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RESEARCH ON DIESEL EFFICIENCY WITH WATER INJECTION IN THE AGRO-INDUSTRIAL COMPLEX

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According to the developed general research methodology, the experiments were conducted in two stages:

- laboratory - taking the loading and external speed characteristics of the 4Ch 11/12.5 engine when injecting different mass-volume fractions of water into the intake manifold;

- field - carrying out traction tests of the pilot model of the agricultural seeding machine-tractor unit as part of the MTZ-82 tractor and the SZS-2.1 stubble planter on the stubble of fodder crops (clover of the first year of use).

In accordance with the experimental research program, measurement methods were selected and sensor installation locations were determined, current collector designs and measurement schemes for individual parameters were developed.

Laboratory tests. Laboratory tests were conducted in a room with active ventilation at an ambient air temperature not exceeding 20...30 ^{0}C. Atmospheric pressure was recorded at no more than 90...100 kPa (675...760 mm Hg). The values of engine parameters (torque, engine crankshaft speed, and fuel consumption) were determined simultaneously. The time for measuring fuel consumption was at least 30 seconds. Experiments were conducted in accordance with the recommendations of DSTU 18509 and DSTU 41.96-2011.

Before starting the tests, the brake stand and instruments were calibrated. Temperatures were recorded during the measurements:

- air supplied to the engine (measurements were carried out at a distance of no more than 0.15 m from the inlet to the air cleaner);

- exhaust gases of the engine (measurements were carried out at a distance of no more than 0.10 m behind the outlet flange of the exhaust pipeline);

- coolant and oil in the engine crankcase;

- diesel fuel (at the entrance to the engine fuel system).

Atmospheric pressure and exhaust gas pressure were also recorded (at a distance of no more than 0.10 m from the outlet flange of the exhaust pipeline). The test bench was additionally

equipped with a device for supplying water to the intake manifold of the experimental engine 4Ch 11/12.5.

Water was supplied under pressure created by an electric centrifugal pump. The synchronicity of the water supply control depending on the load on the brakes was ensured by the mechanical connection of the liquid rheostat reducer with the ball valve on the water line of the water injection system (Fig. 2).

Fuel consumption was measured by a mass method. In order to increase the accuracy, the measurement of water flow was carried out simultaneously by mass and volume methods.

When testing the engine, an electric brake stand KI-1363B was used.

The study of the working process (indication) was carried out with the help of a piezoelectric pressure sensor, which was installed in the first cylinder of the experimental engine. Considering the fact that the readings of the piezoelectric sensor largely depend on the heating of the sensitive element, the sensor was equipped with a cooling system. The applied cooling system ensured a stable temperature of the piezoelectric sensor throughout the experiment.

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