



## Performance and Optimization of Nox Reduction by Urea Spray Formation in SI Engines

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### ABSTRACT

Exhaust contains environmentally harmful pollutants such as oxides of nitrogen (NO<sub>x</sub>) and particulate matter (PM). In order to control these exhaust pollutants engine after treatment technologies are being used in diesel engines. A urea selective catalytic reduction (SCR) is one of the promising after treatment devices for the abatement of exhaust emissions, particularly for NO<sub>x</sub> pollutants. The basic principal of emission reducing systems is to reduce the NO<sub>x</sub> pollutants by ammonia formed from urea. This project aims to analyse the NO<sub>x</sub> emissions from a petrol engine equipped with a Urea catalytic convertor using canister as a catalyst

**Keywords:** *nox reduction using urea, urea spray for nox reduction, nox controlled with urea, exhaust nox decrease with urea*

### I. INTRODUCTION

Petrol engines are widely used in many areas like Automobiles, locomotives marine engines power generations etc., due to its high power output and thermal efficiency. Even though the diesel engines give more benefits, the human discomfort caused by the pollutant emission of these engines have to be considered. the oxides of Nitrogen are considered as the most harmful pollutants to the human health. Emissions of nitrogen oxides (NO<sub>x</sub>) contribute seriously to air pollution, which is a major environmental problem. Emissions of NO<sub>x</sub> react with moisture in the air to form nitric acid, contributing to soil and water acidification in sensitive areas. The

formation of groundlevel ozone is caused by photochemical reactions involving primarily NO<sub>x</sub>.

### II. RELATED WORKS

Mohammad Zaheruiddin and Dinesh Kumar G (2014) estimated the amount of NO<sub>x</sub> emission from aircraft engines using bio-diesel manufactured from algae. They found that NO<sub>x</sub> emissions in thermally stable combustors are low compared to high temperature varying combustors. Debasis Dani (2012) developed an emulsion of water and diesel to reduce NO<sub>x</sub>, Sox and particulate matter emissions. The emulsion was prepared using a mixed surfactant method. Performance and emission tests were carried out by using the fuel in a two cylinder water cooled diesel engine. M.K. Duraisamy et al (2011) used Exhaust Gas Recirculation (EGR) method to reduce the emission of NO<sub>x</sub> from a diesel engine running on biodiesel derived from Jatropha seed oil. Tests were conducted on a fully automated single-cylinder, water-cooled, constant speed direct injection diesel engine. Mohammad Raffic (2015) controlled the emission of NO<sub>x</sub> from a diesel engine using after treatment by Urea solution. The urea solution was dipped in a steel mesh and the steel mesh was coated using Zinc Oxide. K.Sivasamiet al. (2013) estimated the emission of NO<sub>x</sub> from diesel engines running on a water – Cotton seed oil methyl ester emission. A single cylinder, direct injection diesel engine was used to perform the emission test. R.Praveenet al. (2014) reduced the emission of NO<sub>x</sub> from a diesel engine by injecting aqueous solution of Urea in the exhaust pipe.

A single cylinder diesel engine was used to carry out the estimations.

### III. PROPOSED SYSTEM

In order to reduce Nox here we equipped silencer was extracted from a Pulsar 150cc Engine. It was opened on both sides using gas cutting procedure. The insides of the silencer were cleaned to remove dust and soot. The silencer was then core coated with canister (Activated Charcoal). The silencer was re-sealed using gas welding procedure. It was fitted on a Single

Cylinder, 4 – Stroke, Water cooled Pulsar 150cc engine present at outside. A small hole (6mm) was drilled on the bottom half of the exhaust pipe using drilling procedure. A copper tube was partially introduced into the hole to act as a nozzle for injecting the diesel exhaust fluid (Aqueous Urea). A petrol Testing tank was used to serve as a container for holding the Aqueous Urea solution. The aqueous urea was fed into the exhaust pipe through gravity feed mechanism. An AVL Five-Gas Analyser was used to measure the amount of NOx and Unburnt Hydro-Carbons emitted from the silencer.

