



LUBLIN UNIVERSITY
OF TECHNOLOGY
MECHANICAL
ENGINEERING FACULTY



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OF TECHNOLOGY

Title: *A device for testing the physicochemical properties of fuels, particularly those containing bio-components*

Authors: Mateusz Klepka, Rafał Longwic, Przemysław Sander

Innovation number P.453190

The invention relates to a device for testing the physicochemical properties of fuels containing bio-components, intended for use in internal combustion engines, construction machinery and agricultural tractors. Previous methods for assessing this type of fuel relied solely on chemical and chromatographic analyses requiring expensive equipment and lengthy sample preparation times, whilst conventional capillary or rotational viscometers did not adequately reflect the actual operating conditions of the fuel within engine fuel systems. The aim of the invention is to develop a device enabling repeatable testing and precise identification of the amount of bio-component introduced into the fuel.

The operation of the device involves filling the tank with the fuel sample under test and setting the initial temperature to 23°C using cartridge heaters. The measuring element is lowered to the starting position, after which, upon releasing the lower cable, it falls freely into the liquid under test. The fall time is recorded, which serves as a measure of the sample's relative viscosity. The element is then raised at a speed of 10 mm/min, and a strain gauge records the resistance to movement, reflecting the fuel's adhesive and rheological properties. Once the measuring element has been raised above the tank lid, a camera records an image of the deposit forming between the hemispheres, enabling an assessment of the fuel's tendency to deposit on working surfaces. The measurement cycle is repeated at successive temperatures up to 95°C, and the results obtained are compared with reference data for ethanol, acetone and heptane of known viscosities.

A key advantage of the invention is the integration, within a single measurement system, of three previously independent analyses: the measurement of relative viscosity as a function of temperature, the measurement of the drag force in the test medium, and the assessment of the tendency for deposits to form on working surfaces. This enables the rapid and reproducible identification of the bio-component content in the fuel, the early detection of degrading additives, and the assessment of the fuel's impact on the durability of engine components and exhaust emission levels. The invention is covered by a single independent patent claim.