INFLUENCE OF THE TECHNICAL CONDITION OF THE LOW PRESSURE SYSTEM ON THE FUEL SUPPLY PROCESS

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Abstract: *Analysis of operational reliability of tractor diesel engine's supply system indicates that some of the most common faults and failures are in the fuel fine and coarse filters. In process of work, fuel filter's elements gradually are polluted by mechanical particles that are present in the fuel. This leads to increase the fuel filter's hydraulic resistance and reduce the pressure in injection pump head.*

Keywords: POLLUTED FUEL FILTERS, FUEL CONSUMPTION

1. Introduction

Analysis of operational reliability of tractor diesel engine's supply system indicates that some of the most common faults and failures are in the fuel fine and coarse filters. In process of work, fuel filter's elements gradually are polluted by mechanical particles that are present in the fuel. This leads to increase the fuel filter's hydraulic resistance and reduce the pressure in injection pump head. Allowable pressure drop due to increased hydraulic resistance in fuel fine filter in tractors UMZ is 0,05 – 0,055 MPa. In the norms for maintenance was regulated periodically changing of filter's elements in order to not exceed the maximum permitted pressure drop. The use of fuels with high content of mechanical impurities or the presence of water in it leads to extensive pollution of the filters and reduce their throughput [2]. This naturally affects to the fuel supply process [1].

2. Problem discussion

The goal of the research, results of which are presented in this report, was to determine the degree of influence of the fuel fine filter's condition on the fuel supply processes and on the technical and economic characteristics of UMZ tractor's engine. Physical modelling of changing the fuel filter's technical condition (increasing its hydraulic resistance) was done by throttling the fuel flow from fuel pump to the injection pump head. To identify and analyse the fuel supply processes the fuel pressure curve characteristics in the high-pressure fuel lines were plotted. To determine the influence of the fuel filter's technical condition on the engine's technical and economic parameters its power and fuel consumption were measured. Measurements were made on the "D65 N" engine mounted on brake dynamometer. Fuel consumption was defined by flowmeter of liquid fuel type RTG-2. Experimental studies were carried out at the engine's work conditions close to its nominal, because it implied that the influence of the fuel filter is greatest. For visualization the pressure was used measuring system composed of piezo transducer RFT connected to the high-pressure fuel lines. The signal obtained from it was amplified and fed to a dual channel oscilloscope "Philips PM 3335". Information from individual measurements was stored in the oscilloscope digital memory. Via serial interface "RS-232" intended for connection to plotter, the records were transmitted to a computer. "Serial Watcher" program was used to reads the data flow through the serial port and save it in a text file format. With a specially developed application [3] "PM3335 Software" the saved data is plotted and two separately collected pressure curve characteristics are visualized on the graphical window. This allows easy and accurate compartment and analyses of the parameters of the experimentally obtained curves of the fuel pressure. To determine the invariance of the pressure in the high-pressure fuel lines curve characteristics were plotted at random periods of time under the same technical condition and engine modes (fig.1)

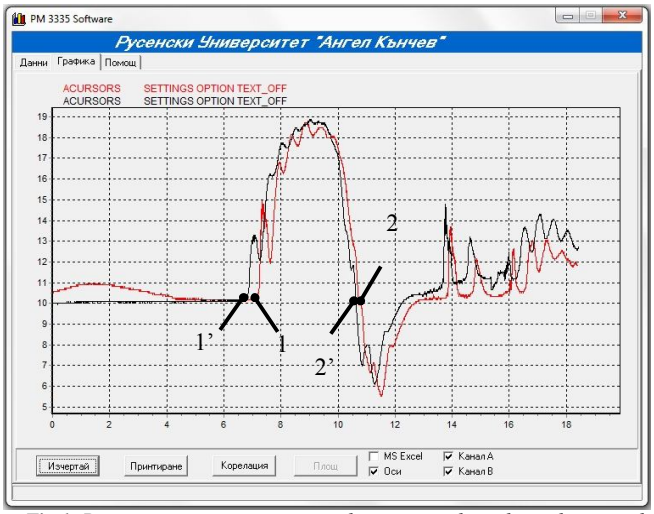

Fig.1 *Pressure curve variation at the same technical condition and engine mode.*

Figure 1 shows that the variation of the start fuelling dynamic angle (point 1) is about 0.40, and injection time (from point 1 to point 2) is about 0,30. This shows that there is good repeatability of the curve characteristics of individual trials. Comparing the pressure curve characteristics in the high-pressure fuel lines of polluted and no polluted fuel filter (Figure 2) shows that with the increase of its hydraulic resistance fuel injection process (point 1') moved towards delay. This affects to engine combustion process and leads to power reduction and increase the fuel consumption.

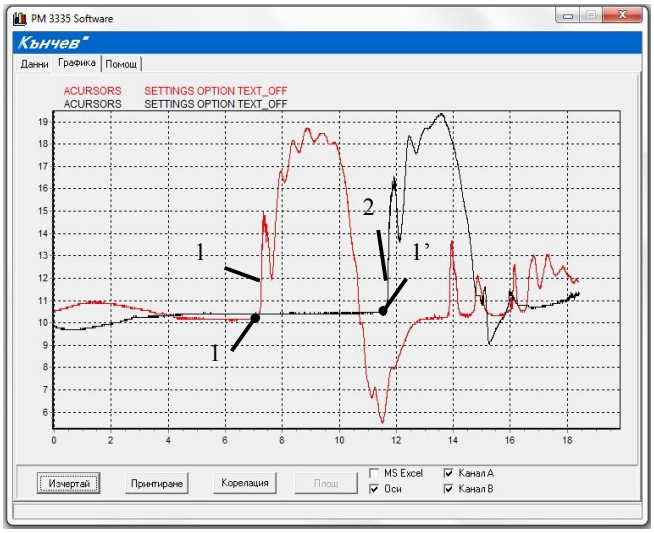

Fig.2 *Pressure variation in the high-pressure fuel lines of no polluted - curve 1 and polluted - curve 2 fuel filters.*

3. Conclusions

1. The analysis of the pressure curve characteristics in the high-pressure fuel lines shows that increasing the hydraulic resistance in the fuel filter leads to a change of fuel supply advance angle and fuel injection time. This influences on combustion process in engine, which reduces the engine's power and increases the fuel consumption.

2. Experimental results show that the greatest change in fuel supply advance angle is seen when the pressure drop below 0,01 MPa in injection pump head and it deviation reaches 160 angle of rotation of the crankshaft.

4. References

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