Performance Analysis And Emission Control By Using Fuel Additives

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***Abstract*-The present scenario of pollution from automobile industries and its causes gives an Impetus to do research on reduce no and smoke in the exhaust of petrol engine. The present program and attempt has been made to reduce the exhaust smoke, particulate matter and no level in the NOx engine by blending oxygenated fuel additives of known percentage in petrol. In addition the NOx level is further suppressed by making use of secondary air injection (SAI). The experiments were conducted in two phases. The first phase tests carried with SAI alone the second phase consists of sole fuel with fuel additives. In the test samples of exhaust gas were analyzed, by gas analyzer. The smoke density was insuring by smoke meter. The particulate matter was measured by high volume sample. From the investigation the smoke density particulate matter and NOx were marginally reduced when compared with sole fuel.**

Keyword: Fuel Additives, Emission Control

1. Introduction

Petrol engines operations more efficiently than diesel engines. Increased compression ratio and elimination of throttling losses in a diesel engines increase the thermal efficiency by about 30% in the best specific fuel consumption range, compared to the gasoline engine.in view of the higher efficiency and lower carbon-di-oxide emission rates than the gasoline engine, the diesel engine continues to gain in popularity the lean mixture and high temperature combustion in a diesel engine is responsible for its efficiency higher and intern that causes the elevated NOx emission.

The US EPA has recently set new national ambient air quality standards for two major air pollutants, ozone and particulate matter. In the past, ozone control strategies have more efforts on reducing the levels of olatile organic compound reduction is more cost effective and readily achievable than reduction of NOx

Recently, more focus been put on the research and regulations have been the during force behind research focused on lowering NOx, control which are needed to further reduce ozone levels in the atmosphere.

Until the 1998 standard, the diesel engine industry had managed to lower the NOx, and participate emissions through combustion system design and fuel injection rate and timing control.

2. Problem Definition

In the present work, an attempt has been made to reduce the emission without affecting the performance of petrol engine. The SAI (secondary air injection) is used in the study two oxygenated fuel were used for this purpose. Various concentrations of these fuel additives were mixed with the petrol fuel and injected into the engine. The performance analysis and emission emission levels were measured by running the engine at constant load and speed in different SAI flow rate. Encouraging results were obtained and the work carried out is presented in the following chapters.

3. Petrol engine emissions

The superior fuel economy and thermal efficiency of petrol engines compared to gasoline engines has received much attention and with concomitant lower carbon di oxide emissions present an important ecological aspect. Petrol engine developments are influenced by two primary concerns. First is the increasing concern. First is the increasing concern on global warming. Second the concern over the effect of particulates and oxides of nitrogen emissions on environment.

The major pollutants emitted by petrol engines are,

Smoke
Particulate matter
Oxides of nitrogen
Carbon mono oxide
Unburned hydrocarbons

Smoke

Smoke is defined as visible products of combustion due to proper combustion. It originates early in the combustion cycle in a localized volume of rich fuel-air mixture. When fuel is burned at relative fuel. Air ratio rather than 1.5 and at pressures developed in the petrol engine produces soot, once formed depends upon local fuel-air ratio, type of fuel and pressure. If this soot, once formed finds sufficient oxygen, it will burn completely. If it is not burned completely in combustion cycle and it will be transported in the exhaust, visible in sufficient quantity. The size of the soot particles, which are chain-line clumps of carbon, agglomerate into bigger particles which have an objectionable darkening effect of diesel exhaust.

