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Electrostatic Soot Accumulator for Vehicle

Trupal Patil[1], Sandesh Pansare[2], Sharad Kasbe[3], Aniket Gurav[4]
Electrical Engineering, VIVA institute of technology, dist. Palghar, Maharashtra, India

Abstract*—The aim of our project is to create a healthy environment for human life. Vehicle exhaust pollution is one of the problem that mankind is facing, it has caused severe hazards to a people. The soot particles having very small diameter penetrates deep inside the lungs and cause various discomfort to the human being. Reduction of soot will help to reduce the problems caused by them. To reduce this, soot accumulator can be used at the end of the silencer to collect the soot particles and leave the exhaust soot free. Principles of electrostatic precipitation, such as particle charging, migration velocity of charged particles and collection efficiency are used. Performance of deteriorates by abnormal phenomenon, including back corona for treating low resistivity dust, abnormal for high resistivity dust, and corona quenching for fine dusts. To scope with these phenomena, new technologies have been developed. Pulsed energisation is a technique to scope with high resistivity dusts, and this results in lower power consumption.*

Keywords—soot, pollutants, corona, electrostatic precipitator, charged particles.

I. INTRODUCTION

Polycyclic Aromatic Hydrocarbons (PAHs), which have carcinogenicity, mutagenesis and strong toxicity, are regulated in many countries to protect the air, water and soil. Marine diesel emission also contains PAHs which are generated due to incomplete combustion of the fuel. There are many reports measuring PAHs concentrations in port areas of the world . Some researchers point out the relationship between PAHs concentration and shipping emission . Therefore, PAHs concentrations in exhaust gases from marine engines were measured and reported. It is known that the state of PAHs in an exhaust gas is gaseous and particulate. It was reported that the gaseous PAHs were low molecular compounds, such as Naphathalene, Phenantherene or Pyrene in which the number of C was lower than 16. PAHs bounded to particulate matter included high-molecular compounds, such as Benz (a) anthracene or Chrysene in which the number of C was greater than 16. Particulate matters, which include black carbon, sulphate and soluble organic fraction (SOF), emitted from marine diesels cause serious problems in human health and coastal environment. Therefore, an electrostatic precipitator (ESP) is developed to collect these particles. The ESP may also be capable of removing PAHs. PAHs removal efficiencies by an ESP in various plants were reported, and high removal efficiencies were obtained in power plants. It was also investigated that PAHs emitted from diesel engine was removed using an ESP. However, there are few reports for the use of PAHs for diesel engines. Equations. The turn's ratio of ESP power supply's high frequency and high voltage transformer is very large. Because of the transformer's large leakage inductance and large parasitic capacitance, voltage spike and current spike will destroy the switch transistor and connection circuit, and the converter can not be operated normally. It is a good choice to take resonant topology, because it can use the leakage inductance and the winding capacitance as resonant elements and eliminate the bad effects of them on the converter operation, thus forming sinusoidal waveform resonant converter. By this means, it will improve the circuit stability and reduce the switching loss. Besides, the LCC resonant topology is adopted due to its good comprehensive performance compared to the series or parallel resonant topology. Because motor vehicles promote people's mobility, the number of vehicles increases rapidly. At the end of 2007, the number of registered motor vehicles in Taiwan totaled 20.71 million; motorcycles accounted for 13.94 million. The number continues to rise by 2–5% annually, as shown in Figure 1.1–3 the continuous increase in the number of motorcycles has made their emissions one of the major sources of air pollutants in urban areas in Tai-wan and severely impacts air quality and public health. Data from the Taiwan Emission Data System, Version 6.1,show that motorcycles contributed approximately 3, 11, and 13% to oxides of nitrogen (NOx), hydrocarbon (HCs),and carbon monoxide (CO) emissions, respectively.4 To reduce the total amount of mobile source emissions, catalytic converters were required to be assembled on motorcycles produced later than 1998. The sale of gasoline containing lead additives had been prohibited in Taiwan since January 1, 2000. The enforcement of many strategies

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including phase-in implementation of stricter vehicle emission standards, regular testing, eliminating old vehicles and two-stroke engine motorcycles, and adocating the use of low-pollution motorcycles has been carried out.

II. EXPERIMENTAL DESIGN OF PROPOSED MODEL

The prototype of theESP we developed consists of various stages. Fig. 1a shows the schematic diagram of the prototype of ESP. The first stage is an ionization stage; it serves for dust particles charging. This ionization stage consists of two centralized hollow metallic cylinders of 14 and 28 cm in diameter. The inner cylinder that is the high-voltage electrode comprises sheets of 15 cm in length,1 mm in diameter and the radius of curvature of which is of 25 μm;the sheets are distributed evenly over its upper and lower surfaces to initiate corona discharges. A grounded rod passes along the centre of the whole model. It is common for both stages and serves for initiating an ionization region with the discharge cylinder. The inner cylinder with sheets at which corona discharges are generated is connected to negative high-voltage DC source. The terminal wire is connected through The air velocity is measured using digital airflow meter (CFM metal vane anemometer, Extech instruments, model 407113, USA) of 0.50–35.0 m/s ± 0.01 m/s accuracy. Dust particles are introduced into the ionization stage through a dust feeding device. They are generated by using a funnel filled with dust particles.

