



COMPACT POWER



Maintaining VR70 and VR140 UNDERHOOD Air Compressors



Maintaining the VR System

The VR compressor contains no reed valves or other easily fouled or fatigue-prone components. Although this makes the system more reliable, organized maintenance practices will increase the life expectancy of the compressor system and maintain operation within the manufactured parameters. VMAC has recommended service intervals for their system that is based on actual testing and performance. The VR system requires regular maintenance that includes:

- inspecting and replacing the drive belt
- changing system oil
- changing filters
- cleaning filter screens

During the warranty period you must follow the maintenance schedule and only use original VMAC replacement parts to maintain the system and the warranty. Periodic maintenance service kits are available from VMAC.

The most critical aspect of compressor operation is proper air filtration. Contamination entering the intake can cause severe, rapid damage to roller bearings, gears and rotors in the compressor.

Never operate the truck, the compressor or even allow the truck to remain parked without the recommended air filter and cover installed on the compressor.



Periodic Maintenance

Good maintenance practices should follow the 3M system. These are:

- management
- materials
- machinery

Management means that you keep accurate, up-to-date records of the maintenance schedule, perform the maintenance on schedule and keep records of any problems or corrections that occurred during that maintenance period.

Materials means that you never attempt to perform a scheduled maintenance without the appropriate replacement parts on hand so that there is minimal interruption and no long down-time. Attempting a full service without the approved oil or without the right filters will only delay the process.

Machinery means that you observe the manufacturer's recommended intervals for service and parts replacement, that reflect both the requirements of the system and good maintenance practices.



Periodic Maintenance (con't)

The maintenance schedule for the system is shown in the following table. The hours shown on the table are those displayed on the control panel read-out. Service should be performed at the lesser of the two intervals, which ever occurs first. Following this procedure will ensure optimum performance and long life from the VR system.

PROCEDURE	SERVICE INTERVAL
Inspect the drive belt	50 hours or 6 months
Replace the air filter, oil filter and change oil	200 hours or 6 months
Replace coalescing separator element and scavenge screen filter	400 hours or 1 year

These service intervals are based on normal operation. Common sense and good maintenance practices will indicate whether these procedures should occur more frequently. For example, if the truck is continuously operating in an extremely dusty environment, the air filter and belt should be inspected more frequently. Since the compressor draws in large quantities of air during operation, the filter may become plugged and will affect operation.



Periodic Maintenance (con't)

Inspecting the Drive Belt

Periodic inspection of the drive belt is necessary to identify potential problems before they cause failure or damage. While VMAC recommends a 50 hour interval, if the operating environment is severe, you should inspect the belt more frequently.

Check the belt carefully for signs of glazing, missing portions of the ribs or damage to the edges or surface. If there is damage, it may indicate a problem with pulley alignment or improper use by the operator. Installing a new belt will not correct the problem, it will just result in damage to the new belt.

A belt that is heat-damaged indicates that the belt is slipping on the compressor or crankshaft pulleys. This may be caused by a defective tensioner or by the operator engaging the compressor while there is pressure in the system. This can cause the compressor clutch to stall and the belt will slip. If the tensioner is applying sufficient pressure and is maintaining belt tension correctly, talk to the operator and find out how they are using the system. Inspect the idlers, pulleys and tensioner for damage. Any component that shows chips, cracks or other physical damage should be replaced.



Periodic Maintenance (con't)

Inspecting the Drive Belt - continued

If the belt is damaged or worn along the edges, it could indicate an alignment problem. If this occurs, check the alignment of all pulleys, idlers and tensioners with a straight edge. If there is an alignment problem, check all system fasteners to make sure that they are tight. Also check for cracking or damage on the mounting bracket and at the compressor.

Inspecting and Replacing the Air Filter

Proper air flow into the compressor is vitally important for good performance. If the filter becomes plugged, the compressor will not be able to meet the demands and will probably overheat. While VMAC recommends that you replace the filter every 200 operating hours or twice a year, you should replace the filter more frequently in severe operating conditions, where it could become contaminated more quickly.

To check the filter, follow this procedure:

1. Make sure that all air pressure has been vented from the system.
2. Clean the area around the compressor and filter cover.
3. Remove the filter cover retaining nut, the cover and the filter element.



