Performance combustion and emission characteristics of 3-cylinder SI engine fuelled conventional gasoline, ethanol blends, and micro-emulsion used as an alternative fuel

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Abstract: In this work 15 % ethanol blended with 85 % gasoline, and micro-emulsion fuel (90 % gasoline, 8 % ethanol, & 2 % H_2O) was compared with 100 % conventional gasoline fuel to check the performance and emission characteristics of 3-cylinder SI engine. The AVL Boost software was used for predicting the performance and emission characteristics of 3-cylinder SI engine. It was found that although power increases for conventional 100 % gasoline as the fuel, as compared to 15 % ethanol blends and micro-emulsion fuel, but emissions were reduced more for micro-emulsion used as an alternative fuel in SI engine, and it meets the standards of present emission norms Euro 6.

Micro-emulsion fuel was prepared in the lab by blending gasoline, ethanol and H_2O was used as an additive in the fuel for improving its physical & thermal properties. The H_2O molecule present in fuel helped in reducing the emissions from 3-cylinder SI engine. As H_2O addition increases the oxygen concentration in the micro-emulsion fuel which helps in enhancing the combustion of fuel, and in build oxygen quantity inside the ethanol fuel also helps in better combustion which ultimately reduces the CO, HC, & NOx emissions. For the combustion analysis vibe-2 zone model was used which is more feasible for resolving the combustion phenomena by considering both burned and unburned zones in the combustion chamber.

In this talk, I will present 3cylinder SI engine simulation model for predicting the performance & emission characteristics as per future emission norms.

The Simulations were performed on 3-cylinder SI engine. This simulation model was developed on Avl Boost software developed by Avl Austria to predict the performance and emission characteristics of 3-cylinder SI engine. In this diagram C1, C2, C3 represents the cylinder of the engine.PL1, Pl2, and Pl3 represents the plenum, Mp1 to Mp15 represents the measuring points.SB1 and SB2 represents the System Boundary of the model.CAT1 represents the catalytic convertor used for reducing the emissions from 3-cylinder SI engine.CL1 represents the cleaner which cleans the inlet air and pressure drop takes place. MNT1 represents the monitor and E1 represents the Engine. The geometrical properties of 3-cylinder SI engine were taken as shown in Table 1.

Figure 1 Shows the Simulation Model of 3-Cylinder SI engine-based test rig.

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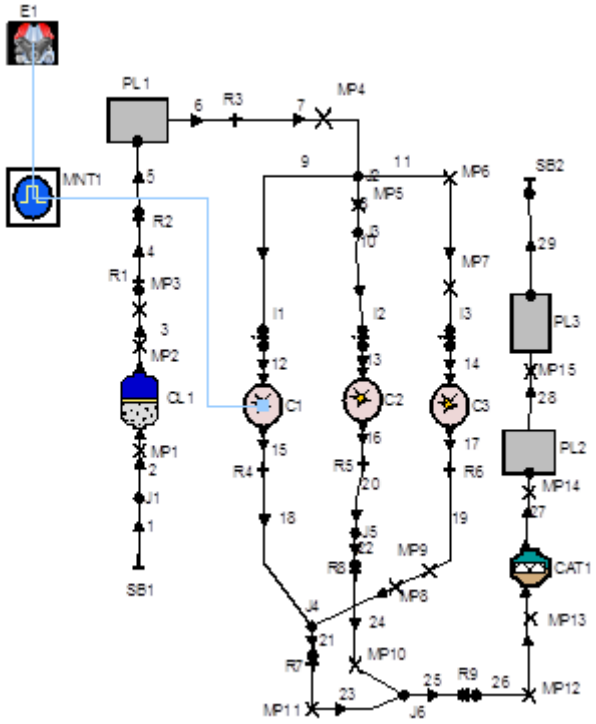

Figure 1. Simulation Model of 3-Cylinder SI Engine

Engine	4s 3c Water Cooled Petrol Engine
Make/Model	Maruti Omni
Bore	68.5 mm
Stroke length	72 mm
Compression Ratio	8.5:1
Displacement	796 cc
Starting	Self start
Method of ignition	Spark Ignition
Orifice Diameter	20 mm

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