

Automatic Dust Collector Car Air Filter Blower

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ABSTRACT: This project aims to create an automatic air blower for dust collection and find the efficiency of the automatic air blower for dust collection. The statistics used in the study are the mean (\bar{x}) and the standard deviation (SD). The experiment was conducted 10 times, divided into 5 times for filtering the air of a car and 5 times for filtering a ten-wheel truck. It was found that the automatic air blower for dust collection can clean the air filter of the car within the least average time (\bar{x}) equal to 12.6 seconds, the standard deviation (SD.) equal to 0.547, the wind pressure level is 6 bars. The cleaning time of the ten-wheel truck air filter is the least average time (\bar{x}) equal to 23.8 seconds, the standard deviation (SD.) equal to 0.447, the wind pressure level is 6 bars. The average satisfaction of the experts who tested it from 5 people found that the average satisfaction of the experts in terms of design, the total mean (\bar{x}) equal to 3.32, the standard deviation (SD.) equal to 0.487, is at the highest level of satisfaction. In terms of the operation of the machine. The overall mean (\bar{x}) was 3.48, the standard deviation (SD.) was 0.328, which was at the highest level of satisfaction. In terms of ease of use, the overall mean (\bar{x}) was 3.08, the standard deviation (SD.) was 0.336, which was at the highest level of satisfaction. In terms of safety, the overall mean (\bar{x}) was 3.2, the standard deviation (SD.) was 0.447, which was at the highest level of satisfaction

KEYWORDS -Efficiency/Filter Blower/Automatic Dust Collector

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I. INTRODUCTION

In the past, if we talk about cleaning car air filters, it was not a difficult matter to clean. Just remove the car air filter and use a blower to blow on the air filter to remove the dust stuck on the filter. But there are some disadvantages as well. Using a blower to blow on the car air filter directly causes the dust stuck on the car air filter to spread into the atmosphere directly, causing people nearby to inhale it. It can enter the respiratory system. It must be smaller than 10 microns. When these small dust particles enter the respiratory system, they will stick to various parts of the respiratory system, causing irritation and damaging the tissues of that organ, such as lung tissue. Which if received in large quantities or over a long period of time, it will accumulate in the lung tissue, causing fibrosis or wounds, and causing the lungs to function less efficiently, causing bronchitis, asthma, emphysema, and the chance of respiratory diseases due to infection. Because nowadays, many car service centers have cleaning Car air filters that are unsafe for the person cleaning and people around them are mostly cleaned by blowing air and releasing the air into the atmosphere immediately. If done in the old way, the dust will spread and be dangerous to the person cleaning the air filter and people around them. The dust that is inhaled is therefore invented to solve this problem. The machine can automatically blow the filter and collect dust so that it does not float into the air.

II. Experimental design

1. Preliminary data study

From inquiries from establishments and service centers about air filter cleaning, there is currently no automatic and inexpensive air filter cleaning machine. Therefore, the researcher studied information on cleaning round air filters of all sizes in order to design and create an automatic dust-collecting car air filter blower for use in cleaning air filters in establishments and car service centers.



Fig 1.1 Air filter used in the experiment

2. Design and construct an automatic dust-collecting car air filter blower.

The research study on constructing an automatic dust-collecting car air filter blower was designed to work according to the objectives of the plan to construct an automatic dust-collecting car air filter blower that was designed to be used to clean the car air filter conveniently and durable. Therefore, the automatic dust-collecting car air filter blower was designed using the solid works program.

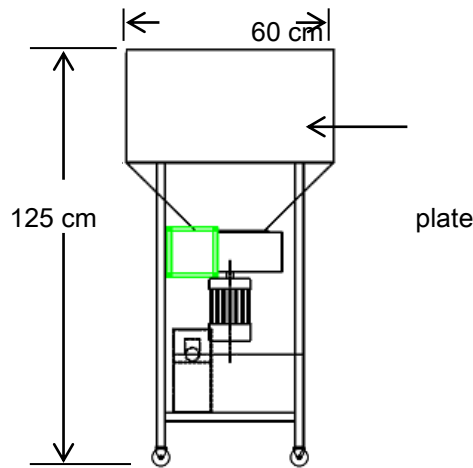


Fig 1.2 Structural type

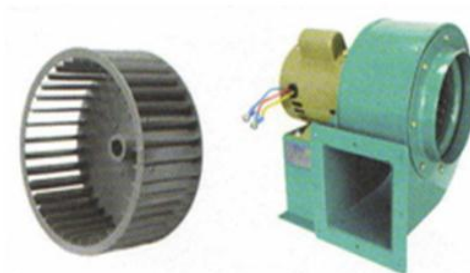


Fig 1.3 Blower motor, 220 VAC, Speed 2800 rpm.