Periodic Maintenance (con't)

Inspecting and Replacing the Air Filter – continued

4. Immediately cover the opening of the compressor with a clean, dry cloth or with masking to prevent contamination from entering the compressor. Do not operate the truck or the compressor until the filter and cover have been installed.
5. Clean the inside of the filter cover with a clean, dry cloth. If necessary, you can use solvent to clean the inside of the cover. If you use solvent, make sure that you rinse the cover with water and dry it thoroughly before installing it on the compressor. Solvent fumes entering the compressor could ignite during the compression process, causing an explosion.
6. Examine the filter carefully for contamination. Place a trouble-light on the inside of the filter and rotate it over the light while examining the element. The amount of light that shines through the element is a good indicator of how much air can pass through the element. If the light is dim or blocked, air will not be able to get through.
7. If the filter is dirty, remove the cloth or masking and install a new filter. Do not attempt to wash or blow the filter element clean. These are not serviceable filters, they must be replaced. Using compressed air to clean a filter element will damage the material and allow contamination to enter the system.
8. Replace the cover and the cover nut. Be careful not to overtighten the nut.



Complete Maintenance of the VR System

Complete system maintenance should be performed once each year or every 400 system operating hours, whichever ever occurs first. Again, as with previous service items, you may have to service more frequently in severe operating conditions.

Complete maintenance not only includes replacing oil and filters, it also includes a complete inspection of the system. This will ensure that the system continues to provide optimum performance and will extend the life expectancy of the components.

For best results, follow these steps for servicing:

1. Perform a complete pre-service inspection of the system.
2. Replace the air filter
3. Drain the oil from the system
4. Replace the oil filter
5. Replace the coalescing separator and clean or replace the scavenge filter
6. Fill the system with oil and check operation



Complete Maintenance of the VR System (con't)

Performing a pre-service inspection

Inspect the system carefully and check the following:

- look for leaks at the compressor, cooler, tank, filter and line fittings
- check the compressor and bracket to make sure that they are tight and secure
- check the cooler to make sure that it is tight and secure
- check the tank brackets and tank mounting to make sure that they are not loose
- check all fasteners for evidence of motion or vibration loosening
- examine all the lines for evidence of rubbing, chafing or other environmental damage
- using the appropriate tools, check all the line fittings to make sure that they are tight
- check electrical connections for security
- check all wiring for security and damage
- check the control units to make sure that they are secure

If you discover any problems, perform the necessary repairs to prevent further damage. Protect all wiring, lines, connections and fittings as required. Tighten any loose fasteners and replace any damaged fasteners or components.



Complete Maintenance of the VR System (con't)

Replacing the Air Filter

Follow the procedures outlined previously for air filter replacement.

Draining Oil from the System

The oil should be drained from the system before changing filters or cleaning the scavenge filter. Make sure that you have a suitable container that will hold approximately 2 gallons (US) before you begin. When draining the oil, follow this procedure:

1. Make sure that all air pressure is vented from the system. If there is any pressure in the system, you could be injured when you remove the drain plug.
2. Place the drain container under the tank below the drain plug.
3. Using the correct tool, remove the drain plug from the tank. Be careful when draining the tank. If the system was operated recently, the oil may be very hot and can cause burns.
4. Clean the drain plug threads and inspect them for damage.
5. Clean and inspect the threads in the tank.
6. Install and tighten the drain plug securely.



Complete Maintenance of the VR System (con't)

Replacing the Oil Filter

Clean lubricating oil is vital for efficient operation and for preventing damage to components. Replacing the oil filter at regular intervals will help keep contaminants out of the compressor and the rest of the system. When replacing the oil filter, remember to:

- make sure that there is no pressure in the system
- use a proper filter wrench
- never over-tighten the filter
- check the oil level after operating the system
- check for oil leaks after service

To replace the oil filter, follow this procedure:

1. Clean the area around the filter to prevent contamination.
2. Remove the filter by turning it counter-clockwise. Make sure that you drain the oil from the filter into a suitable container and dispose of the filter and oil according to local regulations. Before you dispose of the filter, check to make sure that the threaded nipple did not unscrew with the filter. If the nipple is in the filter rather than in the compressor, tank or remote mount, remove it carefully to prevent thread damage and replace it in its original location.



