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OPERATING FUEL CONSUMPTION ESTIMATION IN VEHICLES

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ABSTRACT Operating fuel consumption estimation carried out by drivers encounters basic difficulties connected with the lack of reliable reference standard for comparison of measured fuel consumption during car usage. Therefore it is necessary to identify vehicle operating conditions and ascribe them fuel consumption according to the accepted reference standard. Vehicle operating conditions have been identified in this work with the use of parameter called specific energy consumption, that takes into account both the influence of external conditions and driver's style of driving. The factors mentioned above affect the amount of mechanical energy transmitted to the drive wheels, which is one of the parameters constituting the vehicle specific energy consumption. The place of vehicle operation (traffic intensity) and the style of driving a car may be unequivocal described in the proposed method by the probability density function of the specific energy consumption. The influence of the specific energy consumption on the fuel consumption in propulsion phase has been testified on the territory of the city of Gdańsk in typical urban traffic. A strong correlation has been observed for this relation. The relation obtained by linear approximation may be used with a good accuracy (R^2=0.942) for forecasting the fuel consumption during vehicle operation in urban conditions. A method of calculation of the reference fuel consumption for identified operating conditions has been proposed in this paper. Examples of the comparison of the reference fuel consumption of two vehicles, calculated for the traffic conditions registered with the use of a test vehicle on the territory of the city of Gdańsk have been presented. The reference fuel consumption calculated with the use of this method may be compared with the registered operating fuel consumption. For example, having the results of such an analysis it may be unequivocal determined whether increase of operating fuel consumption is justified by worse traffic conditions. When the measured operating fuel consumption is considerably higher than the reference fuel consumption two situations should be considered: 1. the driver realized improper style of the drive system control (e.g. driving with small load and high engine speed), 2. the drive system was damaged. Preparation of a fuel consumption characteristic (fuel consumption vs. specific energy consumption) by the car dealers (one drive in urban cycle with registration of the basic engine and vehicle parameters) would enable to compare energy efficiency of various vehicles drive systems. It would take place in more representative way for ordinary car usage than it happens today, i.e. the comparison of fuel consumption in the conditions of a chosen certification test performed in cars producers laboratories.