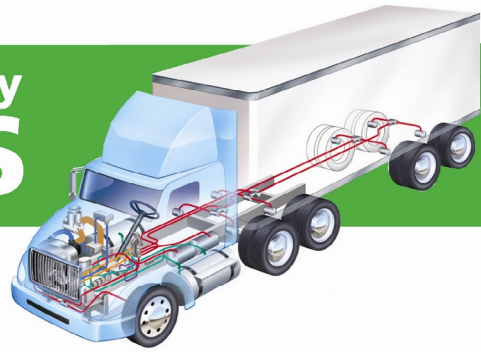
Fleet and Heavy Duty
TECHTIPS



New hose technology advances cooling system performance

To comply with Environmental Protection Agency (EPA) regulations for controlling the formation of oxides of nitrogen (NOx), a component of smog, most engine makers are using exhaust gas recirculation (EGR) to manage high combustion temperatures.

These engines are reported to cost $3,000 to $5,000 more than current comparable models, while delivering fewer kilometers per litre.

As a result, many fleets are expecting to fill their equipment needs by extending the service life of their current trucks, and supplementing them with purchases of low kilometer used trucks.

To keep these trucks on the road, service technicians should follow routine maintenance inspections of vital components such as the cooling system.

Inspections should include checking the cover of coolant hoses for signs of cracking, hardness or swelling. While this may indicate obvious symptoms of hose failure, Gates Fluid Power division engineers say it doesn't indicate the primary case of most coolant hose failures − an electrochemical attack on the tube compound inside the hose.

Electrochemical degradation (ECD) occurs when an electrical charge takes place between dissimilar metals found in the cooling system, such as the aluminum engine block, cast-iron head, copper radiator core, or steel clamps. The electrical charge is carried between metals by the coolant, and damage first shows up as tiny cracks in the tubing.

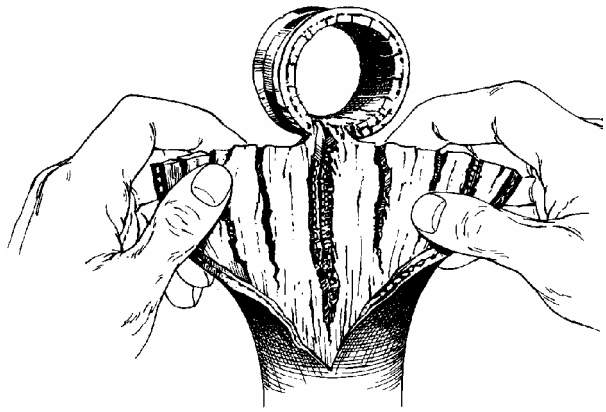
Accelerated by high under-the-hood temperatures and stop-and-go driving, these cracks become larger and deeper. This allows coolant to reach and degrade the reinforcement yarn. Eventually, the hose will rupture or leak.

The best way to check coolant hose for the effects of ECD is to squeeze the hose near the clamps or connectors using the following procedure:

1) Make sure the engine is cool;
2) Use fingers and thumb to check for weakness, not the whole hand;
3) Squeeze near the connectors.

ECD occurs within two inches of the ends of the hose, not in the middle. Check for any difference in the feel between the middle and ends of the hose.

If the ends feel soft compared to the solid feel of the middle of the hose, chances are, the hose is under attack by ECD.



Owners and operators of fleets plagued by electrochemical damage should consider one of three options:

• Earlier hose replacement is recommended for fleet vehicles subject to significant stop-and-go driving or

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hot running engines. Gates research indicates the incidence of coolant hose failure sharply increases after four years.

• Replace rubber hose with silicone hose, which offers excellent resistance to temperature excesses, aging, ozone attack and hardening. Silicone also can withstand excessive vibrations generated by turbo-charged diesel engines.

• Replace rubber hose with electrochemical resistant tube stock, such as Gates line of high temperature Green Stripe hose. The Type P ethylene propylene diene (EPDM) stock in these hoses carries the electrochemical-resistant properties of silicone hose, without the susceptibility to puncture and tearing.

Another common problem encountered in heavy-duty cooling systems is the occurrence of cold water leaks, which usually happen shortly after a new clamp or hose has been installed.

Here is what causes the problem:

Both the radiator and engine block inlet and outlet tubes (metal) are susceptible to heat expansion and contraction. As the coolant and under-hood heat rises, these tubes begin to expand.

Because the tubes have expanded, the hose will be squeezed between the clamp and the tube in excess of the normal compression.

This squeezing of the hose causes a "compression set," that is, the hose will "set" in the compressed position caused by the extra pressure of the expanding metal tube.

When the engine block, inlet tubes and radiator cool down and contract, the hose will not return to its original form due to the compression set. The coolant can then begin to seep past the clamp connection.

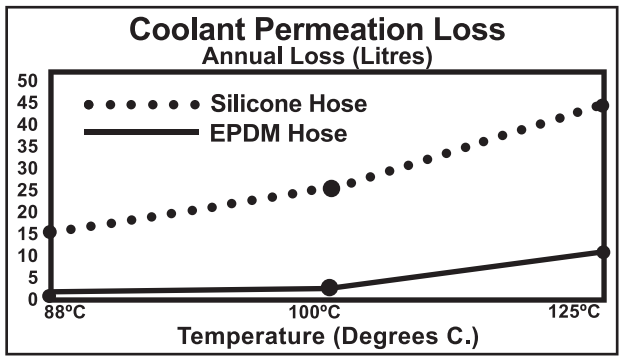
An easier solution is to use a modern EPDM hose and constant-tension or spring-clamps that tighten as the rubber in the hose wall thermally contracts and loses resilience.

To avoid cold water leaks, constant-diameter or screw clamps must be retightened after a "run-in" period. This eliminates the gap created by the rapidly contracting inlet tubes and compensates for most of the compression set that occurs in the hose.

Gates engineers say coolant problems can also result from water permeation, an invisible phenomenon in which water molecules from the coolant migrate through the hose wall. If maintenance personnel top-off their radiators with 100-percent antifreeze or a 50:50 premix, the coolant balance is upset and the coolant loses its thermal efficiency.

Electrochemical-resistant EPDM hose, described by SAE J20 as Type EC Class D-1, offers the same durability and performance as silicone hose in typical heavy-duty applications.

Testing by Gates engineers shows that a Class 8 truck, operating at a temperature of 99°C with a two-shift-per-day driving cycle, would lose nearly 20 litres



of water each year if it were equipped with silicone hose. The same truck equipped with electrochemical-resistant EPDM coolant hose would lose only one litre in the same period.

In addition to reducing leaks by adhering to metal fittings, today's EPDM hoses, including Gates Green Stripe hose, are more resistant to water permeation than conventional EPDM hoses.

For additional information on heavy-duty coolant hoses, go to www.gatesaustralia.com.au/transportation.

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