Abstract

The aim of this study is to determine the effects of methanol blending to gasoline on the dynamic response of the IC engine. The fuel blends were prepared by blending 0, 10 and 20 volume % of methanol with a specified amount of gasoline. These fuel blends were designated as M0G100, M10G90 and M20G80, respectively. Commercial gasoline (Octane No. is 81) was used in the study. The experiments were conducted on a single cylinder, four stroke variable compression "Varicomp" dual diesel /Petrol for cycles under various engine speeds ranging from 1200 rpm to 2000 rpm for increment of 400 rpm at constant torque of (10 N.m) and compression ratio of 9. The data acquired from these experiments present the relation between the cylinder pressure and the crank angle.

For the purpose of investigating the vibration response of IC engine under dynamically loaded and ignition condition, the experimental cylinder pressure profiles of (Prodit) single cylinder four stroke engine for different percentages of methanol blending with a gasoline base fuel, were assumed to be created in each cylinder of (Zetor-M-Type) in-line four cylinder-four stroke engine. A transfer matrix method was adopted to calculate the vibration of the crankshaft for the latter engine. It was accounted for the shear and gyroscopic effects for the mathematical model of the crankshaft and the effect of the unbalance forces, also, it was accounted for the dynamic loads that were applied on the main and big end bearings, and two coefficients of damping and stiffness represented the oil film for each bearing.

To embrace the theoretical side, a computer program (FORTRAN 90) which depends on the data acquired from the experimental work, was developed to compute the vibration response of the crankshaft for each percentage of methanol blended with gasoline. This program is used to compute the crankshaft dynamic response and its critical speeds as well as calculating the reactions at the main and big end bearings in x and y direction.

The results indicated that the M10G90 gives minimum vibration in comparison with the other implemented blended fuels.

Also, the shear force and bending moment at the crankshaft stations were less when M10G90 was used in comparison with the other blended fuel M0G100 and M20G80.