

Fig. 3.9. Braking Distance vs Velocity

According to the graph analysis, ventilating holes diameter 12 mm shows significantly braking distance became upper level than others ventilating holes diameter as results of increasing velocity.

The increasing velocity shows the different braking distance at 40 km/h until 80 km/h. According to mean test is caused the excellent data prefer to investigate at this position because the tolerant braking load could be increasing at real time condition.

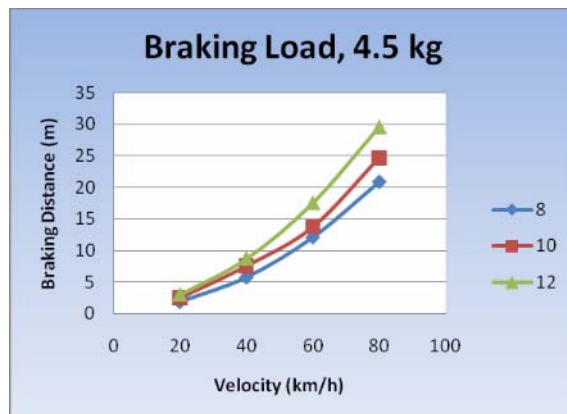


Fig. 3.10. Braking Distance vs Velocity

According to the graph analysis, ventilating holes diameter 12 mm shows significantly braking distance became upper level than others ventilating holes diameter as results of increasing velocity

Significant analysis could be investigated the braking distance at 40 km/h until 80 km/h. At 80 km/h the different data shows excellent analysis to know level of braking distance by stationer test.

5. Conclusions

According to the testing experiments that have been done during the stationer test:

- Ventilating holes diameter of disc brake has a good performance against to 10 and 12 ventilating holes diameter.
- Results of pertaining tests can be seen that ventilating holes 8 mm has braking distance is

shorter than ventilating holes diameter 10 mm and 12 mm.

- Mean test shows significantly changed ventilating holes diameter that it is subject to velocity and braking load on itself.
- The influence of braking distance amongst those different ventilating holes diameter is generally to investigate significantly the most when the velocity has upper level condition or situational tests.
- To stop the motorcycle efficiently is important to increase braking load and to decrease velocity at many level situation tests so that braking distance will get hurry to stop the motorcycle.

Reference:

1. Crouse, William, "Automotive Mechanics", The Drayden Press, USA 1993.
2. Northop, R.S., "Teknik Reparasi Sepeda Motor" Pustaka Setia, Bandung, 2004.
3. Owen, Clifton, "Automotive Brake System", Haynes, North America, California, 2004.
4. Sutantra, I.N., "Teknologi Otomotif, Teori dan Aplikasinya", Guna Widya, Surabaya, 2001
5. Albert, Christian, "Pengaruh Perubahan Diameter Lubang Ventilasi Pada Pringan Cakram Terhadap Jarak Penegereman Pada Pengujian Stasioner", UK Petra, Surabaya, 2009

- Disc brake, ventilating holes diameter 10 mm.



Fig. 3.5. Ventilating Holes 10 mm

- Disc brake, ventilating holes diameter 12 mm.

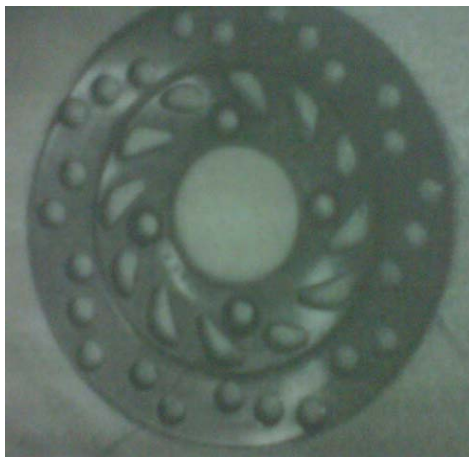


Fig. 3.6. Ventilating Holes 10 mm

The three types of disc brake with different ventilating holes should have the equal material properties for testing evaluation so that the results could be approximated. To accommodate some of those conditions are using repeating testing and doing a large amount of testing experiments by using $P\text{-value} < \alpha$ to anticipate needed parameters.

4. Results and Discussion

According to the testing experiments that have been done during the stationer test, the polynomial equation can be written for each braking load to determine braking distance. On this page can be shows four graphs analysis to know a wide range of broadly data. X-axis is velocity (km/h), and Y-axis is braking distance. After doing the graphs should give the influence of both of the parameters. Braking distance is clear and can be discussed the problems about braking system when it is applied to the brake pads.

