

Cooling System

Cavitation Analysis - I blew an engine and Ford made good on it during the warranty period!

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A very frequent question I receive via e-mail and on the Chat Board is about cavitation in the Ford diesels. It's a well-known problem, but doesn't seem to be as common as some people think. I myself have never personally seen one with the problem. Cavitation is not an inherent problem with Ford diesels, almost all diesel engines are subject to it without proper maintenance. The problem with Ford is that they originally neglected to put cavitation maintenance procedures in their owner's manuals. They have since remedied this with 94+ Power Strokes Owner's Manuals.

What is cavitation? One of our diesel experts offered this explanation:

Cavitation is a localized low pressure zone that forms adjacent to the outer wall of the cylinder. It is caused by the flexing of the cylinder wall due to the high cylinder pressures experienced in diesel engine ignition. Gasoline engines don't typically get this failure mode due to lower cylinder pressures during ignition. Basically what happens is the cylinder wall quickly expands due to ignition then returns to its original geometry. This expansion of the cylinder wall is more pronounced as you increase the demand for power. Basically when you increase your demand for power you are pumping more fuel into the cylinder. If you have a turbo charged unit you are also increasing air charge. This increase in fuel and air causes a more violent ignition which further increases cylinder pressures and thus increases the flexing of the cylinder wall. This fast cylinder wall movement causes a low pressure zone to be created in the coolant adjacent to the cylinder wall. When this pressure zone drops below the vapor pressure point (temperature, coolant ratio, and additive dependant) a vapor bubble is formed. When this low pressure zone returns to a high pressure zone, the vapor bubble collapses, causing an implosion, or pitting phenomena on the cylinder wall (like hitting the surface with a microscopic ball peen hammer). If left unchecked, it will eventually eat all the way through the cylinder wall.

The next question is probably What do I do to prevent cavitation? The answer is simple, add the appropriate coolant additive at 15,000 mile intervals and perform a complete coolant change every 30,000. By following these procedures, you'll never have a coolant-related failure. The additives include Ford's FW-16 (replacement for the older FW-15), Fleetguard's DCA4, Penray's Pencool, and others. A new alternative is to use Cat and Fleetguard's new extended life coolant. It is impregnated with the proper additive and mixed to the proper antifreeze/water combination at the factory. You simply pour it in.