4. Preparation of reagents

i) Absorbing reagents

5g of sulfanilic acid is dissolved in a litre volumetric flask containing 945ml distilled water and 5ml acetic acid. After the sulfanilic acid has dissolved, 50ml of the dye stock is added. The dye stack solution is prepared by dissolving one gram N-(1-napthyl) ethylene diamine hydrochloride in 1 litre distilled water. Reagent is kept absorbed in brown bottle. The solution is stable for several weeks at room temperature. In order to increase the shelf life of the absorbing reagent, it has to be stored in a dark bottle and kept refrigerated.

ii) Standardizing reagent

The sodium nitrite is prepared by dissolving 2.18 sodium nitrite in 1 litre distilled water. 10ml of this solution is placed in a1 litre volumetric flask and field to the mark with distilled water. This gives a 0.0218 gram/liter standardizing solution.

iii) Calibration sodium nitric solutions

The calibration curve, which is a plot of micro litres NO per millilitres absorbing reagent is obtained by adding 0.2, 0.4, 0.6, 0.8, 1.0and 0.218 sodium nitrite per litre to 25 ml volumetric flasks and then filling to the mark with absorbing reagent is equivalent to o.4 NO per ml absorbing reagent. These standards will provide a series of increasing color intensities which allows a plot of intensity against concentrations.

Properties of fuel additives

Methylene chloride properties
Formula = ch2cl2
Molecular mass = 84.93
Billing point = 40c
Melting point = -97c
Flash point = -2c
Auto ignition temperature=556c
Vapor density = 2.9
Stability condition = stable under ordinary

Ethyl Hexyl Nitrite

Molecular mass = 124.2
Billing point = 152c
Melting point= -58c
Flash point = 41c
Vapor pressure kpa at 20c

Performance analysis without fuel additives

PERFORMANCE ANALYSYS

S.NO	Load (kg)			Time for 10 CC fuel consumption (sec)	Brake power (kw)	Total fuel consumption (kg/hr)	Specific fuel consumption (kg/kW-hr)	Indicated power (kW)	Mechanical efficiency =m (%)	Brake thermal efficiency =bth (%)	Indicated thermal efficiency =ith (%)	IMEP (kN/m²)	BMEP (kN/m²)	Fuel power (kW)
	W1	W2	W											
1	4	0.5	4.5	23.26	0.797	1.129	1.417	0.997	79.9%	5.7	7.2	31.07	24.83	13.78
2	5	0.6	5.4	23.23	0.959	1.136	1.183	1.159	82.7%	6	8.3	36.12	29.88	13.86
3	6	0.7	6.3	22.14	1.116	1.188	1.065	1.316	84.8%	7.7	9.1	41.01	34.78	14.50
4	7	0.8	7.2	19.66	1.279	1.333	1.042	1.479	86.4%	7.86	8.89	46.09	39.86	16.26

Performance analysis with fuel additives

S.NO	Load (kg)			Time for 10 CC fuel consumption (sec)	Brake power (kw)	Total fuel consumption (kg/hr)	Specific fuel consumption (kg/kW-hr)	Indicated power (kW)	Mechanical efficiency □m (%)	Brake thermal efficiency □bth (%)	Indicated thermal efficiency □ith (%)	IMEP (kN/m²)	BMEP (kN/m²)	Fuel power (kW)
	W1	W2	W											
1	4	0.5	4.5	23.17	0.780	1.105	1.397	0.977	79.9	5.6	31.10	31.10	24.83	13.773
2	5	0.6	5.4	23.05	0.943	1.176	1.153	1.133	82.5	8.2	36.12	36.12	29.88	13.85
3	6	0.7	6.3	22.02	1.101	1.169	1.023	1.311	84.0	9.1	41.01	41.01	34.78	14.50
4	7	0.8	7.2	19.45	1.240	1.325	1.022	1.469	86.5	8.88	46.07	46.07	39.86	16.26

Result and Conclusions:

Parameter	Regulation limit	Actual
CO(% by vol)	3.5	2.862
HC(PPM)	4000	1220
LAMBDA		2.9

Without fuel additives

Parameter	Regulation limit	Actual
CO(% by vol)	3.5	1.365
HC(PPM)	4000	1102
LAMBDA		2.65

With fuel additives

Comparison:

Parameter	Without fuel additives	With fuel additives	Comparison:
CO(% by vol)	2.862	1.365	1.497
HC(PPM)	1220	1102	118
LAMBDA	2.9	2.65	0.25

5. Conclusion:

The emission from the petrol engine has been reduced slightly without affecting performance of the petrol engine. Also without affecting properties of the petrol.

6. Reference

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