KOHLER Engines

Service Bulletin

NO.	347
MODEL	ALL
DATE ISSUED 5/16	DATE REVISED

Cylinder Leakdown Tools and Test Procedures

Recent investigation has identified discrepancies regarding the accuracy of leakdown test results. There are numerous variables contributing to these inaccuracies, with the main factors being the leakdown test tool, the techniques used during the test procedure, and understanding the test results.

Single Gauge Leakdown Tools

Single gauge leakdown tools, such as cylinder leakdown tester 25 761 05-S, utilize one gauge to set the incoming line pressure and the same gauge to observe pressure differential created by cylinder leakage. Single gauge tools typically do not indicate a PSI value, instead indicating a percentage of leakage in conjunction with shaded areas indicating Low, Moderate, and High. Once the valve is opened and air flows into the cylinder, the gauge indicates an approximate amount of cylinder leakage.

With a single gauge tool, once the valve is opened, the incoming air pressure can no longer be regulated at a specific pressure. Without the ability to precisely regulate incoming air pressure while simultaneously observing pressure differential on a second gauge, a single gauge tool cannot accurately measure a specific percentage of leakage.

Kohler Tool 25 761 05-S and the shaded areas indicating Low, Moderate, and High leakage are reasonably accurate for cylinders exhibiting normal (green/Low) to high normal (yellow/Moderate) amounts of leakage. **The percentage of leakage indicated is not accurate and should be ignored, relying solely on the text of the shaded areas.** Refer to Figure 1: This cylinder has leakage in the yellow shaded area indicating moderate; the 60% should not be read as the actual cylinder leakage.

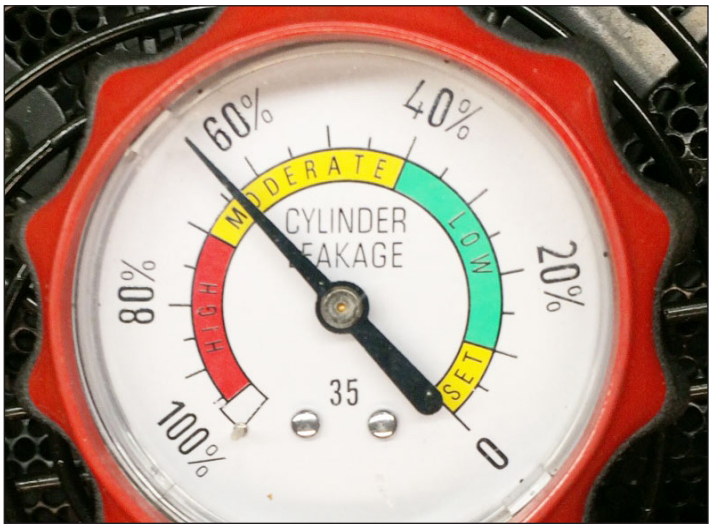

Figure 1. This should not be understood as having 60-70% leakage.

Because the current version of 25 761 05-S requires approximately 35 PSI to set/zero the gauge, this tool becomes less accurate when indicating high (red shaded) leakage. Numerous independent tests have identified 35 PSI can be insufficient for accurately measuring high amounts of leakage. This is more problematic on a single gauge tool where the incoming line pressure cannot be regulated precisely at 35 PSI. A tool utilizing an incoming line pressure of 75 PSI or more may indicate a passing leakage value on the same cylinder that fails utilizing a tool that relies on a lower incoming line pressure such as 35 PSI.

Kohler Engines continues to support the value of this tool as an indicator of the source of the cylinder leakage. The current tester is also useful in determining the relative condition of the engine when descriptions of low, moderate, and high are used (not a percentage of leakage).

