

**CATALYTIC CONVERTER SYSTEM FOR SPARK
IGNITION ENGINE EXHAUST EMISSION
CONTROL – DESIGN DEVELOPMENT
AND PERFORMANCE EVALUATION**

by
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of the requirements for the degree of

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IN PROFOUND MEMORY OF

MY RESPECTED FATHER

CERTIFICATE

We, the undersigned, are satisfied that the thesis entitled **Catalytic Converter System for Spark Ignition Engine Exhaust Emission Control - Design, Development and Performance Evaluation** presented by Shri S. Bhagavanta Rao, is worthy of consideration for the award of the degree of **Doctor of Philosophy** and is a record of the candidate's original bona fide research work carried out under our guidance and supervision. The matter embodied in this thesis has not been submitted in part or full, elsewhere for the award of any degree/diploma.

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ABSTRACT

The problem of atmospheric pollution is increasing at an alarming rate due to the growing number of automobiles fueled with gasoline as fuel. Different techniques have been adopted to minimise the pollution due to carbon monoxide, unburned hydrocarbons, and nitrogen oxides in the exhaust of the engines. One of the techniques is to use a catalytic converter in the tail pipe of exhaust system so that the level of obnoxious emissions from the engine are reduced before they are let out to the atmosphere. Hence the present study's objective was focussed towards the design, development and performance of a catalytic converter for an automobile spark ignition engine. In this context a comprehensive theoretical and experimental investigations were carried out on a spark ignition engine fitted with an exhaust gas catalytic converter.

The theoretical study comprises of the development of a mathematical model for the four processes of a spark ignition engine which predicts the performance and emission characteristics. The emission data obtained from this analysis has been taken as input data for a catalytic converter model to predict the catalyst temperature, gas temperature and the concentration of major pollutants. Significant parametric studies have also been conducted to indicate the capabilities of the model.

Extensive experiments have been carried out on a four cylinder spark ignition engine, not only to obtain data for the validation of models but also to generate performance and emission characteristics of the engine with the catalytic converter in the exhaust line. Three different types of catalysts have been used and among them two are indigenously available. All the three catalysts have shown good response in controlling the emissions.

A good correlation has been found between the predicted and experimentally obtained performance and exhaust emission data, before and after the catalytic converter.

The results from the present study have shown that they can be used to minimise the exhaust emissions in the motor vehicles by fitting the catalytic converter with indigenously available catalysts.

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