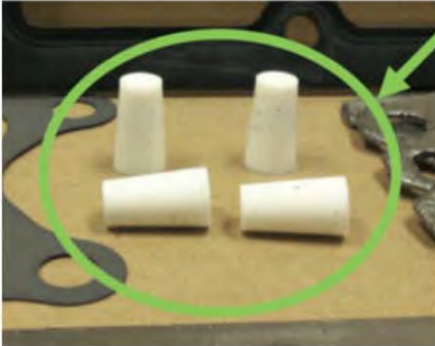


Simple precautions for Cummins® ISX Engines

BY STEVE SCOTT

Cummins ISX engines have been the subject of many articles, due in part to the popularity of these engines within the on-highway industry. Here are a few simple precautions that may help you avoid some major problems.

Most bearing manufacturers will tell you that debris (dirt) is the number one cause of bearing failure, which brings us to the first simple precaution. To those not familiar with the ISX engines, the presence of small plugs in the engine and gasket kits may be of concern if the technician does not know their purpose, and/or if discovered after the engine repair is completed.



Plugs

The OE has made several attempts to stress the importance of using these plugs during repairs on ISX engines in various service campaigns and literature; however, these plugs are often overlooked. The purpose of these plugs is to temporarily block off the oil ports, thus keeping debris out of the engine while it's being repaired. On the ISX engine, you will find almost straight ports from the lower bearings to the upper bushings in each corner of the cylinder block and head. After the head is removed from the cylinder block, these ports become open pathways for debris to enter straight down into the lower oil passages of the engine.

(continued)

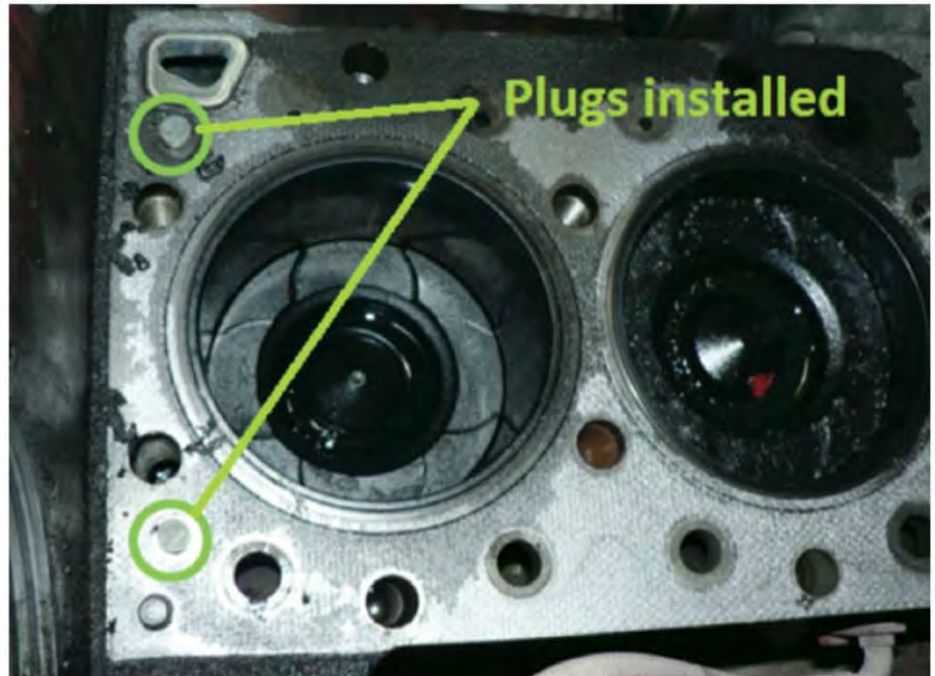
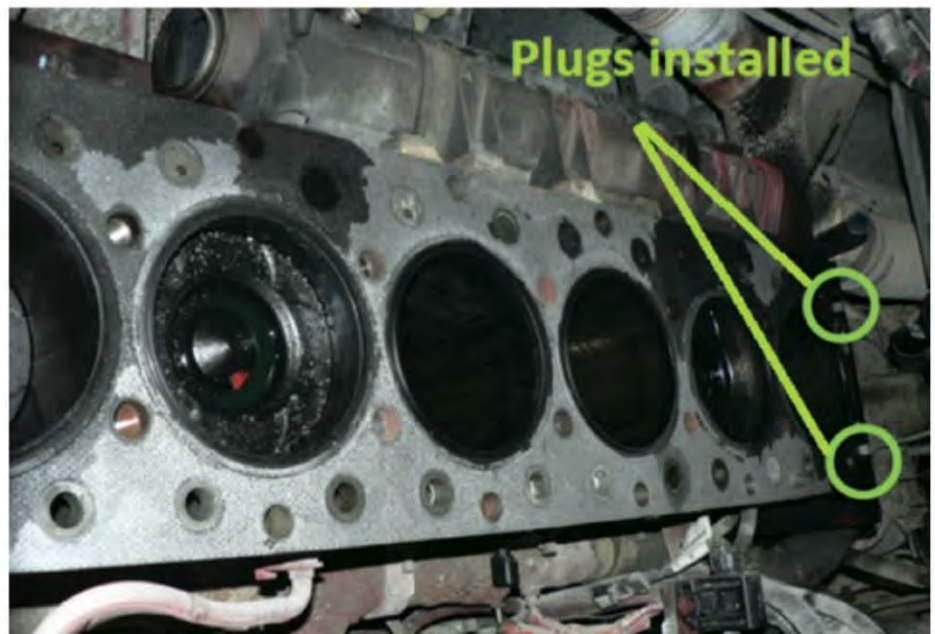


