Cool enough to be forgotten? Don't do it!

BY **STEVE SCOTT**

When the coolant level is okay, and the color of the coolant looks good, that's the extent of the maintenance programs too many engines are subject to. Most modern engines are equipped with technology that gives instant feedback on various electrical and mechanical systems, where-as previous/older engines just had a gauge or indicator light to indicate something might need to be checked. Regardless of engine age, human interaction is still required when performing maintenance or visual inspections to maintain these systems properly.

In fact, the cooling system is no less important than the maintenance required of lubrication or fuel systems.

The most common cooling systems are a radiator and fan combination, but there are other systems such as keel coolers, heat exchangers and cooling towers. Understanding which design cooling system(s) your equipment has, and how to maintain it will save you time, money and extend the life of your equipment.

Cooling systems vary depending on the applications. A few of the basic components are:

• Water pump: Is the heart of the system. It pumps coolant through the oil cooler and into the block. Coolant then flows through the engine block, cylinder head(s) and other components, absorbing the heat in the engine.

• Thermostat/regulator: Regulate the amount of hot coolant that can pass into the radiator.

• Oil cooler: In most industrial engines, oil is sprayed on the bottom of the pistons to cool them, and heat is transferred from the piston into the oil. Oil then passes through the tubes or plates of the oil cooler where the coolant reduces the oil temperature.

• Fan: Either pulls or pushes air around the fins and tubes in the radiator to decrease the temperature of the coolant.

• Aftercoolers: Reduces the temperature of compressed air after it has passed through the turbocharger.

• Transmission, torque converter, hydraulic and retarder coolers: Like an oil cooler, they reduce the oil temperatures from the components. How the equipment is operated can have a direct effect on these components.

• Water cooled manifold and turbocharger: These components can be greatly affected by fuel and timing settings, or restrictions in the intake and exhaust systems.

• Coolant: Obviously the most important. The type of coolant and mixture ratio is critical, following the OE coolant recommendations and maintenance is the best practice. Not all coolants are compatible with others, or with all engines. Engines with aluminum components may require different coolant than engines with cast iron components. Damage caused by neglected coolant cannot be reversed by simply replacing it.

The coolant used in an engine is responsible for more than just keeping the system from overheating. Properly maintained coolant will:

• Protect the components from freezing. Using the correct mixture extends the boiling and freezing temperature ranges. Undiluted ethylene glycol freezes at 0° to -9°F, so using the correct mixture not only produces better results, it also reduces the cost.

• Reduces corrosion. Water is naturally corrosive; antifreezes and additives help reduce damage water can cause.

• Reduces scale. Scale is a barrier that blocks heat transfer. 1/16" of scale build up reduces heat transfer by approximately 40%.

• Reduces cylinder liner pitting (cavitation). This is a chemical and physical occurrence that results in pitting of the

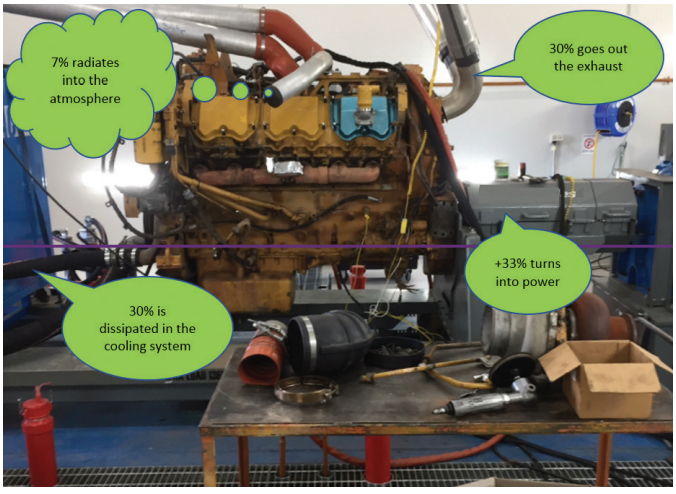
outside of cylinder liners. In extreme instances, these pits will travel through the liner and into the combustion cylinder.

Cooling systems are designed to function under pressure, which also raises the boiling point. Coolant under pressure has a higher boiling point. Use caution when working on any part of these systems. The heat and pressures can be extremely dangerous. Do not add coolant or water to an overheated engine. Allow it to cool down first, and then add coolant.

The cooling system alone only accounts for dissipating approximately 30% of the engines temperature. Approximately another 30% of the total heat is converted to power, less than 10% is radiant heat expelled into the atmosphere, and the balance exits through the exhaust system.

An imbalance that causes an engine to run too hot or too cold will cause poor performance and/or damage. Operating temperature must be high enough for the engine to run efficiently, but low enough to keep the coolant from boiling.

Overheating can come from several sources. The overheating of one system (the engine for example) can affect



Scale is a barrier that blocks heat transfer. 1/16" of scale build up reduces heat transfer by approximately 40%.

Cylinder liner pitting (cavitation) is a chemical and physical occurrence that results in pitting of the outside of cylinder liners. In extreme instances, these pits will travel through the liner and into the combustion cylinder.

