RINGS AND PISTONS INDICATE ENGINE MAINTENANCE NEEDS

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In the July issue, we talked about analyzing the air intake system, oil, carburetor, and valves as you tear down your four-cycle engines. By carefully noting what you find, you can better understand what steps you must take to prevent engine problems in the future.

Now we come to the rings and the pistons. Here you should remember that almost all ring and piston failures are related to either excessive wear or seizure.

If during teardown you find that a piston has cracked, check for wear patterns on the side of the piston, excessive wear on the rings, and wear patterns in the cylinder bore. Such wear can cause piston slap which leads to cracking in the piston skirt.

In some instances, wear may be caused by dirt that entered through the air intake or by a build-up of carbon. You can tell this by examining the top ring and the area above it. If the top ring and the area above it are excessively worn but there are signs of decreasing wear on down to the oil ring it is likely that dirt or carbon contamination was the culprit.

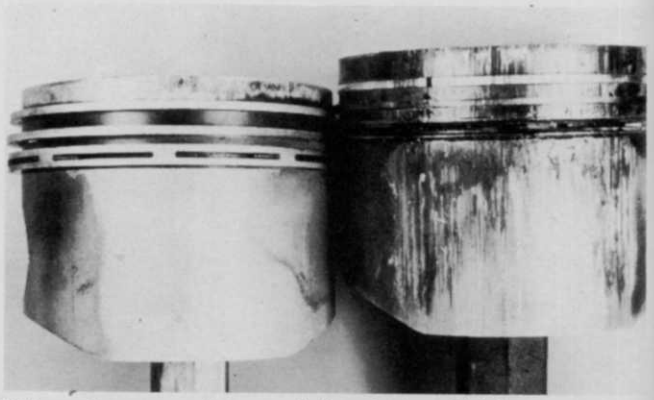
Piston seizure is most commonly caused by overheating resulting from a lack of cooling air. It can also be caused by poor lubrication, oil additives, foreign matter in the oil, and gum deposits from stale gasoline. Since all of the causes leave similar types of damage, it is very difficult to single out the culprit by examining the affected parts. But, if you have carefully noted the condition of the oil and cooling system when you began the teardown, you can probably figure out the cause of the seizure.

It used to be assumed that the discoloration of a rod indicated a failure caused by lack of lubrication. Recent studies show, however, that such discoloration may have many causes.

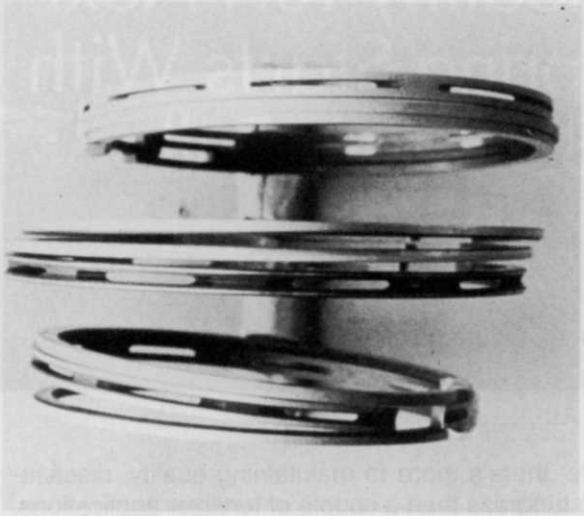
You can analyze a rod failure by checking four areas. First, inspect the dipper. Has it been broken off? Note its color compared to the rest of the rod. If there is a color difference between the top of the rod and the bottom it indicates that there was oil in the crankcase. If the dipper is broken and the color on both sides of the break is the same, that would indicate that the break occurred after the seizure. If the rod is the same color from one end to the other, it indicates that there was no cooling and that the entire rod ran extremely hot.

If the dipper is missing, check the surface of the break for clues to the cause of the breakage. Burned oil on the break surface indicates that the dipper broke before the seizure. An oil-free break tells you that the break occurred after the seizure.

Next examine the rod bearing surfaces. Look for the presence of deposits as indicators of specific conditions. For example, carbonized oil deposits on the bearing surface show that there was oil present so a lack of oil is unlikely to be the cause of the engine failure. If no such deposits exist, there was no oil present when the failure occurred and that has to be considered as a possible cause of the engine trouble. Partial scoring of the surface of the bearing shows that there was an incorrect fit between the rod and the crankshaft.



Pistons show excessive wear (left) and seizure (right). Wear can be a result of dirt coming in the air intake or carbon buildup. Seizure is usually caused by inadequate colling or poor lubrication.



Oil rings tend to wear faster and get wider as wear takes place.

The third area to be examined is the surface between the cap and the rod. Improper fit here is usually the result of incorrect tightening or incorrect torque. You should be able to see signs of this on the mating surfaces as well as on the rod bolts.

Rough mating surfaces may prevent correct fit between the rod and the crankshaft even though proper torque is applied. That will cause an un-

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even scoring on the bearing surfaces because there was not enough clearance between the rod and the crankshaft.

If the rod was not tightened to the correct torque, the mating surface will have a peened effect caused by the two sections of the rod pounding together. A dull gray finish — called fretting — would be the result if the two rod sections were not quite loose enough to cause peening but still loose enough for the two parts to work against each other.

If the mating surfaces have indicated a loose connection, check the bolts. If a bolt is polished all the way around it means it was turning or backing out. If it is polished only on one side, that indicates that the bolt was stationary.

The fourth area you should examine are breaks. Look along the sides of any breaks for faults such as pock marks.

One last area that should be considered is oil pump failure if the engine is pressure lubricated. Examine the pump carefully for failure. Check the oil galleries to be sure that they were not restricted or completely plugged.

At this point, you have made a very thorough examination of your engine. You have noted the condition of the oil as you found it, the state of the air cleaning system, and any marks on pistons and rings. From these observations you can identify the cause of this particular engine failure.

Determining the cause of the failure would be strictly an academic exercise unless you plan to do something about it. If lack of lubrication seemed to be the problem, certainly you would pay extra attention to that in your regular maintenance schedule. If your air cleaner was dirty or grass screen clogged, you would make a note to check these more frequently.

By finding out what causes an engine problem, then taking steps to correct the problem, you can reduce the frequency of engine repair and costly downtime.

A bit of failure analysis is all it takes — and it's worth it. **WTT**