

ANALYZING ENGINE AILMENTS FOR PREVENTION AND CORRECTION

by Paul Scholten, Service Manager, Kohler Co.



Valve stem erosion (top) indicates the fuel mixture is too lean or condensation inside the engine. Damage to entire circumference of the valve face (bottom) is caused by insufficient valve clearance.



Too often a mechanic will pull an ailing engine from a piece of equipment, tear it down, rebuild it, and put it back into service without really finding out what went wrong with the engine in the first place.

What I would like to do is outline an approach that will help you determine what went wrong. With that knowledge, you can take steps in your regular maintenance program to prevent future problems and also eliminate some of the causes of premature engine wear and increase engine life.

Start with a notebook in which you can jot down the condition of parts as you find them. Observing the condition of engine components is the key to analyzing engine troubles. And keep in mind at all times that dirt, improper lubrication, and excessive heat are three of the most frequent causes of engine problems.

Do not begin by cleaning up the engine and tearing it down. You'll destroy a lot of valuable evidence that way.

Instead, start by checking for any accumulation of dirt and grit on the engine block and cooling fins. Dirt on the engine block, and especially in the fins can be a cause of heat build up which can lead to many other problems. Also, dirt on the engine increases the opportunities for dirt to get into the engine. If dirt accumulation is heavy, make a note to include a brief cleaning of the engine in your preventive maintenance schedule.

Next, examine the engine for any obvious oil leaks and make note of them. When you drain the oil, save it and measure it. From this you can tell if the engine had been running with too little oil. Too little oil, of course, means poor lubrication and ultimately damage to the engine.

Examine the condition of the oil. Is it thick and gritty? If so, review your maintenance schedule to be sure that you are changing the oil at proper intervals. Also, check to see if there is any foreign matter or chunks of dirt or metal in the oil.

Carefully examine the folds of the oil filter element to determine if there are any pieces of grit or metal trapped there. Debris in the oil can be a source of severe engine damage.

The next step is to examine the air cleaner assembly. Check the fit. Is the assembly loose or are there signs of damage? Remove the air cleaner element and inspect it carefully by holding a bare light bulb inside of it. You should be able to see light coming through the paper element. Is the element dirty, damaged, or plugged? A very dirty or plugged air cleaner element may mean that enough air was not getting through to the carburetor, and it may also mean that dirt was getting into the engine. Remember, dirt in the engine can ruin an engine in short order.

Also, carefully examine the air cleaner for openings at the edge of the paper and other indications that the element may have been defective.

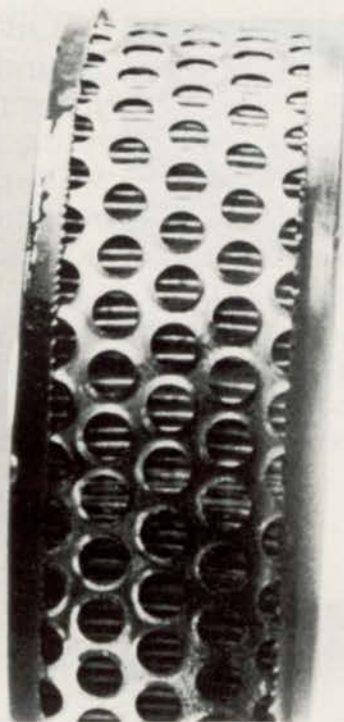
If you discover defects or troubles with the air cleaner, make sure that your preventive maintenance schedule includes a careful examination of the air cleaner in the future.

Now look down the carburetor throat. Again, check to see if somehow dirt had gotten past the air cleaner. Make a note of the deposits you find there.

This is the point at which you can finally steam clean the engine and begin actual teardown. Throughout the disassembly of the engine you should continue to make notes on the condition of the engine components as you find them. Everything should be examined for cracks, deposits, or other signs of damage that may have occurred and that may give you some clue to what has been happening inside your engine.

Your next step is to remove the carburetor and check the intake port for signs of dirt, poor seal, or perhaps a damaged gasket. When the cylinder head is off, examine it carefully, noting the amount of

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Air cleaner is easily inspected by shining a light through the center.