Complete Maintenance of the VR System (con't)

Replacing the Oil Filter - continued

3. Check the sealing surface on the compressor, tank or remote mount to make sure that it is clean and smooth.
4. Apply a light coating of compressor oil to the gasket on the new filter.
5. Spin the filter on the threaded nipple until the gasket contacts the seat.
6. Tighten the filter an additional $\frac{3}{4}$ to 1 full turn to provide a good seal.

Replacing the Coalescing Separator and Scavenge Filter

To perform this part of the service, you must remove the back cover on the tank. Before attempting to replace the coalescing separator and scavenge filter, always make sure of the following:

- there is no pressure in the system
- the oil has been drained from the tank
- the back of the tank has been cleaned to prevent contamination
- be careful of hot oil



Complete Maintenance of the VR System (con't)

Replacing the Coalescing Separator and Scavenge Filter - continued

When these conditions have been met, follow this procedure:

1. Clean the back of the tank to prevent contamination.
2. Disconnect the air outlet line, 1/4 inch and 5/16 inch lines from the back of the tank.
3. Remove the bolts holding the discharge cap from the back of the tank and remove the cap and small spring, if equipped.



To prevent damage to the tank, remove all of the bolts completely while holding the discharge cap firmly in place as the coalescing separator element is springloaded against the discharge cap.

4. Remove the coalescing separator element, large spring (and on the VR140, the spring plate) from inside the tank. Discard the coalescing separator element.
5. Remove and discard the O-ring seal and the rear cap seal.
6. Wipe out the inside of the tank



Complete Maintenance of the VR System (con't)

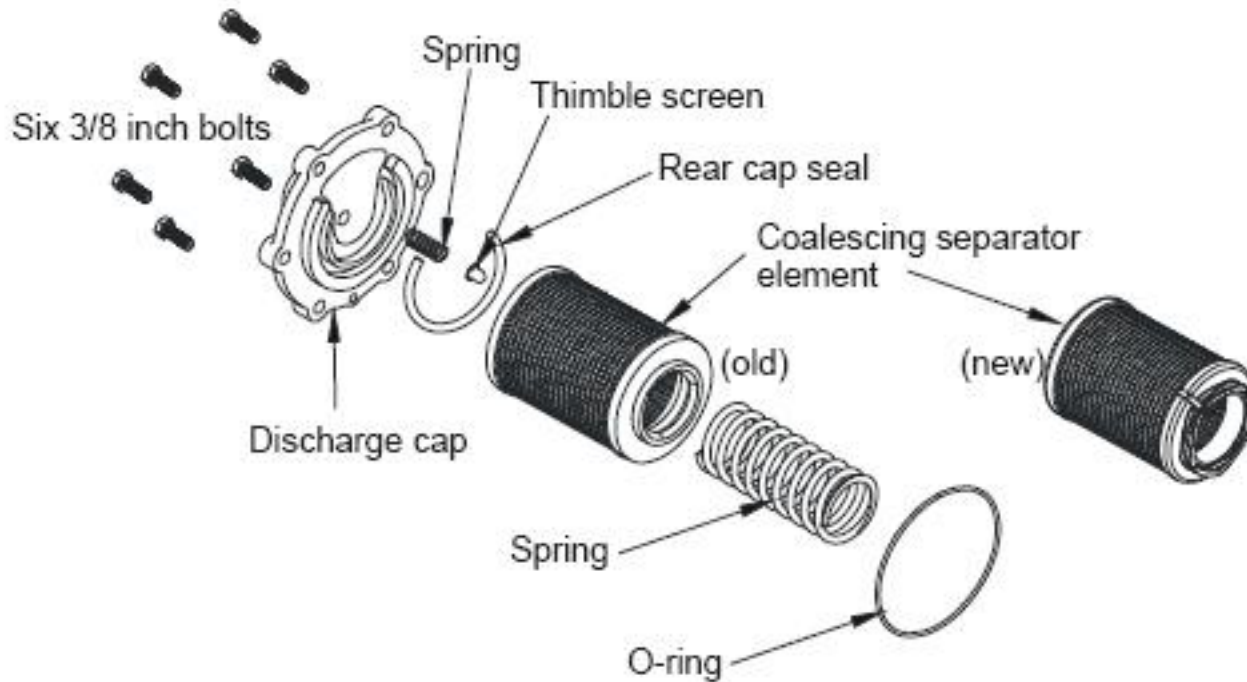


Figure 6.1 Typical VR70 System



Complete Maintenance of the VR System (con't)