Photo above shows the front of an ISX block with the plugs (circled in green) installed in the oil ports.



There are two additional ports at the back of the block.

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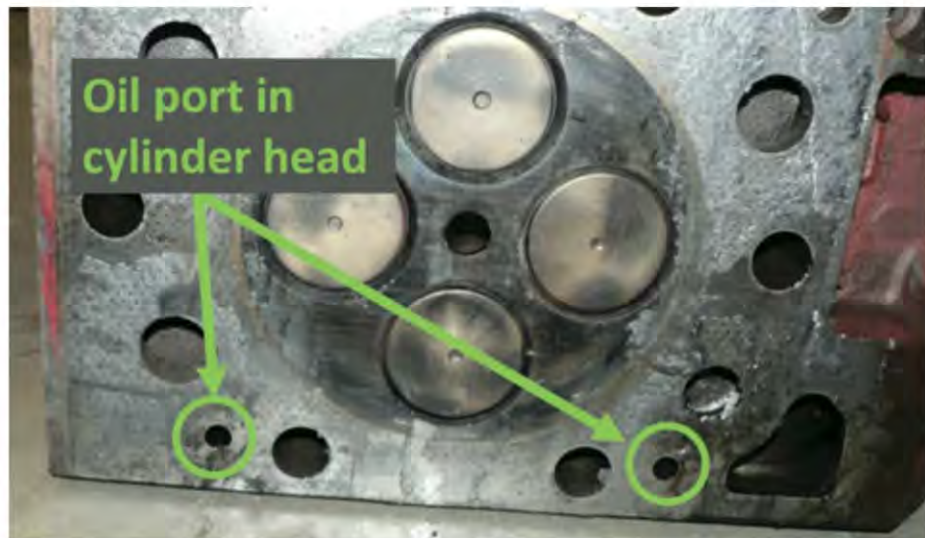
Plugging the ports in each corner of the cylinder head is also important, since debris entering these ports can go directly into the cam and upper bushings.

Of course, there are far more ports to consider on an engine than where these plugs are used. In fact, there are additional plugs used for the front and sides of the cylinder block. The OE service manuals have more detailed instructions for keeping debris out, and for cleaning and protecting engine components, which should be considered when working on these engines.

