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# Catastrophic Failure of Diesel Engines

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Catastrophic failure of a heavy-duty diesel engine will be expensive for the owner, not only because of the high cost of repair, but also because of lost revenues when a truck or piece of earthmoving equipment is out of commission. Oftentimes, simple routine maintenance will allow the owner to avoid these failures. A case in point is proper coolant maintenance, including the use of recommended additives.

Heavy-duty diesel engines are normally designed with wet sleeve cylinders that allow coolant to circulate around the cylinders for effective dissipation of heat. Seals near the bottoms of the sleeves (or liners) keep the coolant out of the crankcase. However, the sleeves can fail due to cavitation erosion, a failure mechanism that is not unusual in diesel engines.

High pressures are developed on each compression stroke due to the very high compression ratios common to diesels. These pressures cause the sleeves to rock back and forth in the engine block during operation, causing the sleeves to vibrate. Cavitation occurs when coolant vapor forms bubbles on the outer surface of the sleeve due to the vibration, then implode like many small explosions. These localized pressures can exceed 50,000 psi. This action causes pits to form on the sleeves from the outside toward the inside. When a pit breaks through the wall of the sleeve, coolant will leak into the cylinder. Enough coolant can leak into a cylinder while the engine is shut off that, upon cranking, the piston rod will bend, often fracturing the engine block. This occurs because water is incompressible, and when the piston pushes against the coolant (water), something is going to give. This condition is sometimes called “hydraulic lock.”

Cavitation erosion can damage sleeves in as little as 250 hours or 12,000 miles of operation if the engine is operated with straight water as a coolant. This expensive problem can be easily prevented by the use of an additive to the coolant that will coat the outer walls of the sleeve with a protective film. The additive has a definite life, and the coolant system must be maintained by the proper changing of coolant additive and filters as recommended by the manufacturer.

As usual, overlooking the small things can have large consequences.