
Chapter 25

Muffler Protoype with Filter Paper Made from Trembesi Leaves (*Samanea saman*) and Mahogany Leaves Extraction (*Switenia macrophylla*) as Silencer, Emission Gas Redutor, and Pollutant Filter (CO and NO_x) by Diesel Engine Cars

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Abstract

Out of many solutions, one of them is using a muffler with a filter paper made from trembesi leaves extraction (*Samanea saman*) and mahogany leaves extraction (*Switenia macrophllya*). Trembesi leaves extraction contains tannin which is mixed with aldehyd groups from mahogany leaves extraction, then the mixture turns condensed tannin, which has aform of shards/tiny pieces into a filter paper with absorbent properties through fermentation process. Based on experiment, this muffler configuration is effective in absorbing carbon monoxide contained in the diesel engine emission gas. It is proven by emission test that the best this filter paper thickness is 0,15 cm because it could absorb 0,1% of carbon monoxide in 90 seconds. It can also be concluded that the longer the absorbtion time, the more amoint af carbon monoxide absorbed in 30 to 90 seconds.

Keywords: Diesel Engine, Emission gas smoke, Filter Paper, Muffler

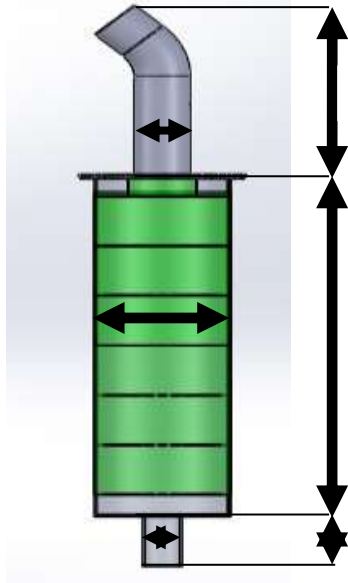
Introduction

Nowadays, the problem with diesel cars transportation system is how thick the emission gas smoke is, and the amount of pollutant in it. One of the compounds of the pollutant is CO (carbon monoxide). Out of many solutions, one of them is using a muffler with a filter paper made from trembesi leaves extraction (*Samanea saman*) and mahogany leaves extraction (*Switenia macrophllya*). Trembesi leaves extraction contains tannin which is mixed with aldehyd groups from mahogany leaves extraction, then the mixture turns condensed tannin, which has aform of shards/tiny pieces into a filter paper with absorbent properties through fermentation process. Based on experiment, this muffler configuration is effective in absorbing carbon monoxide contained in the diesel engine emission gas. It is proven by emission test that the best this filter paper thickness is 0,15 cm because it could absorb 0,1% of carbon monoxide in 90 seconds. It can also be concluded that the longer the absorbtion time, the more amoint af carbon monoxide absorbed in 30 to 90 seconds. Muffler with filter paper

configuration can be the correct solution in minimizing respiratory problems caused by carbon monoxide and the smoke, greatly reducing air pollution to create a healthy Indonesia by 2020.

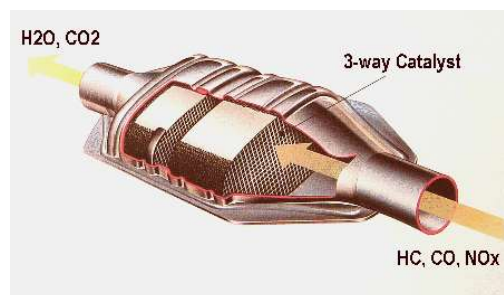
Content

In order to reduce carbon monoxide in the emission gas, we need to install the filter paper into the muffler and install a resonator to act as a silencer. The filter paper also reduces the smoke the engine produces. Partitions will be added inside the muffler to store the filter papers. The picture below shows the design of the muffler:

