Review on Automatic Air Filter Cleaning System

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Abstract – The air filter is an in intake system permanently removes foreign particles such as dust, dirt and soot from air intake thereby maintaining the performance of the engine and protecting it from damage. The previous research on air filter has shown that they are replaced pre-maturely before reaching full capacity of utilization, loading to increasing maintenance costs and to reduced engine protection against abrasive wear. Also the customer plays a very important part because beyond the warranty period, they have a last word, making decision about replacing or not the air filter. So, in this project we are making automatic cleaning of air filter of heavy vehicle without using manual energy it's completely automatic. If it is done by manually air filter cleaning may be uneven but by this process cleaning should be proper and maintaining the efficiency of air filter as well as engine. The effects of air filter performance were studied carried out with the different diesel engine of cleaned air filter.

Index Terms – Air filter, Vehicle, Engines, Automatic Cleaning.

1. INTRODUCTION

A particulate air filter is a device composed of the fibrous material which removes. Solid particulate such as dust pollen, mould and bacteria from air. Filter containing an absorbent or catalyst such as charcoal may also remove odor and gaseous pollutants such as volatile organic compound or ozone. Air filter are used in application where air quality important notably in building ventilation system and engine. Some buildings as well as aircraft and after human made environments use foam, pleated paper, or spun fibrous glass filter elements. Another method, air ionizer use fibers or element with a static electric charge, which attract duct particles. The air intakes of internal combustion engine and air compressors.

The combustion air filter prevents abrasive particulate matter from entering the engine cylinders, where it would cases mechanical wear and oil contamination. Stainless steel mesh in another example of medium which allow more air to pass through. Stainless steel mesh comes with different mesh counts offering different filtration standard. In an extreme modified engine. Loading in a space for a cone based air filter, some will option to install a simple stainless steel mesh over the turbo to ensure no particles enter the engine via the turbo. For every liter of fuel consumed, a modern diesel engine typically required 15,000 liters of air, therefore poor air quality can significantly impact engine wear and performance. As a result effective air filetration is essential, to protect the engine from particulate contaminants symptoms of poor maintaince include plugged air filters, reduced engine performance and higher fuel consumption.

The life of an engine is determined by the rate at which it injects abrasive contaminated. Approximately 1 gram of duct per HP is sufficient to destroy on engine. Unlike the human body, which has different filteration system and sensor to warm of bad air, the air filter is the only protection of the engine against potential damage. It has only one chance and one chance to remove dust. As the air filter progressively remove contaminants, the level of restriction increases like a congested nose. It takes an engine more effort to draw in air when the air filter is blocked.

2. LITERATURE REVIEW

This paper describes the measured results with focus on changes in vehicle fuel economy but also includes emissions and performance. Previous studies shows that, replacing clogged air filter can improve vehicle fuel economy and conversely a clogged air filter can be significantly detrimental to fuel economy. older studies of carbureted gasoline vehicles have indicated that replacing a clogged or dirty air filter can improve vehicle fuel economy and, conversely, that a dirty air filter can be significantly detrimental to fuel economy.[1]

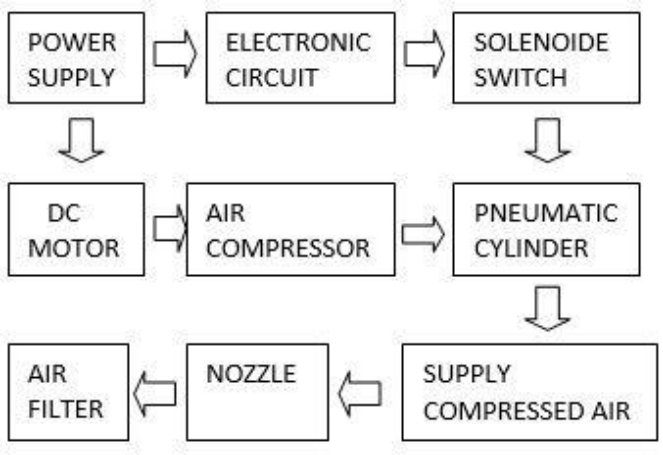
Investigated on engine lifetime, engine emission and fuel consumption depend on the air induction system design and its performance, So Study of papers on different type of air filter filtration media and their effect on engine performance is done in this paper. This study is useful to select zero maintenance, long life, reliable and durable air filters improves performance of the existing engines without any major modifications.[2]

The aim of the research is to evaluate the criteria, according to which actual replacement of motor air filters was performed

and to measure the influence of air filters with different levels of use on the engine performance. To reach the goal, air filter cartridges from 100 vehicles of the same model and type, which were used in Latvia were collected. The influence of air filter clogging on several vehicle exploitation parameters, such as engine power and fuel consumption was analyzed. [3]

Biomaterials is a term used to indicate materials that constitute parts of medical implants, extracorporeal devices, and disposables that have been utilized in medicine, surgery, dentistry, and veterinary medicine as well as in every aspect of patient health care. Synthetic materials currently used for biomedical applications include metals and alloys, polymers, and ceramics. Because the structures of these materials differ, they have different properties and, therefore, different uses in the body [4].

3. WORKING AND CONSTRUCTION



From this block diagram we get information about the component and how they are link up with each other. We take power supply from electric board for DC motor, Air compressor and electronic circuit by single wire. In electronic circuit there are three components.

1) Micro controller

2) Amplifier

3) Regulator

So it is completely machatronics system it consists mechanical parts as well as electronic parts.

For the automation processes electronic part are required then electronic circuit provide electrical power to solenoid switch. This switch can control the up and down movement of the pneumatic cylinder which is observed in Y- axis. After that air compressor supply compressed air to pneumatic cylinder through pneumatic pipe. This compressed air passed from pneumatic pipe to nozzle. We are using nozzle because we should have to give direction of the compressed air. Air filter is placed at rotating circular plate which is connected to DC motor which are controlling circular motion of rotating plate.

Main aim of the project is to eliminate the dust and impurities from the air filter which is used in heavy vehicle like bus and truck to absorb clean air intake for engine, which increase efficiency of engine. The cleaning process is completely automatic without manual work. It is mechatronics system. It is combination of electronics and mechanical component.

- Electronic Component
  1. Microcontroller
  2. Amplifier
  3. Regulator
  4. Solenoid switch
- Mechanical Component
  1) Air filter
  2) DC motor
  3) Nozzle
  4) Pneumatic cylinder
  5) Air compressor

Process is start with electric power supply to the air compressor DC motor and electronic circuit by single wire. After that electric power supply to solenoid switch which operate the up and down movement of pneumatic cylinder. After that air compressor supply compressed air to pneumatic cylinder through pneumatic pipe. Air filter have hollow portion. We will place nozzle inside hollow portion by horizontal extra frame and it is connected with pneumatic cylinder. Coming compressed air strike air filter wall through nozzle. Dust and other impurities is flow away. Air filter is placed on rotating plate which is operated by DC motor, so circulation motion of air continuously will clean the air filter within 5 minute. By this system reduce human effort and enhance the efficiency of work.

4. COMPONENTS

1. Pneumatic cylinder
2. Solenoid switch
3. Air compressor
4. 12 DC adaptor
5. Electronic circuit
6. MS frame of square bar

Electronic circuit

1. Microcontroller

2. Motor drives
3. Voltage regulator
4. Relay

5. CONCLUSION

Using automatic air filter cleaning system we can perform our task much better and in an efficient way or we complete that task in much less time so this system is very useful for automotive service counter to reduce manual effort.

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