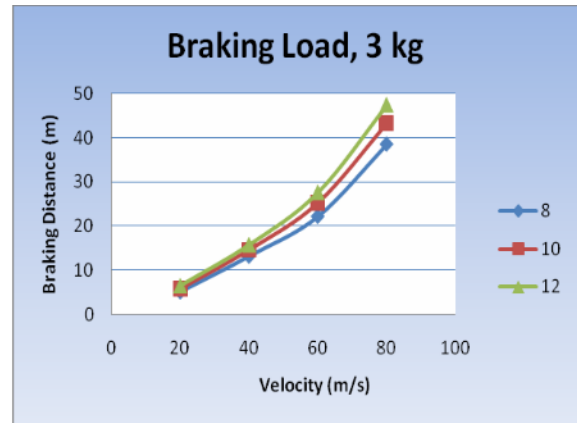


Fig. 3.7. Braking Distance vs Velocity

According to the graph analysis, ventilating holes diameter 12 mm shows significantly braking distance became upper level than others ventilating holes diameter as results of increasing velocity.

According to the graph analysis, ventilating holes diameter 8 mm shows significantly braking distance is shorter than the others. It proves that minimal diameter of ventilating holes is subjected to its surfaces has efficient braking. At increasing of braking load has the equal pattern.

Different velocity at 20 km/h until 40 km/h shows mean data that wide range of data is not significantly fast to get the influence of braking system amongst the three types of ventilating holes diameter on its surfaces.

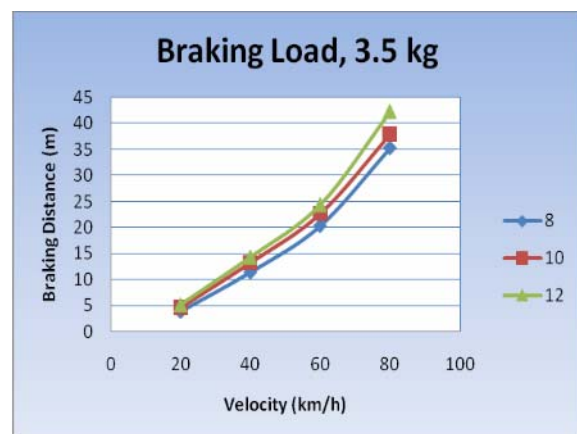


Fig. 3.8. Braking Distance vs Velocity

According to the graph analysis, ventilating holes diameter 12 mm shows significantly braking distance became upper level than others ventilating holes diameter as results of increasing velocity

Efficient braking load is success when it is given by increasing braking load on its surfaces to stop the motorcycle with minimal ventilating holes diameter.

At approximation velocity at 60 km/h does not shows a significant correlation of braking distance amongst those different ventilating holes diameter.



3. Research Methodology

Testing evaluation are based on two steps i.e. providing tools and material, and evaluating experiment. To save time and power should be provided:

- Preparing motorcycle that must be used and setting disc brake should be done for changed dimensions of ventilating holes that they are respectively 8 mm, 10 mm, 12 mm.
- Preparing papers, stopwatch, digital camera, the weights.
- Adjusted a roller at rear wheel of selected motorcycle.

The steps of the evaluated tests can be done for testing experiment and can be explained:

- Preparing for setting motorcycle position that have been put it on the roller at rear wheel which selected velocity respectively : 20 km/h, 40 km/h, 60 km/h and 80 km/h.
- After giving the weights are according to the suitable velocity by falling the loads respectively: 3 kg, 3.5 kg, 4 kg and 4.5 kg.
- Five times testing parameters should evaluate the results when the rear motorcycles have been stopped. Statistical method is applied to accommodate faults result during processing test
- Writing down the tests on papers for preparing evaluation about brake performance during the processing

Tools and materials that used at this testing experiment can be explained

- Supported roller, for holding of rear wheel and makes the tire is not forward or backward during the testing experiment.

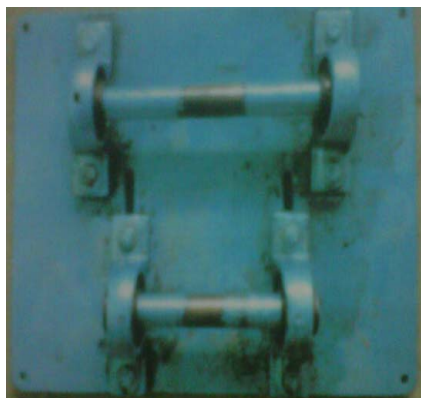


Fig.3.1. Supported Roller

- Motorcycle, for testing experiment is used Supra X in good condition including excellent performance for getting the results. This motorcycle is selected because every people uses this type and their parts are easy to find in market places. It is the best characteristic why this paper chooses this motorcycle and

scheduling maintenance system is easy to adjust in anytime that it is used by adjuster.