The next precaution involves the injector camshaft and bushings on the earlier dual overhead cam engines. The injector camshaft is massive in comparison to the valve camshaft, with a journal diameter of approximately 85.0 mm (3.346") compared to the journal diameter of approximately 65.0 mm (2.559") of the valve cam. The injector cam weighs almost 60 lbs., versus 35lbs. for the valve cam. While it may be common practice to drive the camshaft bushing in for other engines, the Cummins installation instructions indicate that the cam bushings (injector & valve) are to be pressed in (not driven). Several cylinder head rebuilders have reported that they are convinced that due to the size and amount of retention (crush) holding the injector cam bushing in place, that they cannot be driven in without distorting or damaging the bushing, which may cause them to fail once the engine is put in service.

Common to most assembly instructions and practices, lubricating the camshaft bushing and journal, and pre-lubing an engine before startup is not new. However, please note that this massive injector camshaft receives its oil from the cylinder head at the end journals (#1 & #7). Oil is then supplied to the remaining journals via the large oil port inside the camshaft. This internal oil port holds approximately 1.06 liters (36 oz.) fluid. That's over a quart of oil in this camshaft alone! Considering the load that's placed on these camshaft bushings, the timing for pressurized oil to reach the bushings is critical.

Another precaution to be aware of concerns the connecting rod bearing and bolts. There are three different styles/types of connecting rods used in these engines. The early engines used a non-drilled rod, which do not have an oil passage running between the connecting rod bearings up to the



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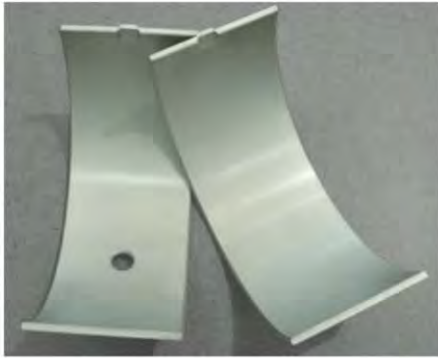
connecting rod bushing. Later engines use drilled connecting rods, of which there are two different types "saw cut" and "fractured". These terms describe the surfaces between the connecting rod and rod cap. "Saw cut" rods have been used for years, and "Fractured" rods are the newer technology (released in 2012). Matching the correct connecting rod bearing to the correct rod is critical. Non-drill bearings must be used with non-drilled rods, and drilled bearings must be used with drilled

rods. "Fractured" rods require different bearings from "saw cut". "Fractured" and "saw cut" connecting rods can be mixed in an engine.

The connecting rod bearings (big end) for the "saw cut" rods are made up of an upper and lower shell. The shells are marked as to their locations, and have alignment tabs that are somewhat offset; however, this design does leave room for error. In most cases where upper and lower shells are involved, the alignment tabs are designed so that the shells

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cannot be installed incorrectly. In the ISX “saw cut” connecting rods, the tabs on the bearing shells are only offset approx. 2.89mm (.114”).

Although it is noticeable if the shells are installed incorrectly, the connecting rod can actually be installed this way. There is enough clearance that the rod can be bolted in place to the crankshaft. If this happens, the engine is destined to fail. The bearing will wear on the fillet radius of the crankshaft. Since the lower shell (which is now in the upper position) doesn't have the oil supply hole in it, then the connecting rod bushing (small end) and piston pin connection fails due to the lack of an oil supply.

The bearings for the “fractured” rods also have an upper and lower shell, but the tab design prevents them from being install incorrectly.

Lastly, if the connecting rod bolts are going to be reused, then they must meet the following criteria:

- The minimum diameter for the bolt above the threads is 11.10mm (0.437”).
- The maximum length of the bolt from the bottom face of the bolt head to the end of the bolt is 101.00mm (3.976”).

If the bolts do not meet both of these requirements they should be replaced. ■



Steve Scott joined the service department at IPD in 1982, working with parts, service and sales for a variety of equipment, diesel, and natural gas engines. Since 2004, he has been the director of product development and technical support for IPD. For more information, email sscott@ipdparts.com.