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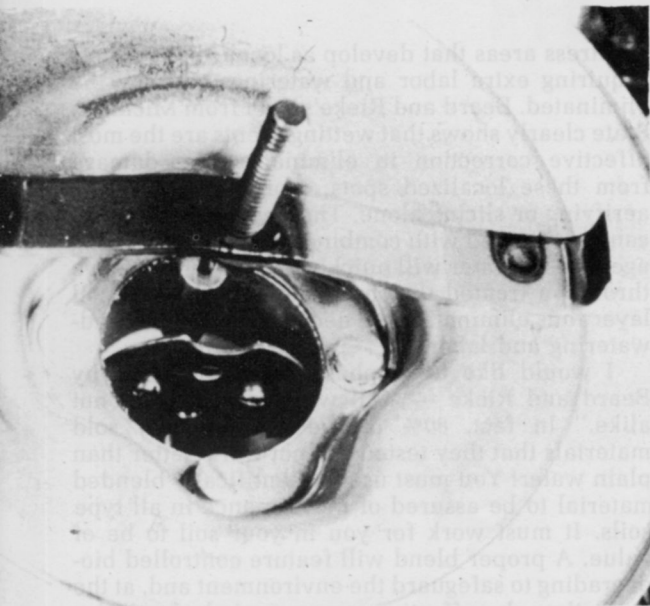
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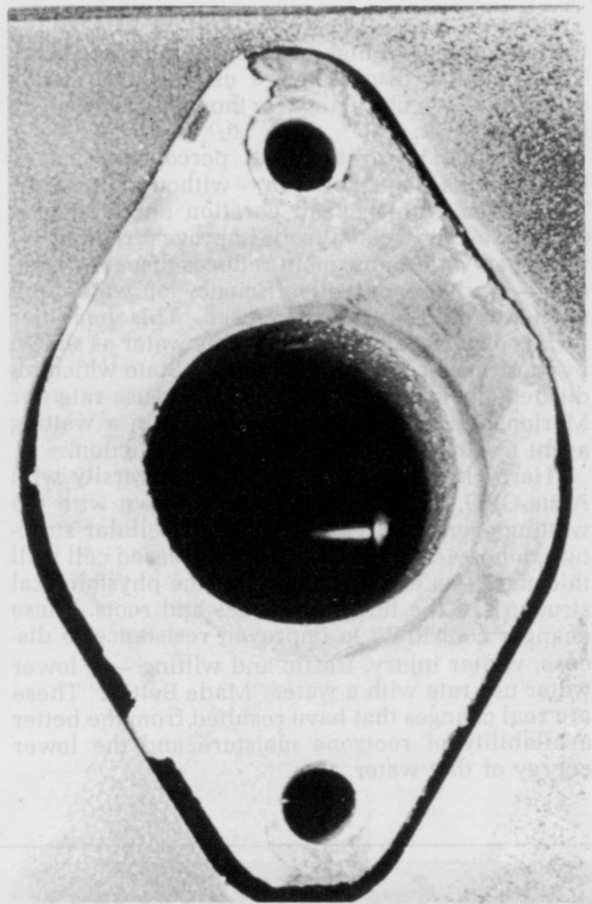
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Look down the throat of the carburetor (top, left) to check for dirt and debris getting past the air cleaner. After removing the carburetor, check the intake port for evidence of gasket damage, poor carburetor seating, and dirt. (top, right)



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carbon build up inside and the type of build up. Hard and crusty carbon might indicate that the engine is overdue for its scheduled carbon cleanout or that for some reason the engine has been running excessively hot. A softer, sootier deposit would mean that you are experiencing excessive oil consumption or that you have too rich a fuel mixture.

When you pull the pan, check it closely for sludge and pieces of parts or foreign objects. Tracking down the source of such foreign objects will give you a real clue to the source of your engine troubles.

Next come the valves. Power loss, poor compression, difficult starting, and high fuel consumption are all signs of valve problems.

One of the most common of the valve failures is burning. A burned valve is most often the result of improper seating or leakage. If the entire surface of the valve face is damaged, you know that there was probably insufficient valve clearance. As the engine got hot, the entire valve was prevented from seating.

If the face has been burned only on one side, the burning was caused by a poor grind on the face or the seat, or the wrong valve was used. If the damage was caused by an improper grind, inspect the face and the seat. You may be able to regrind the valve, but often you are better off to replace it.

Sticking valves, another common valve ailment, is most often caused by gum, combustion deposits,

and carbon on the valve stem. An engine that dies after 20 or 30 minutes of running and is then hard to start is displaying typical symptoms of sticking valves.

The deposits are often caused by running the engine excessively hot. If you notice that the engine was dirty or that the air intake was restricted, you may have found some of the contributing factors to the valve sticking problem since dirt and restricted air flow would cause the engine to run hot. The cure for stick valves is to ream the guides and replace or clean the valves.

Condensation inside the engine or running with too lean a fuel mixture can cause valve erosion which shows up at the top of the stem and the underside of the valve head.

At this point, what have you learned by carefully examining the appearance and condition of the engine components? You may know that your maintenance schedule should call for closer examination of the air cleaner, a cleaning of the engine surface and cooling fins, or a close watch on the oil. You might have learned that you are allowing dirt and grit to get into the engine or are running too lean a gas mixture. What you are seeing may be a series of seemingly small things that have contributed to poor engine performance.

In the next installment, I'll discuss pistons, rings, connecting rods, and what you can learn from analyzing them during an engine teardown. **WTT**