

Experimental Investigation of SCR System for Nox Reduction Using Waste Urea Based Organic Fluid

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Abstract - Present study investigated the Selective catalytic reduction exhaust after treatment technology in CI engine to control the NOx reduction. In this study the urea solution are replaced by other waste urea content material. Also some metal oxides are used to reduce the pollution from CI engines. It was observed that low cost natural waste product based SCR solution shows very good capability to reduce emission of diesel engine.

Keywords: Natural waste urea based fluid, Exhaust gas emission, SCR, Diesel engine.

1. INTRODUCTION

Diesel engines are more prone to oxide of nitrogen and smoke emission. The both emissions are having trade-off between each other [4-8]. A EURO-VI norm has the stringent emission norms resulted into focuses towards reduction of NOx and smoke. Selective Catalytic Reduction (SCR) technology very promising technology to control NOx. However, the urea solution required for this technology is hazardous and costly. [9-11] The water emulsion technology also one method to reduce the NOx emission [12-15]. In previous studies, Ammonia is used in place of urea. However, pure ammonia is toxic and harmful to the human being. Ali Azam et al [1] developed heat exchanger based SCR was developed in a combination with counter flow heat exchanger and also smoke to water heat exchanger with , arrangement of cleaning for oil and exhaust gas recirculation (EGR) for reduction of NOx. Mina Mehregan,

Mohammad Moghiman [2] reports an investigation on combined effects of nano particles dosed fuel and urea-SCR system on NOx emissions. They also used the nano-additives effects on emission of NOx and CO reduction performance of a urea-SCR system is investigated. B20 blended biodiesel of 20% waste frying oil biodiesel and 80% diesel blends was used with Manganese oxide and cobalt oxide nano particles with the dosing of 25 and 50 ppm was used. They obtained the significantly affect the NOx emission. Havva H. Ş. [3] reported results of the pollutants of CI engine using oxygenated additives by using the SCR system. The nano additives of NiO, SiO₂, and Zn_{0.5}Ni_{0.5}Fe₂O₄ along with oxygenated fuel additives on exhaust emissions were investigated. And the They have obtained that CO, HC, and NOx emissions was reported to be reduced significantly using urea solution and ammonium sulfate salt addition to urea solution. Present study investigate the effect of urea based organic waste material as a reductant in SCR for reduction of NOx.

II-EXPERIMENTAL SETUP

The experimental set up consists of SCR system with injection pump as shown in figure 1. Exhaust analyser and smoke meter was used to measure the emission of diesel engine and compared with base diesel. SCR was mounted at the exhaust of the engine and various emission was measured under varying load.

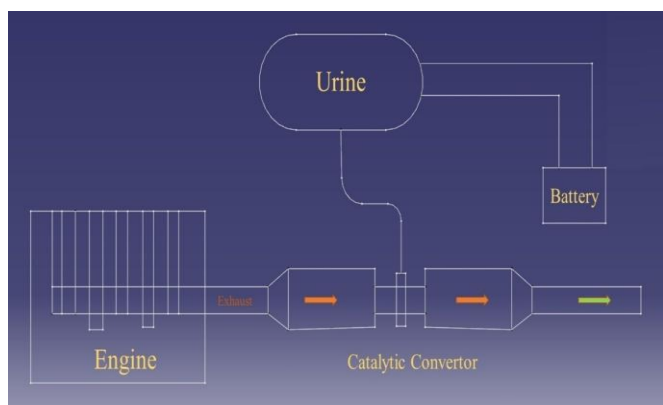


Fig 1- Block diagram of New SCR System

III-METHODOLOGY & EXPERIMENTATION

The solution of waste urea based organic compound was mixed with water with concentration 50 ppm. The diesel engine started with diesel and without SCR test was carried out. Under the various loads, readings were recorded. Then SCR system was used and with varying the solution of reluctant, reading were taken.

IV-RESULTS AND DISCUSSIONS

The output obtained from the experiment was shown in table 1 and table 2 to determine the effect of the SCR with new urea based fluid and to obtain the value of corresponding NOx as discussed.

Table 1 Without SCR

Sr.No	Load (W)	Fuel Consumption (ml)	Time (Sec)	NOx (PPM)	CO (% Vol ume)
1	100	5ml	39.81	170	0.03
2	300	5ml	43.54	176	0.02
3	500	5ml	41.16	182	0.01
4	700	5ml	40.93	188	0.01

Table 2: With SCR

Sr.No	Load (W)	Fuel Consumption (ml)	Time (Sec)	NOx (PPM)	CO (% Vol ume)
1	100	5ml	45.35	165	.03
2	300	5ml	43.67	169	.02
3	500	5ml	42.69	175	.02
4	700	5ml	41.06	179	.01

CONCLUSIONS

From the research study it can be concluded that that the distinct SCR system reduces the NOx emission

- Urea based organic substances (which is a composition of Urea and water) acts a good catalyst for the NOx reduction in diesel engine.
- Due to injection of new solution developed for SCR system in the tailpipe NOx reduction was achieved.
- Simultaneously CO also gets decreases.
- With the use of New SCR the most hazardous gases are minimized and Pollution can be controlled significantly. The vehicle performance will be enhanced.

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