B

National Fire Protection Association (U.S.A.)



References

- : Available upon request.
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 Responsible name : Product Safety – RS

▼ Indicates information that has changed from previously issued version.

- For Copy of (M)SDS** : The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

Internet: lubrications.petro-canada.ca/msds

Lubricants:

Western Canada, telephone: 1-800-661-1199; fax: 1-800-378-4518 Ontario & Central Canada, telephone: 1-800-268-5850; fax: 1-800-201-6285 Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 1-800-201-6285

For Product Safety Information: (905) 804-4752

Notice to reader

16 . Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.