Fig 1.4 Creating a structure according to the model.

III. Method of experiment and recording results

3.1 Experimental method and recording results

The project conducted an experiment using an automatic dust-collecting car air filter blower using 3 sizes of car air filters in the experiment: ISUZU car air filter, cylindrical, 15 X 15 mm. $\text{Ø} = 15$ cm., TOYOTA car air filter, cylindrical, 220 X 150 mm. $\text{Ø} = 22$, and CHEVROLET car air filter, cylindrical, 17 X 14 mm. $\text{Ø} = 17$, using air pressure of 5 bar, blowing time of 2 minutes, and then weighing the tested air filter on a Mettler Toledo weight scale, model cat1-2001-002.



Fig 1.5 shows the characteristics of the weight test of the workpiece.

3.2 Results of the construction of the automatic dust-collecting air filter blower

From the construction of the machine according to the design and the selection of materials and methods used in the construction of the automatic dust-collecting air filter blower, after that, the operation of the automatic dust-collecting air filter blower was tested to be in accordance with the model, resulting in the results of the construction of the automatic dust-collecting air filter blower, as shown in Fig 1.6



Fig 1.6 Automatic air filter blower and dust collector

3.3 Analysis of the performance data on the weight of the car air filter before and after cleaning with the automatic dust-collecting car air filter blower

Table 1.1 Comparative analysis of the car air filter before and after cleaning with the automatic dust-collecting car air filter blower with 6 bar air pressure, testing time 2 minutes.

Parts	ISUZU		
	Before testing (grams)	After testing (grams)	Weight loss rate
1	654.5	649.5	99.24
2	655.5	649.5	99.08
3	656.5	650.0	99.01
4	652.5	647.5	99.23
5	654.5	649.5	99.24
\bar{x}	654.7	649.2	99.16
SD	1.5	1.0	66.67

From Table 1.1, from the experiment of blowing the air filters of the 3 types of automobiles, it was found that the ISUZU automobile air filter had an average total weight loss of $\bar{x} = 99.16\%$, with a standard deviation of $SD = 66.67\%$

Table 1.2 Comparative analysis results of car air filters before and after cleaning with an automatic car air filter blower with 6 bar air pressure, testing time 2 minutes.

Parts	TOYOTA		
	Before testing (grams)	After testing (grams)	Weight loss rate
1	754.5	748.5	99.20
2	758.5	750.5	98.99
3	755.5	749.5	99.21
4	757.5	751.5	99.21
5	759.5	752.5	99.08
\bar{x}	757.1	750.5	99.13
SD	2.1	1.6	76.19

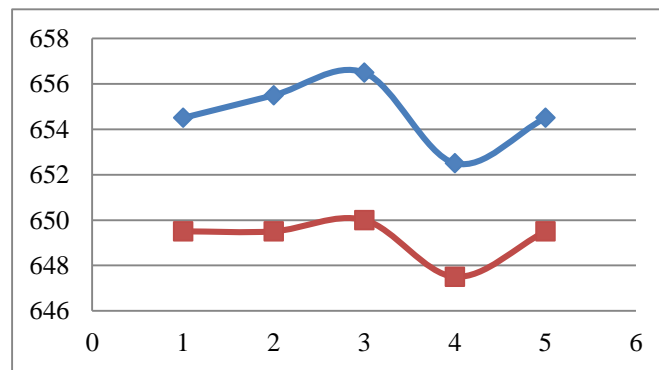
From Table 1.2, from the experiment of blowing the air filter of TOYOTA car, the average weight loss is $\bar{x} = 99.13\%$, the standard deviation $SD = 76.19\%$

Table 1.3 The results of the comparative analysis of the car air filter before and after cleaning with the automatic car air filter blower with 6 bar air pressure, testing time 2 minutes

Parts	CHEVROLET		
	Before testing (grams) (100 %)	After testing (grams) (%)	Weight loss rate (%)
1	556.4	546.4	98.20
2	554.3	545.8	98.46
3	557.5	553.5	99.28
4	570.7	561.5	98.39
5	586.5	577.5	98.47
\bar{x}	565.1	556.4	98.46
SD	13.6	13.1	96.32