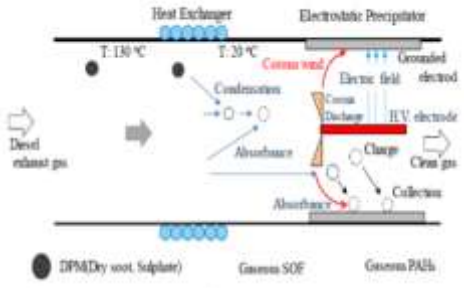
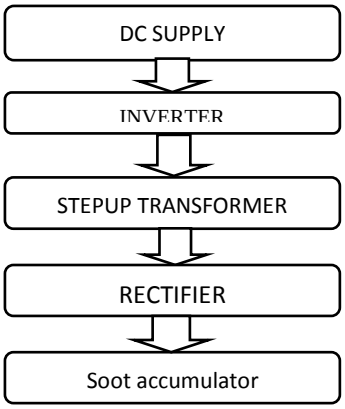


Fig. 1 Design of Proposed Model

III. WORKING



1. DC SUPPY: For the device required supply in the vehicle 12v dc supply is available. We use this supply.Voltage is forward to the inverter.
2. Inverter: inverter is a device which convert DC supply to the AC supply. The inverter is convert 12 volt battery DC supply to the 12 volt AC supply heat is transferred to the Step Up transformer.

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3. Step Up Transformer : Step Up Transformer is used to step up a AC voltage that is we received 12 volt AC supply from the inverter and it is convert to the 10kv AC voltage the Transformer rating is 12 volt AC to the 10 KV. Then it is transferred to the rectifier circuit.
4. Rectifier: rectifier is a circuit which convert AC voltage to the DC voltage respectively. We received 10 KV AC voltage from the step of transformer then we have to convert in ADC form. Because the soot accumulator device required DC supply so rectifier is convert 10 KV AC to the 10 KV DC.
5. Soot Accumulator: soot accumulator is a device which contain electrodes and it is made up of cylindrical device which is connect to the vehicle silencer the carbon source coming from the engine it is harmful for the human body so we collect the carbon shot from soot accumulator the carbon is attract to the positive plates that 10 KV supply is connect to the electrodes and plates when the carbon attract to the plates then the gas is a pass through the outer side.

IV. CIRCUIT DIAGRAM

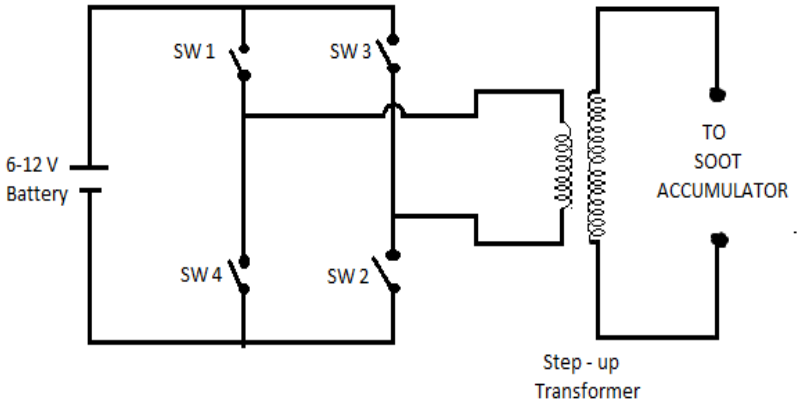

Fig. 2: Circuit Diagram

Above figure show the circuit diagram of Shoot accumulator 12V battery is connected to the circuit it is received from two wheeler vehicle after then it is 4 Asha switches connect in parallel it's convert DC voltage to AC voltage that is 12 volt dc to 12 volt AC there is a freak there is a current he is a law as in milliampere so the inverter Connaught DC to AC after then the Step Up Transformer is used which is convert 12 volt AC to 10kv AC voltage the device required supply is in KV after the stepping up voltage it is forward to the rectifier circuit the rectifier circuit convert AC voltage to the DC voltage that is 10 KV DC AC do that 10 KV DC after the rectifying a voltage supply it is connect to the Suite accumulator device The Suite accumulator device contain electrodes has a negative or plate heat it is as a positive negative is a return path and positive is a collecting plates from the two wheeler vehicle engine there is a huge amount of Carbon suits are produced it is it is very harmful for the human and it is hazardous then the carbon suits are coming from the engine it is moved to the silencer the should accumulated device is connected to the silencer when the supply is connected to the accumulated device the plates are charged the carbon particles are attract towards the positive plates the positive plates is a made up of aluminium and electrodes are the copper when the current particles are attract towards a plate only gases are passed to the outer side in the air natural the main effect part that is carbon it is attacked by plates it is the men working of suit accumulator device.

V. ADVANTAGES

1. The high efficiency of removal of particles/pollutants.
2. Low operating costs.
3. Automatic operation.
4. The dust is collected in solid form.

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5. Easy Disposal.

VI. CONCLUSION

Epidemiological and experimental studies provide increasing evidence for an association between wood smoke exposure and various health outcomes such as decreased lung function, reduced resistance to infections and increased severity/incidences of acute asthma. Moreover, inhalation studies have demonstrated that wood smoke exposure may induce systemic effects, providing a possible link to cardiovascular effects. The influence of the physicochemical properties of wood smoke particles, and of the combustion conditions, on various biological endpoints is presently largely unknown, although in vitro studies suggest that particles from incomplete combustion conditions are more toxic than particles generated under more complete combustion conditions. In order to establish targeted strategies to reduce wood smoke emissions in developed countries, more research is needed concerning the physicochemical properties of the wood smoke particles we are exposed to and the influence of these properties on the induced biological effects. To achieve this, there is need for a stronger collaboration between the different fields of research including combustion science, aerosol science, epidemiology and toxicology.

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