УДК 62

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VACUUM METHOD FOR ASSESSING THE STATE OF THE CYLINDER-PISTON GROUP AND PREDICTING THE RESIDUAL LIFE BY THE CLAS DEVICE

Abstarct*: In this article given vacuum method and diagnosing of cylinder-piston group by modern devices.*

Key words*: dignostics, vacuum, cylinder, piston, CLA*

Introduction

The cylinder is the space through which the piston travels, propelled to the energy generated from the combustion of the air/fuel mixture in the combustion chamber. In an air-cooled engine, the walls of the cylinders are exposed to the airflow, to provide the primary method of cooling to the engine. Using the Cylinder Leakage Analyzer (CLAs) (Fig. 1), it is possible to reliably accurately (without disassembling the engine) evaluate separately the technical condition of the entire valve train, cylinder liner, compression and oil scraper rings.

Figure 1 -

Cylinder Leakage Analyzer (CLA)

Diagnostics with this device does not differ from the measurement of compression. All measurements are carried out in the process of "cranking" the engine with a starter or a starting device through the spark plug or nozzle holes. The advantages of the CLA are in the simplicity of the diagnostic process and, at the same time, in the high information content of the measurement results. The advantages of the device are that no matter what state the battery is in, its condition will not affect the quality of diagnostics. It is not necessary to know the nominal compression value for each engine in order to compare it with the diagnostic results. You only need to know the brand of fuel on which the given car drives.

Research

The diagnosed parameters are checked against the diagnostic diagrams for the given type of fuel, and the state of the CPG is assessed. Diagnostic diagrams have been developed for AI-80, AI-92-95-98, and diesel fuel. And if the car alternates between running on gasoline and gas, then the diagram should be used for this brand of gasoline. Due to the timely detection of defects in the components of the CPG, the Cylinder Leakage Analyzer (AGTs) allows you to avoid unreasonable repair of the CPG, to make fuller use of the engine resource, and to carry out routine maintenance efficiently.

The principle of diagnostics by the CLA device

The presence of two original valves in the CLA makes it possible to measure two significant parameters using a vacuum gauge when the engine is "cranked" by the starter: P1 and P2. An explanation is required here. The total vacuum value (P1) is measured in the space above the piston (Fig. 2), during the intake stroke through the vacuum valve.

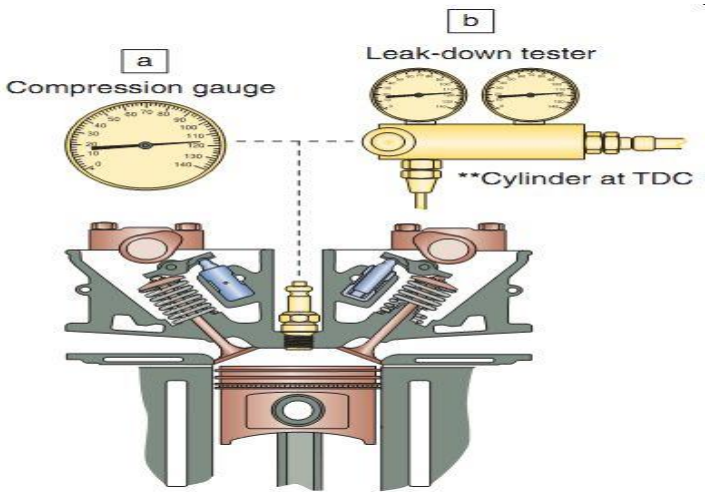

Figure 2 - Scheme for measuring total vacuum

Before the measurement, during the previous compression stroke, the cylinder is purged through the low pressure reducing valve (0.01 bar). The obtained value of the total vacuum makes it possible to estimate the wear of the cylinder wall (liner) and the density in the mating of the valve and the seat.

However, parameter P1 does not make it possible to assess the condition of the piston rings; the presence of an oil "wedge" allows maintaining a sufficiently high vacuum in the space above the piston. The degree of wear of the piston rings is assessed by measuring the second parameter (Fig. 3) - the residual vacuum (P2).