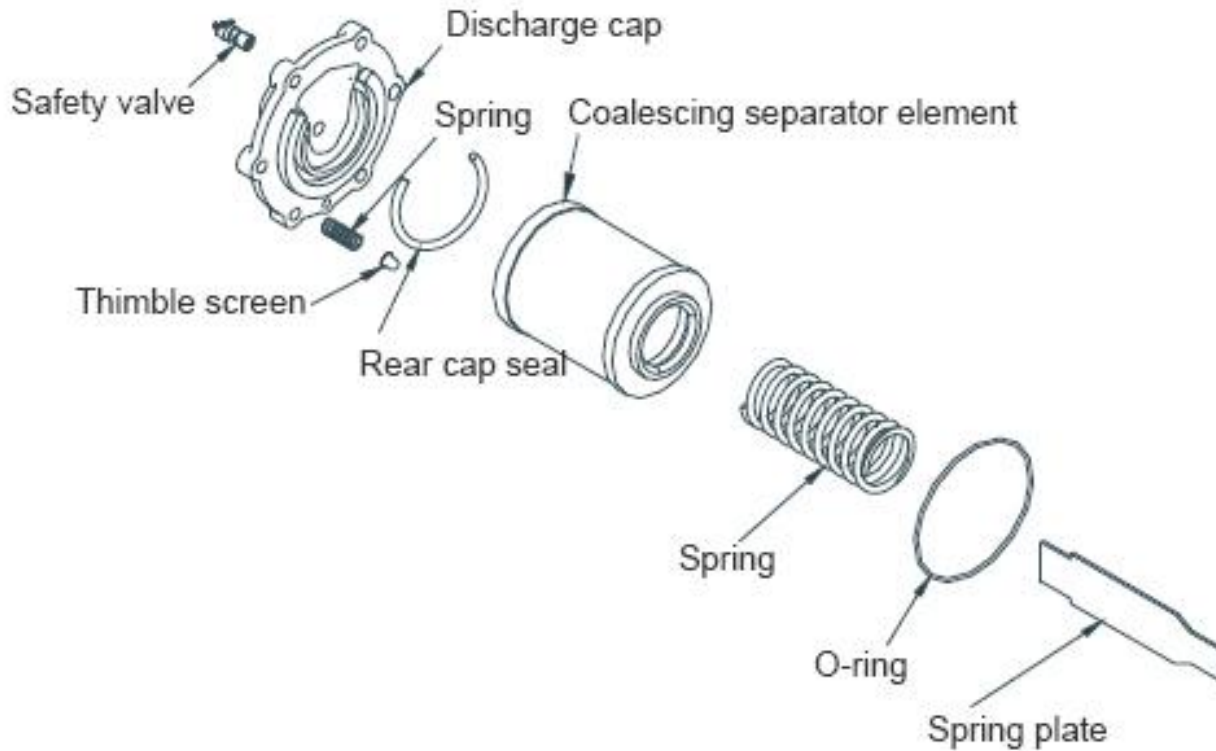


Figure 6.2 Typical VR140 System



Complete Maintenance of the VR System (con't)

Replacing the Coalescing Separator and Scavenge Filter - continued

7. If the tank has a small spring and thimble screen, the screen can be removed by carefully pushing it out of the oil scavenge hole from the inside of the tank.
8. If the system does not have a small spring, the scavenge screen will be located inside the tank coalescing chamber and is retained by a small screw.
9. Check the thimble screen or scavenge screen for contamination or damage. If contaminated, clean as necessary and blow out with compressed air. If damaged, replace the thimble screen or scavenge screen.