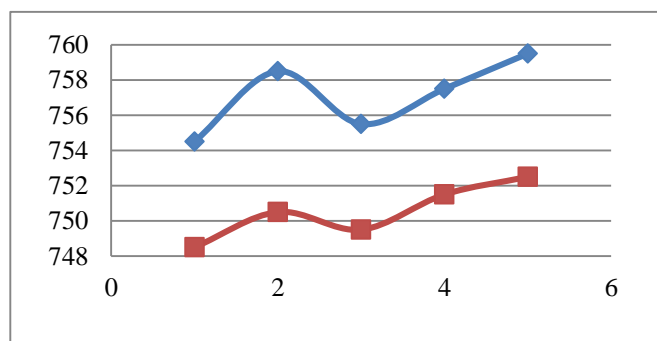
From Table 1.3 from the experiment in blowing the air filter of CHEVROLET car, the average weight loss $\bar{x} = 98.46\%$, standard deviation $SD = 96.32\%$

Table 1.4 Graph showing the average weight comparison of the ISUZU car air filter in the cylindrical shape, size $\varnothing 15 \times 15 \times 15$ cm. before and after the experiment with the automatic dust collector air filter blower in the experiment



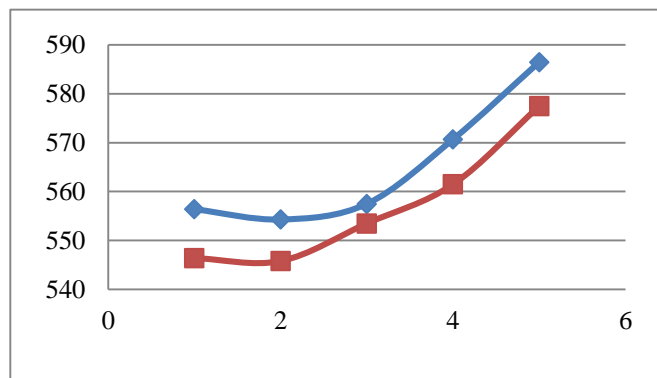
From Table 1.4, the graph showing the average weight of the car air filter before and after the experiment using the automatic dust-collecting car air filter blower found that in the ISUZU car air filter blowing, the average total weight loss $\bar{x} = 99.16\%$, with a standard deviation of $SD = 66.67\%$.

Table 1.5 Graph showing the average total weight comparing the weight of the TOYOTA car air filter, which is a cylindrical type with dimensions of $\varnothing 22 \times 22 \times 15$ cm. before and after the experiment using the automatic dust-collecting car air filter blower in the experiment.



From Table 1.5, the graph showing the average weight of the car air filter before and after the experiment using the automatic dust-collecting car air filter blower found that in blowing the TOYOTA car air filter, the average weight loss was $\bar{x} = 99.13\%$, with a standard deviation of $SD = 76.19\%$.

Table 1.6 Graph showing the average weight of the CHEVROLET car air filter, which is a cylindrical type with dimensions of Ø17 X 17 X 14 cm. before and after the experiment using the automatic dust-collecting car air filter blower in the experiment.



From Table 1.6, the graph showing the average weight of the car air filter before and after the experiment using the automatic dust collector car air filter blower found that the average total weight loss in the CHEVROLET car air filter blower was $\bar{x} = 98.46\%$, with a standard deviation of $SD = 96.32\%$

IV. CONCLUSION

4.1 In terms of machine properties

The automatic dust-collecting car air filter blower that was created has the specified properties: it is newly created, can be easily moved, and has a box to collect dust to prevent it from spreading. However, there is no tool to measure the amount of dust in the car air filter when cleaning the air filter. Therefore, the researcher measured the cleanliness of the air filter from the weight of the air filter used in the experiment.

4.2 In terms of the results of the experiment using the machine

It was found that from the experiment on blowing the 3 types of car air filters after cleaning with the automatic dust-collecting car air filter blower at a pressure level of 6 bars for 2 minutes in blowing the ISUZU car air filter, the average weight loss was $\bar{x} = 99.16\%$, with a standard deviation of $SD = 66.67\%$. Air filter TOYOTA car has an average total weight loss of $\bar{x} = 99.13\%$, standard deviation $SD = 76.19\%$, CHEVROLET car air filter has an average total weight loss of $\bar{x} = 98.46\%$, standard deviation $SD = 96.32\%$

4.3 Appropriateness of the design and construction of the machine

The evaluation results found that experts have consistent opinions on the design and construction of the machine because the shape and characteristics of the machine are suitable for the size of the specified workpiece. The structure of the machine is designed to be strong, durable, and safe to use by using a 1"x 1"x2.0 mm STEEL BOX as the structure and a 1.2 mm thick steel sheet as the body. The dust collection box can be removed for cleaning. The machine has wheels on all four sides for easy movement and uses simple technology in use.

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