

BIOS No. A22I.G. (Oppau) Rep. No. 47216.8.41Halder.Testing of the lubricating quality of R 200 and R 300

Synopsis: R 200 and R 300 were examined on four different instruments in regard to lubricating quality and wear and compared with Diesel fuel II and leaded gasoline. It was found that Diesel fuel II was a better lubricant than R 200 and R 300. The latter were about as good as leaded gasoline. A uniform grading of the substances is not possible because of the different results obtained from the four instruments. The operation of an injection pump with R 200 or R 300 was thus not possible without lubrication, just as in the case of gasoline.

Purpose of the experiments.

The experiments had the object of finding out whether failures would occur in the operation of an injection pump with R 200 and R 300 due to deficient lubrication. In particular it was required to investigate whether the use of these ignition fuels, as with gasoline, would require lubrication of the injection pump with oil. The alternative would be to do without lubrication, as can be done with Diesel fuels. Diesel fuels II and gasoline VT 702 + Pb were therefore used for comparison purposes.

Experimental arrangement and method

The instruments were:-

- the four-ball machine (see report No. 293)
- the wear machine (see report No. 388 and 488)
- the Wieland machine
- the chain machine which will be reported shortly.

Tests were normally carried out at room temperature, but a temperature of 30°C was used in the wear machine.

Experimental results

Of the four substances tested the best lubricating properties were shown by Diesel fuel II on the fourball machine (fig. 1), the Wieland machine (fig. 2), and the chain machine. This fuel showed least wear in the region of higher pressures between 1300 and 400 kg/cm² (see figs. 4 and 5). For longer test runs, i.e. for lower specific load, the wear rose rapidly, exceeding that of any other substance. Since higher pressures are used in the operation of injection pumps Diesel kraftstoff II may also be considered superior on the basis of these wear experiments.

Different order of evaluation resulted when the two ignition fuels were compared with leaded gasoline.

The seizing of the bearings in the Wieland instrument occurred with two plates with R 200, with 2 or 3 with VT 702 + Pb, and with 3 to 4 plates with R 300. The lubricating qualities of R 300 thus seem the best.

The same order is obtained in the four ball engine but only with a load of 45 kg (see fig. 1). At higher loads the seizure delay is of the same order for R 200 as for R 300, both being above that of gasoline. Since the four-ball instrument works with extraordinarily high pressures, the region of lower load may in this case approximate more nearly to practical conditions.

The determination of the coefficient of friction only showed small differences. Gasoline was a little better than the two R- substances. The latter differed little from each other (fig. 3)

At a temperature of 30°C the gasoline gave the highest wear (fig. 4). The effective pressure of 1200 kg/cm² at the beginning of the experiment was so large that the conical brass test piece used was worn down to a diameter of more than 5 mm in the first hour. The wear observed for the ensuing 59 hours was only small. The experiment with R 300 led to a similar result; the wear was however somewhat lower on the whole. R 200 gave similar characteristic curves but considerably smaller wear. This difference between R 200 and R 300 is very remarkable. The experiment was repeated at room temperature (21 to 23°C) in order to provide a check (see fig. 5). Although the wear was less than it was for 30°C the large difference between R 200 and R 300 persisted. This phenomenon cannot so far be explained.

For wear experiments for injection apparatus see report No. 445.