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Dual Gauge Leakdown Tools

Dual gauge leakdown tools (see Figure 2) utilize one gauge to precisely regulate incoming line pressure and a second gauge to observe pressure differential created by cylinder leakage. Ideally, both gauges will be identical and read up to 100 PSI. This tool provides the ability to precisely regulate incoming line pressure while identifying an accurate percentage of leakdown. For example, with 100 PSI of incoming line pressure indicated on one gauge and 80 PSI indicated on the second gauge, 20% leakage can easily be calculated. Additionally, the incoming line pressure can be precisely regulated as needed. For example, with 80 PSI of incoming line pressure indicated, and 40 PSI indicated on the second gauge, 50% leakage is calculated.

Figure 2. Dual Gauge Leakdown Test Tool.

Confirming and Retaining Tool Accuracy

Inspect the pressure gauges for faults, such as the needle not being in the proper position at rest (see Figure 3); this indicates a defective gauge that requires replacement. It is critical to release (by turning counterclockwise) regulator pressure every time the tool is used, as excess line pressure can damage the gauge.

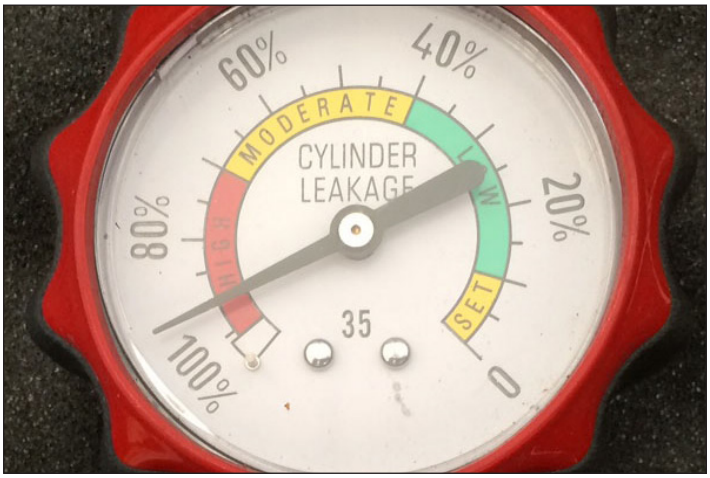

Figure 3.

For dual gauge tools utilizing identical gauges, confirm the gauges are accurate to each other (connect tool only to air supply and regulate air pressure- both gauges should indicate the same value); small discrepancies can then be documented and compensated for.

A Master Orifice Tool can and should be used to verify the accuracy of any leakdown test tool. The master orifice (Kent-Moore 646953A) indicates an industry standard of acceptable leakage for the leakdown tool used and the environmental conditions it is being used in. Ideally, this procedure would be done prior to performing every leakdown test.

Understanding the Results

It is important to understand leakdown testing is a static test, meaning the leakage identified may not be accurate for a running engine (a dynamic test). A running engine produces significant cylinder pressures and conditions that cannot be replicated by static test procedures.

Whenever high leakage is identified, the next step is verification. The source of high leakage should be documented. If the engine runs acceptably, it should be ran under conditions that duplicate normal loads and normal operating temperatures. A consecutive test of the failing cylinder should be performed immediately afterwards. If the cylinder now passes, document and return to service.

If the cylinder fails consecutive leakdown tests, consider the source of leakage and any related customer complaints before disassembly. Oil consumption, spark plug condition, and crankcase vacuum need to be taken into consideration.

For example, high leakage past a valve will not cause engine oil consumption, though excess oil entering the intake may create excess carbon deposits on the intake valve that prevents proper valve sealing. **This excess oil may be caused by a valve guide/seal issue and/or breather system issue that does not require head removal to repair.** Excess carbon deposits on valves can result in high static leakdown test values without significantly affecting engine performance or actual (dynamic) valve sealing.

High dynamic leakage into the crankcase will overwhelm the ability of the breather system to function and maintain proper crankcase vacuum, often forcing excess oil into the breather system and creating excess oil consumption. **If high leakage into the crankcase is measured static and crankcase vacuum testing passes, dynamic leakage is not likely to be excessive.** This too could be caused by a condition that does not require engine disassembly and repair, such as a flooding carburetor that is affecting piston to cylinder lubrication and sealing.