

Analysis of Diesel Engine Exhaust System

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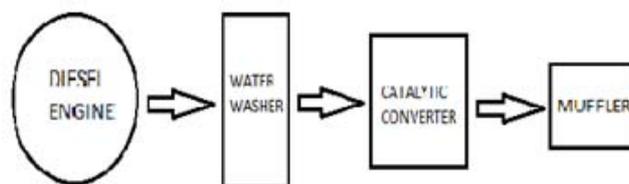
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Abstract: This article is a literature review of analysis of diesel engine exhaust system. In today modern world of globalisation and industrialisation the condition of environment is depleting at a fast rate. Air pollution is major problem worldwide, and is causing severe damage to life and properties. Motor vehicle emissions contribute to air pollution and are a major ingredient in the creation of smog in some large cities. A 2013 study indicates that 6,00,000 early deaths occur per year in the world because of vehicle emissions. The proposed emission control system comprises of a water washer, exhaust manifold preparation and after muffler and catalytic convertor. The whole system should work for the entire life of the involved engine experimentation. This arrangement can be critically evaluated against the option of shifting both the engines. The shifting involves a little foundation arrangement. In the effort of controlling the particulate matter and the emissions from different sources of such pollutants, the proposed low cost emission system opts to be the perfect choice.

Keywords: Internal Combustion Engine, Muffler, Exhaust System, Water-Washer System, Catalytic Convertor, Atomiser, Accumulation Box, Spray misting nozzle, Pollution control

1. Introduction

Reciprocating internal combustion (IC) engines are used in a variety of stationary applications, including gas compression, pumping, power generation, cogeneration, irrigation and inert gas production. Stationary combustion engines may be spark-ignition (natural gas, propane or liquid [LPG] or gasoline) or compression ignition (diesel). Diesel engines generally operate lean, while combustion engines that can use natural gas, propane or gasoline to operate in rich or lean modes. The difference between rich combustion and lean-burn engine operation is in the air-fuel ratio. A rich combustion engine is out of excess fuel into the combustion chamber during combustion. A lean burn engine, on the other hand, by excess air in the combustion chamber during the combustion. Stationary diesel engines are widely used in emergency backup generators and water pumps, especially when the power grid fails. In places where a mains supply is not accessible or available, diesel engines can be used to generate primary power as a distributed generation source. The operation of stationary internal combustion engines resulting in the emission of criteria air pollutants, such as hydrocarbons (non-methane hydrocarbons [NMHCs] or volatile organic compounds [VOCs]), carbon monoxide (CO), nitrogen oxides (NO_x) and particulate matter (PM). Exposure to these pollutants is associated with numerous effects on human health, including increased difficulty breathing, hospitalisation for heart or lung disease, and even premature death. The air pollutants (i.e., hazardous air pollutants [HAPs]) emitted by stationary engines are formaldehyde (CH₂O), acetaldehyde and methanol. People exposed to sufficient concentrations of toxic air pollutants and the duration of an increased chance of developing cancer or to experience other serious health effects. The actual concentration of these varies from engine to engine, mode of operation and is heavily based on the type of fuel used.



2. Path of Exhaust Gas

Water Washer

The use of Internal Combustion Engines in a closed room or hall is possible by using The Water Washer. Particulates emitted from engines causes significant health hazards like lung cancer cardiovascular diseases asthma. Water washer is use to settle down the heavy particles of flue gas using multi point sprinkler.

Benefits:

- 1) reduced filtration system cost
- 2) reduced operating cost
- 3) increased PM capture efficiency
- 4) Reduces exhaust gas content.

Muffler

The role of the muffler within the exhaust system of a vehicle is to minimise the noise produced by the engine as well as reduce back pressure. Too much back pressure reduces engine efficiency.

Catalytic Convertor

A catalytic converter is an emissions control device that converts toxic gases and pollutants in exhaust gas to less toxic pollutants by catalysing a redox reaction (an oxidation and a reduction reaction). Catalytic converters are used with internal combustion engines fuelled by either petrol (gasoline) or diesel—including lean-burn engines as well as kerosene heaters and stoves.

Muffler Selection

- Determine the exhaust flow and acceptable exhaust system back pressure of engine.
- A free-flowing air intake and exhaust system in vehicle.
- Muffler must be built tough to handle high pressure exhaust gasses, absorb impact from road debris, and resist corrosion.
- Number of inlets, single or dual system.
- Diameter of pipe, Inlet and outlet.
- Size of the muffler.
- Material used, stainless steel muffler offers superior corrosion resistance, durability, and life span than the aluminised steel muffler.

3. Parameters

1. Ammonia (NH₃)
2. Sulfur Dioxide (SO₂)
3. Oxides of Nitrogen (NO_x)
4. Carbon Monoxide CO

4. Conclusion

Different types of muffler and designing methods are studied. After studying this methods and procedures for designing a muffler, we conclude that combination type of muffler is more efficient than reactive and absorptive mufflers. New theory for designing muffler by counter phase counteracts split- gas rushing and methods of designing Active silencer are also preferable for new research work.

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