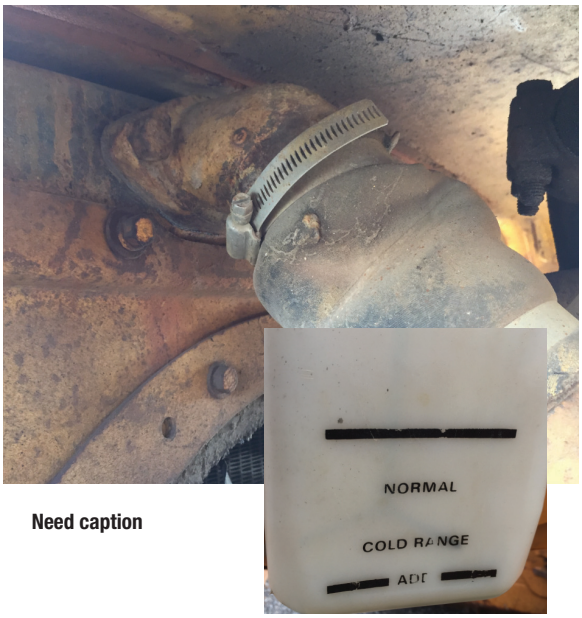
An imbalance that causes an engine to run too hot or too cold will cause poor performance and/or damage. Operating temperature must be high enough for the engine to run efficiently, but low enough to keep the coolant from boiling.

other systems such as the transmission. Some common contributors to overheating are:

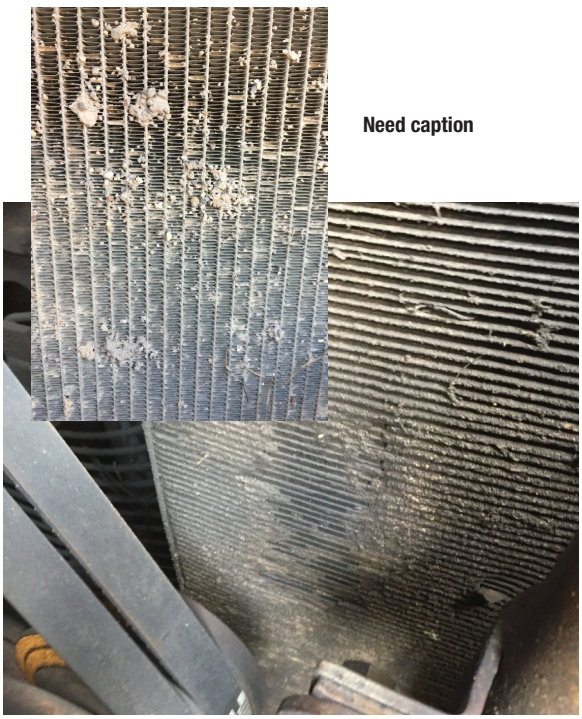
- Weak, neglected coolant
- Low coolant level
- Worn or loose belts
- Failing or failed thermostats or water pump
- Restrictions in the coolant, intake or exhaust
- Ineffective fan(s)
- Harsh operating conditions

Overheating can cause:

- Cylinder heads and engine blocks to crack or warp
- Head gaskets to fail
- Pistons to seize
- Etc.



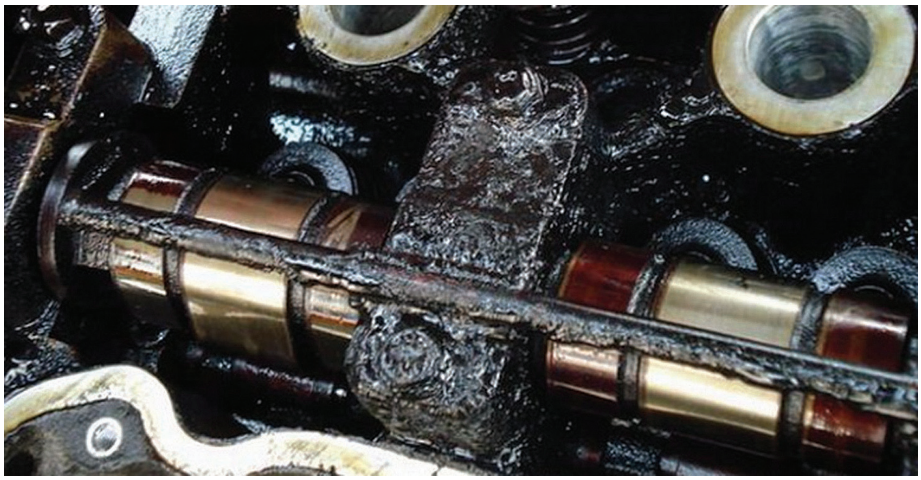
Need caption



Need caption

COOLING SYSTEMS

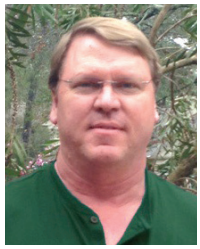
BY **STEVE SCOTT**



Overheating is not the only condition to focus on. Continuously overcooling an engine can cause moisture, sludge, and carbine to build up, and can also make oil become too acidic.

To make things more confusing, there are a variety of coolants, additives, cleaners, testing equipment and services available that can be applied to an engine's cooling system. Following the OE's recommendations for your specific equipment is the best practice. Maintaining the cooling system correctly in comparison to the damages and costs of repairing a neglected system is minimal.

Applying the same attention that is given to your equipment's lubrication and fuel systems ensures that the equipment's cooling system is in optimal health. That's time and money well spent, which is a cool situation to be in.■



Steve Scott joined the service department at IPD in 1982, working with parts, service and sales for a variety of equipment, diesel, and natural gas engines. Since 2004, he has been the director of product development and technical support for IPD. For more information, email sscott@ipdparts.com.