210. OPTIMIZATION OF INJECTION SYSTEM PARAMETERS AND EGR ON JATROPHA BIODIESEL ENGINE USING TAGUCHI APPROACH

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The diesel engine injection system parameters apart from the operating parameters such as load and speed significantly affect its performance and exhaust emissions. The effect is even adverse sometimes when the engine is tried with some alternative fuels, such as Jatropha biodiesel due to its physico-chemical properties. For better performance and to meet out stringent emission norms, these parameters have to be optimized. An experimental investigation and analysis carried out to simultaneously optimize injection system parameters and exhaust gas recirculation (EGR) levels of small direct injection diesel engine for lower fuel consumption and higher thermal efficiency and peak cylinder pressure is presented in this paper. During the experiments, the different parameters such as fuel type, injection timing, injector opening pressure, nozzle configuration, and nozzle tip protrusion, percentage of exhaust gas recirculation (EGR), load torque and speed were changed. Taguchi's signal-to-noise ratio approach was applied to obtain an optimal setting of these parameters. From the experimental results and further analysis it is concluded that under 95% confidence interval the injection timing 340°CA, injector opening pressure 250 bar, nozzle configuration 5x0.18, EGR 0%, load torque 15Nm, speed 1800rpm with Jatropha biodiesel, gave the maximum peak cylinder pressure, while the lowest BSFC with diesel fuel was obtained with nozzle configuration 4x0.18, load torque 15Nm and speed 1800rpm and the highest brake thermal efficiency with nozzle configuration 4x0.18, tip protrusion 2mm, load torque 15Nm and speed 1800rpm. However, the significant control parameters responsible for brake thermal efficiency with their percentage contribution were load torque (79.13%), speed (17.54%), nozzle configuration (1.33%) and tip protrusion (0.96%).

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