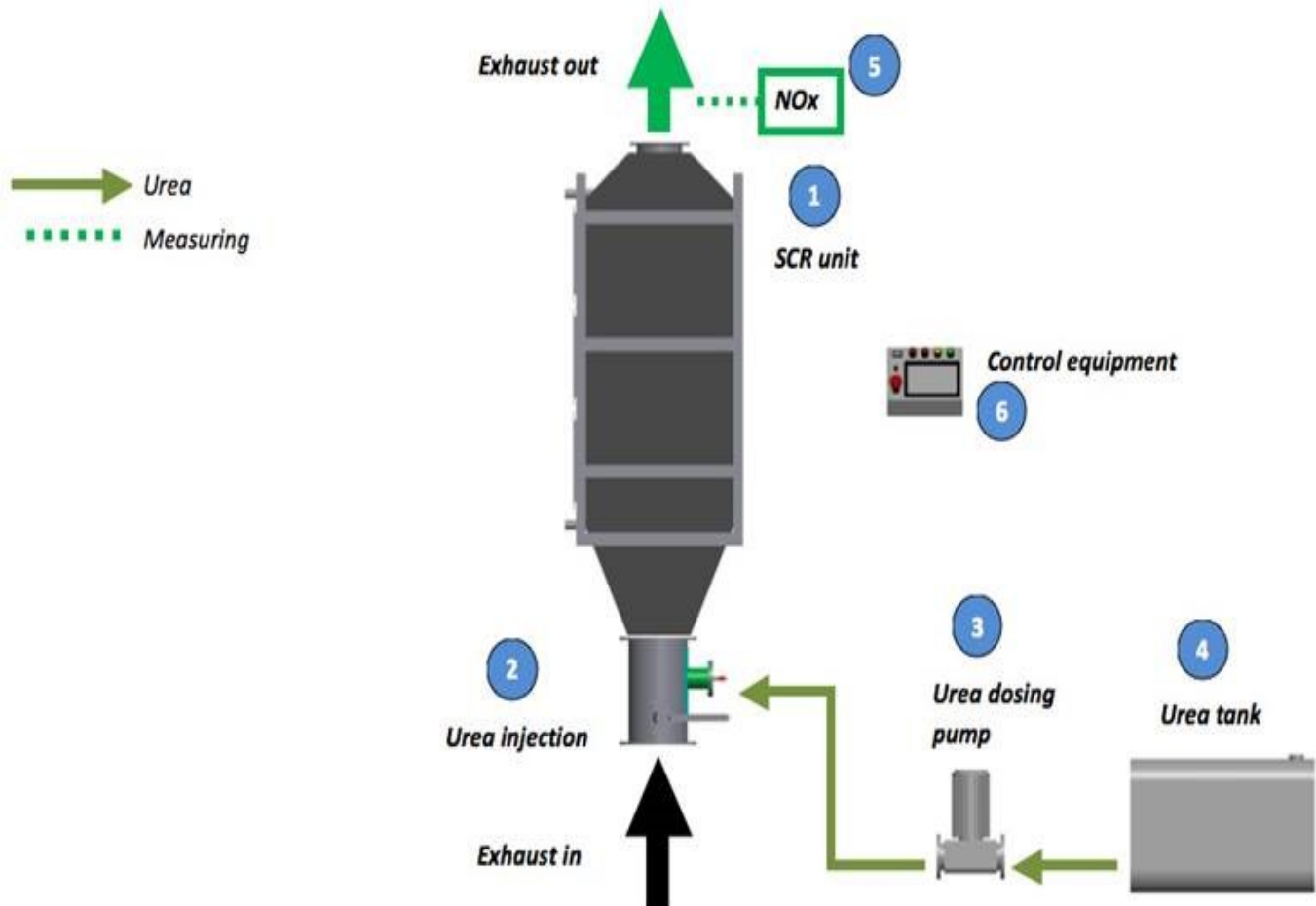


Fig. 1 Architecture of FLOW DIAGRAM

### CHARCOAL IN EXHAUST

Carbon dioxide is the one of the gases in atmosphere bearing percentage of 0.04, it plays an important role in maintaining optimal condition of earth by enriching photosynthesis in plants and other benefits, but it has also become a major issue in the recent decade due to its increase in percentage leading to increasing the global temperature, which causes melting down of

glaziers and increasing water levels, heavy changes in temperature.

### UREA

Commercial deployment of urea-SCR systems depended on the development of not only the catalyst, but also the urea dosing and injection system. The increase in NOx conversion efficiency of SCR systems that has been seen since the launch of SCR



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