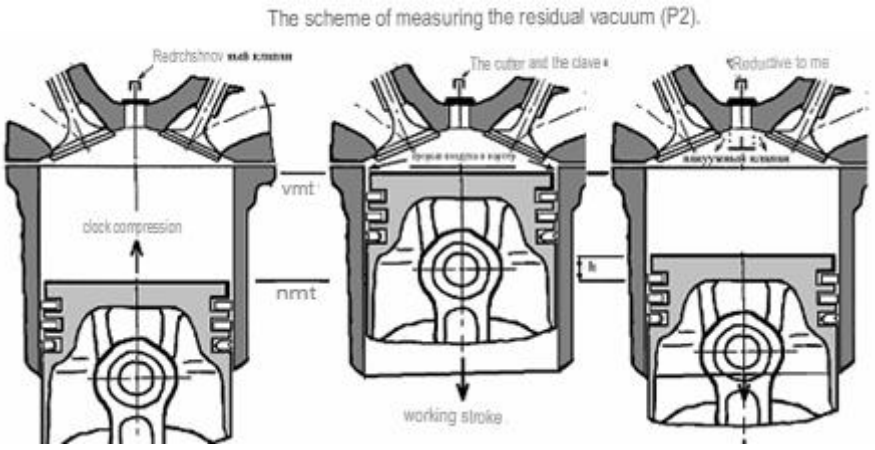

Figure 3 - Scheme for measuring residual vacuum

To measure its value, the over-piston volume is isolated by overlapping the pressure reducing valve. In this case, during the compression stroke, the pressure rises to a maximum value (compression value) and a part of the

compressed air "breaks through" through the gaps in the mating of the piston rings into the crankcase.

Measuring the expansion vacuum value in this case (again through the vacuum valve) allows you to determine the residual vacuum (P2), the value of which is proportional to the compression loss due to air leakage. In the normal condition of the rings, the value of P2 is extremely small and significantly increases with wear, breakage or coking.

It is easy to check the gas distribution mechanism. If the valve is loose in the seat, it is difficult to pinpoint the exact cause of the difference between P1 and P2. But if there is a crack, chipping or burnout on it, P1 sharply decreases and excess oil or unburned fuel is no longer able to close the gap.

Reconciliation of the results of measurements of the total vacuum (P1) and residual vacuum (P2) with the state diagram of the CPG for a given type of fuel and gives an assessment of the state of the CPG.

The procedure for diagnostics by the CLA analyzer

1. The engine warms up to a temperature of 80°C - 85°C;

2. Unscrew candles (nozzles) from all cylinders;

3. The ignition coil (switch) is turned off. On diesel engines, squeeze the fuel pump rail (shut off the fuel supply);

4. The engine is cranked by the starting device for 3-5 seconds to blow out all the dirt from the combustion chamber.

5. The adapter (PU) is connected to the spark plug (nozzle) hole and the device is connected to it.When diagnosing diesel engines, the device must be connected to an injector simulator. Connecting an CLA instead of a glow plug will not give a reliable measurement of the total vacuum (P1).

6. Measurement of full vacuum (P1):

CLA is connected to the spark plug (nozzle) hole. The plug is completely unscrewed and removed. The starting device is turned on to rotate the crankshaft for 3-4 s. The value (-P1) of the complete vacuum is fixed. Measurements in the

remaining cylinders are carried out in the same way. The reading of the vacuum gauge is recorded and the P1 measurement is deleted by pressing the reset valve button.

7. Measurement of residual vacuum (P2):

The pressure reducing valve is closed off with a plug, screwing it in until it stops so that the sealing ring of the plug fits snugly against the cover of the pressure reducing valve. CLA is connected to the spark plug (nozzle) hole. The starting device is turned on to rotate the crankshaft for 5-8 seconds, while during scrolling it is necessary to press the reset button three times, after fixing the parameter P2 by the vacuum gauge. The first time the residual vacuum parameter will be incorrect (since it is not known in what position the piston was at the beginning of the rotation), the second and third times the vacuum gauge readings must match. This is the value of the residual vacuum (P2). The value of P2 of the residual vacuum is recorded. Measurements in the remaining cylinders are carried out in the same way.

Conclusions

One gauge on the tester measures the pressure of the air entering the cylinder and the other measures the percentage of the air escaping (or leaking) from the cylinder. The loss percentage will indicate the condition of the cylinder and overall condition of the engine.

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