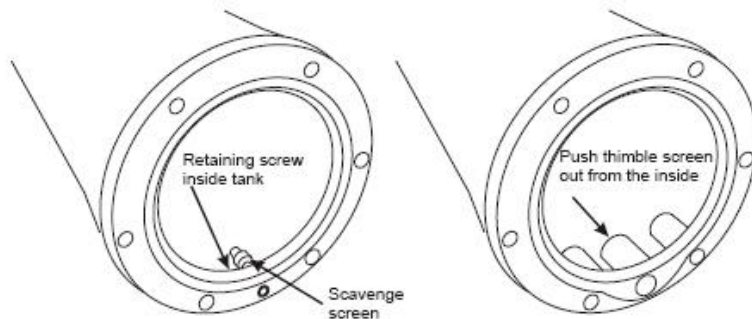


Figure 6.3 Scavenge Filter and Thimble Screen



If you use solvents for cleaning, thoroughly rinse the parts with hot water to remove all solvent residues.



Complete Maintenance of the VR System (con't)

Replacing the Coalescing Separator and Scavenge Filter - continued

10. Install new O-rings (including the small O-ring for tanks with the internal scavenge screen) and rear cap seal.
11. Thoroughly clean the large spring and the spring plate on VR140 systems. Remove any rust or contaminants.
12. Install the large spring (with spring plate on 140 systems – tapered end away from the filter) and a new coalescing separator element. Make sure that the spring is in place, as it holds the coalescing separator element tight against the rear cap seal.



The large spring also prevents electrostatic buildup by grounding the coalescing separator element. If the spring is not installed, an electric arc may occur, which could result in an explosion, potential tank rupture or fire.



The coalescing separator element service kit may include a wave-type spring (Figure 6.1). Replace the large coil spring with the wave spring and discard the coil spring.



Complete Maintenance of the VR System (con't)

Replacing the Coalescing Separator and Scavenge Filter - continued

13. Install the discharge cap and torque the bolts to specifications.
14. Install the lines on the back of the tank.
15. Remove the filler plug from the air inlet control valve.
16. Pour compressor oil into the oil filler hole on the inlet control valve using a funnel.
17. Turn the compressor clutch clockwise to speed the fill process.
18. Allow five minutes for the oil to drain into the tank, then check the level at the sight glass at the front of the tank. Continue adding oil until the level is correct.
19. Install the fill plug in the inlet control valve and tighten it securely.



Complete Maintenance of the VR System (con't)

Filling the System With Oil

1. Remove the fill plug from the inlet valve on the compressor.
2. Using a funnel, pour oil into the compressor while turning the compressor in a clockwise direction using the hex head cap screw at the center of the compressor clutch assembly.
3. At regular intervals, check the oil level at the sight-glass until it reaches the specified level.
4. Replace the fill plug or the inlet control valve.
5. Perform a quick inspection of the system to make sure that all lines are on and tight and that the filter is tight.



Complete Maintenance of the VR System (con't)

Completing the Service

1. Place the manual transmission in neutral or the automatic transmission in park and fully apply the park brake.
2. Start the engine and allow it to reach operating temperature.
3. Turn the compressor switch on the control unit to the "ON" position, allow the system to pressurize and return to preset base idle speed.
4. Turn the compressor switch on the control unit to the "OFF" position.
5. Allow the system to settle for five minutes, and then check the oil level through the sight glass. The level must be between the minimum and maximum level indicators.
6. Check for oil leaks.



Troubleshooting

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Compressor does not run	Oil temperature too high.	Turn compressor off, allow to cool for 30 minutes, retry.
	Oil level is too low.	Park on level ground, check level at sight glass, add as necessary.
	Drive belt is broken or missing.	Install new compressor belt. Check alignment of pulleys.
	No power to the clutch.	Check for 12 V at the clutch, check fuse, check for broken wires or failed switch.
	Bad clutch ground.	With 12 V applied to the clutch check for voltage between the clutch stator housing and the engine. If voltage is present, ground the stator.
	Open clutch stator windings.	With compressor switch off and clutch wire disconnected, check resistance between the input wire and ground. Resistance (less lead resistance) should be 2.5 ohms to 3.0 ohms. If outside this range replace the stator.