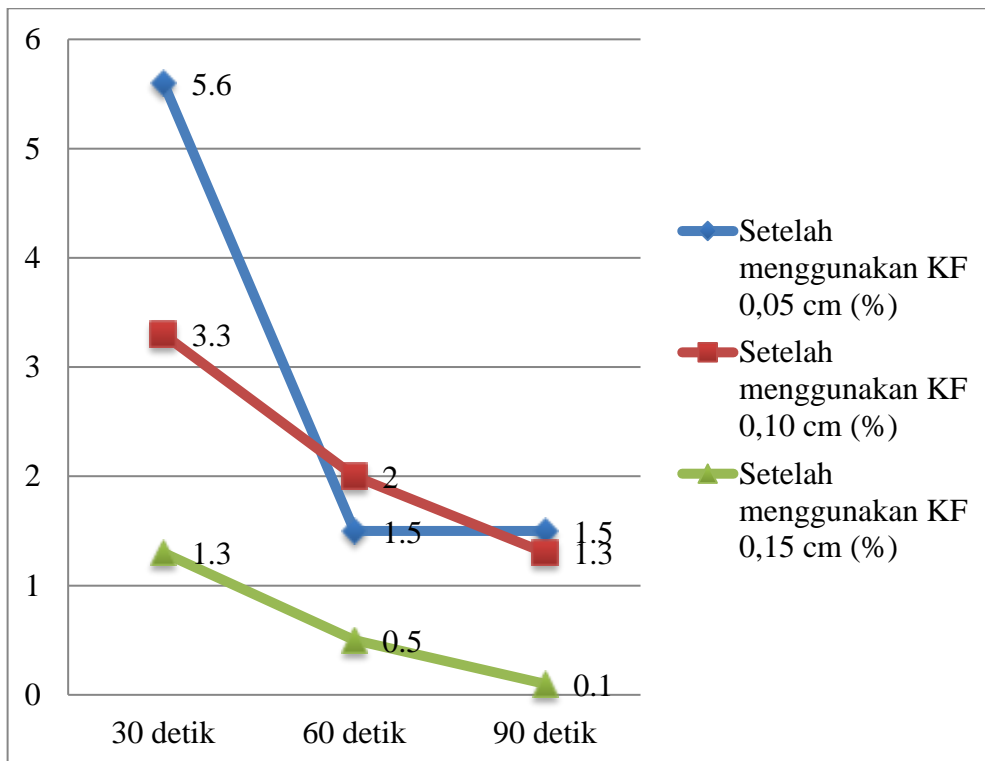
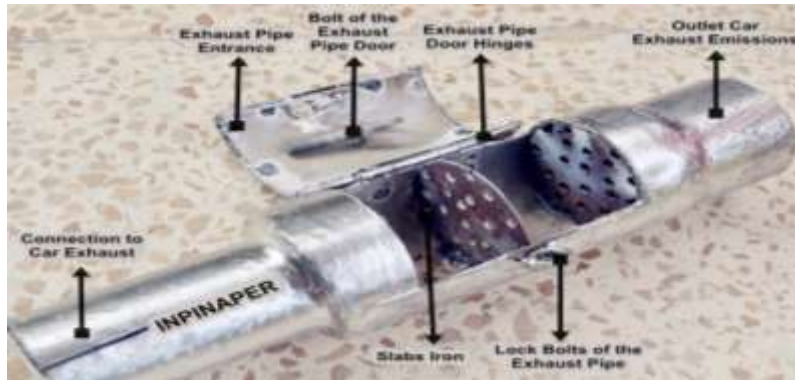


There are two work principals in this configuration:

- a. Oxidization muffler. This process reduces hydro carbon that has not been emitted in the emission room and oxidize it with platinum and palladium catalysts. The picture below shows how it works:



- b. Monitoring emission gas. A sensor that detects oxygen will be installed in the engine pipes in front of the muffler. This sensor will give an information to the Electronic Control System (ECS) about how much oxygen in the waste pipe. The ECS will increase or decrease the amount of oxygen based on the ratio of air and fuel. Below is the picture of the prototype:



The graph above shows the amount of carbon monoxide absorbed by the filter paper. We can see that with 0,15 cm paper thickness, this configuration can absorb 1,3% CO in 30 seconds, 0,5% CO addition after 60 seconds and addition of 0,1% CO after 90 seconds. Based on the graph, we have 0,15 for the best result. It can also be concluded that the longer the absorption time the more CO can be absorbed, proven by the decrease of CO from 30 seconds to 90 seconds absorption time. With filter paper configuration, we need to check and change the filter regularly due to the temperature inside the muffler caused by the engine.

Conclusion

Mufflers with filter paper made from trembesi leaves extraction and mahogany leaves extraction which contains condensed tannin can reduce the CO in the air by absorbing it with filter papers. It can also reduce the noise produced by the engine using resonator. The two work principles of the muffler

works alongside each other. When the emission process is in process, the device absorbs CO, filters the pollutant and dampens the noise at the same time according to each principal's stages. This configuration effectively absorbs CO, and with 0,15 filter paper thickness it can absorb 0,1% of CO on 90 seconds, and the longer the absorption time the more amount of CO can be absorbed.

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