

# Piston burning can have many causes

MILWAUKEE, Wisc. — The incidence of piston burning has dramatically increased in many makes of diesel engines. Seldom is there one specific cause, but rather a combination of circumstances. Simplified piston burning is caused by localized high temperatures in the piston.

What are the causes of piston burning? Basically, there are three categories: 1) detonation or irregular combustion; 2) localized hot spots caused by stuck rings, broken or cracked pistons, poor cooling; and 3) external causes such as fuels and maintenance.

Detonation usually occurs when the combustion flame at the commencement of ignition advances irregularly, causing spontaneous ignition of the air/fuel mixture. This irregular explosion occurs with high velocity and temperatures. The high localized pressures and temperatures may reduce cylinder head capscrew

torque, break pistons or rings, disturb ring insert integrity or cause other such physical destruction. Detonation is usually caused by one or more local spots and corresponding hot spots creating an irregular flame front.

We are all familiar with the "diesel rattle" associated with engine startup. This is detonation in one of its simplest forms. Some detonation causes are:

1. Improper cooling, either too hot or too cool, reflecting scale, loose belts, bad or improper thermostats, etc.
2. Improper air/fuel mixture caused by a dirty air cleaner, a sluggish turbocharger, a malfunctioning intercooler or an improperly adjusted injection system.
3. Incorrect valve timing or valve lash.
4. Excessively high or low

compression ratio caused by improper parts or after resurfacing of cylinder block or head.

5. Use of fuel with improper cetane rating, mixtures including volatile ingredients such as gasoline, water present and the like.

6. Heavy local buildup of carbon. This is rather insidious in that it may be caused by any of the other factors and will continue to generate unless casual items are corrected.

7. Excessively cool inlet temperatures caused by operating at extremely low ambients or excessive idling or light load operation.

8. Excessive lugging, especially on turbocharged engines. This is very true when engines are accelerated under full load conditions from low speeds.

Localized hot spots may be

created by improper seal of the compression rings, cracked pistons, improper piston cooling, scaled cylinder liners, varnish deposits, etc. All of these factors create a localized spot of high temperature which will continue to build until the piston burns or "gutters."

The basic purpose of the piston rings is to seal the combustion gases and transfer heat to the cylinder walls and the coolant. The rotation of the rings allows the even distribution of combustion gases and temperature around the circumference of the piston. Naturally, if ring rotation is

halted, a hot spot will be generated at the ring gap position.

Any condition that causes the piston to operate at abnormally high temperatures will promote ring sticking.

Piston cracking or distress will also create a local hot spot. Some causes of cracking are:

1. High cylinder pressures caused by improper injection timing, incorrect injectors, overfueling, ether abuse and the like.
2. Improper handling of pistons during rebuild.
3. Operation under extremely

(Turn to Page D10)



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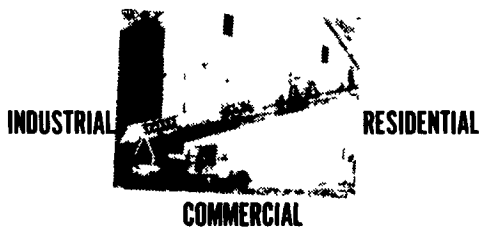
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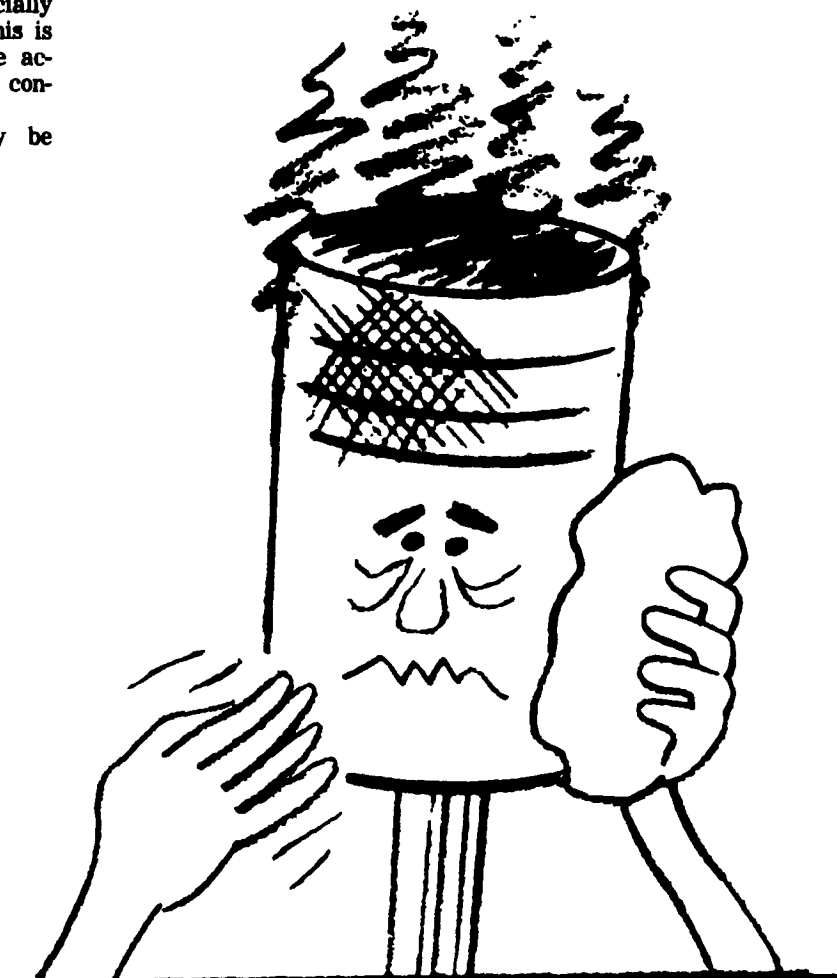
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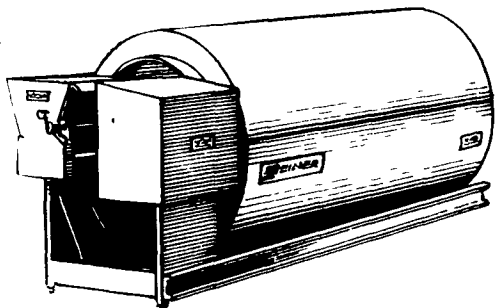
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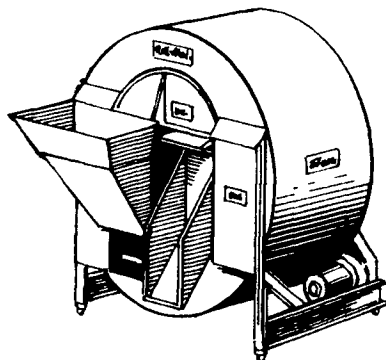


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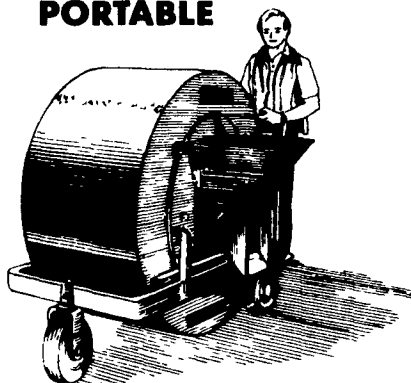
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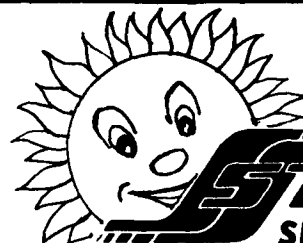


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