Troubleshooting (con't)

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Frequent over-temperature shutdowns.	Low oil level.	Check oil on level ground, add as required.
	Restriction in the compressor oil hoses.	Check for kinked or pinched oil hoses.
	Compressor oil filter plugged.	Replace oil filter.
	Heat exchanger not functioning or is fouled with deposits.	Remove and clean or replace heat exchanger.
	Engine cooling system failure (high engine temperature).	Correct engine cooling problems.
	Engine fan clutch slipping.	Replace fan clutch.
	High ambient temperatures.	Reduce duty cycle.
	Oil temperature probe failure.	Replace if defective.
	System needs service	Perform recommended service



Troubleshooting (con't)

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Excessive air pressure	Pressure regulator valve too high.	Reduce system pressure by adjusting pressure regulator valve.
	System return line blocked or frozen	Clear or replace the line.
Engine stalls when compressor is activated.	System is under pressure.	Allow sufficient time for blow-down.
	Blow-down valve not working.	Replace blow-down valve.
	RPM setting too low or throttle not set correctly.	Readjust RPM and throttle settings for optimum operation.
	Throttle control not connected properly at foot pedal	Check for proper connections.
Belt squeals when compressor switch is activated.	System is under pressure.	Allow 10 seconds for blow-down.
	Blow-down valve not working or muffler is plugged.	Replace blow-down valve or clean muffler.
	Improper belt tension.	Check belt tensioner.
	Belt is glazed.	Replace belt.



Troubleshooting (con't)

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Frequent relief valve operation.	Pressure regulator setting too high.	Adjust pressure regulator setting below 160 PSI.
	Pressure control line plugged or frozen.	Remove the pressure control line and clear any obstructions. (Blow out.)
	Relief valve defective.	Replace relief valve.
Power fuse blows.	Short to ground in the control circuit.	Locate and correct short or replace control panel.
	Incorrect fuse.	Install correct OEM fuse.
	Incorrect wiring.	Repair wiring according to wiring diagram.
Low air pressure.	Air flow is too high.	Reduce consumption.
	Throttle control set too low.	Increase maximum RPM settings.
	Pressure regulator valve set too low.	Increase pressure by adjusting pressure regulator valve.
Engine RPM excessive on initial startup and during operation.	Maximum RPM setting is too high.	Reduce maximum RPM setting throttle control or reset cable nipple.
	Idle-down pressure is too high.	Reduce idle-down setting of the throttle control.



Troubleshooting (con't)

SYMPTON	POSSIBLE CAUSE	CORRECTIVE ACTION
Objectionable noise level.	Excessive gear wear.	Contact the nearest dealer to replace compressor/gearbox assembly. Refer to the dealer.
	Maximum RPM setting higher than necessary to meet air demand requirements.	Reduce maximum RPM settings.
Engine RPM stays at base idle when compressor runs.	Operating with the hood open	Close the hood.
	Mechanical throttle control receiving power, housing is acting as a chassis ground.	Test and correct connections.
	Throttle control not adjusted properly.	Adjust throttle controls.
	Poor electrical connections.	Test and correct connections.
	Throttle control not functioning.	Replace throttle control.
	Pressure sensor defective or disconnected.	Check connections or replace pressure sensor.



Troubleshooting (con't)

SYMPTON	POSSIBLE CAUSE	CORRECTIVE ACTION
Engine RPM over- revs when compressor is activated.	Throttle controls not connected properly.	Check and correct connections.
	Throttle control not setup properly.	Adjust high idle screw.
	Pressure sensor defective or disconnected.	Check connections or replace pressure sensor.
Engine RPM does not return to base idle.	Wiring fault.	Check and correct wiring according to wiring diagram.
	Throttle not properly adjusted.	Adjust idle down screw.
Engine RPM stays at maximum whenever the compressor is running.	Idle-down setting is too high.	Reset idle-down pressure.



Troubleshooting (con't)

SYMPTON	POSSIBLE CAUSE	CORRECTIVE ACTION
Excessive oil in the air.	Failed coalescing separator element.	Replace element.
	Clogged scavenge line screen.	Clean or replace parts as required.
	High oil level.	Correct oil level.
	Poor fit between coalescing filter and tank – lack of seal at O-rings.	Replace parts as required.
	Vehicle is not within requirements of 15 degrees of level.	Level vehicle and check for oil in the air.
	Compressor was turned off while running at high speed.	Allow engine RPM to drop before turning the compressor off.
	Wing tank – volume shutting down under load.	Clean or replace parts as required.
	Oil blows out of compressor air filter on compressor shutdown.	Shutting the engine off while running at high speed.
Oil drips from clutch after shutdown.	Seal leaking.	Contact the nearest dealer to replace gearbox input shaft seal.



Comments



Thank You!

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