Fig. 3.2. Supra X 125 R

- Weights, for testing experiment technique is used as braking load against to brake pedal. To give each weights is important to know stopping time during the load have been giving during the tests. Braking distance can be counted by physics formulation after each clear testing time.



Fig. 3.3. Weights

- Disc brake, ventilating holes diameter 8 mm.



Fig. 3.4. Ventilating Holes 8 mm



CHANGED DIMENSION OF VENTILATING HOLES DIAMETER-DISC BRAKE BY STATIONER TEST

Ian Hardianto Siahaan¹⁾, Christian Albert²⁾

Mechanical Engineering Petra Christian University^{1,2)}

At Siwalankerto Street 121-131, Surabaya 60236. Indonesia^{1,2)}

Phone: 0062-31-8439040, Fax: 0062-31-8417658^{1,2)}

E-mail : ian@peter.petra.ac.id¹⁾

ABSTRACT

Braking distance is one of the most important parameter of vehicle dynamic. The method of friction force often is used to evaluate on their parameter. Friction force might have been caused that makes vehicle could be stopped on its usual condition and can be slow as long as the tire acceleration. Researchers tell that ideal braking force are supposed to know about braking force- distribution of a vehicle. In this paper, ventilation holes diameter had been selected by the method while changed dimensions are respectively 8 mm, 10 mm, 12 mm neither velocity vehicle nor braking load were given is having distinguish variables of parameter on its surface. Relational parameter between both of variables are supposed to be found that braking distance of three types disc brake on them will be counted as results. At the end of this final testing have told that the increasing of velocity vehicle shows braking distance is faster than type of disc brake with minimal diameter of ventilation holes on braking load condition that its used on its surface.

Keywords: Disc Brake, Braking Distance, Ventilation holes Diameter

1. Introduction

Automotive competition has extremely fast development today. A lot of products can be seen in market places that they can influence for changing other products became good products which having compatible power in many areas. Either engine, chassis or body of vehicle have been changed by automotive engineering at automotive industries. Acceleration and power are supposed to be given particularly of changing automotive parts at automotive industries. It cause why braking system is always need to be analyzed for each large portion as important element in vehicle dynamic planning. Disc brake is generally selected as the main testing requirement for this paper, because of its easy function to detect and maintain about the parameter responses of acceleration and braking load that could be given on surface.

2. Theory Background

Disc brake are consists of caliper, brake pads, piston and others with hydraulic system on its function is important for giving power to push piston or actuator. Wheel cylinder, master cylinder and reservoir have been built the integrated hydraulic system so that it is easy to make the movement on its surfaces. At hydraulic system, piston on caliper surfaces move oil pressure and it is distributed to master cylinder. Hydraulics pressure occurs piston that moving brake pads and holding the disc brake. During holding time of disc brake generates the braking distribution on pads.

Disc brake always has low temperature because the ventilating rotor distributes heat their pads as result of friction force on surface. Disc brake has pollutant disadvantages which they are easy to enter because its

open construction. The dirt on its surface always influence caliper and brake pads movement. Every pollutant always gives the brake pads to be worn out as the reason of the pollutant on its surface and their contaminations. In holding time, rotor became thin wall and make the disc brake will be difficult to hold the rotor.

Disc brake could be evaluated by using hypothesis-test to investigate the influence of parameter against to several parameter responses. This method is used to analyze the parameters i.e. velocity, deceleration, stopping-time. On this paper is generally analyzed changed dimension of disc brake against to braking distance at stationer test.

Disc brake could be investigated by using normal-test to look if the data have normal distribution or not. The first test, Kolmogorov-Smirnov, if $P\text{-value} < \alpha$ the concluding decision is not normal distribution. The second test is dot diagram/histogram. Dot diagram test is used to be small data whereas histogram -test is used to be large data. The decision follow normal distribution if the mean is around at null pointer.

Disc brake could be evaluated by variant-test to know wide range of permissible tolerance of variant . If $P\text{-value} < \alpha$, null hypothesis couldn't be accepted

Disc brake could be evaluated by independent-test to know if the data have a lot of pertaining relational parameters to each others. If $P\text{-value} < \alpha$, null hypothesis couldn't be accepted.

On this page, only are explained about mean test to look for disc brake performing even though all the tests can be used for having the pertaining test. To complete all of researcher use according to the techniques that they fill out about and depending on their approaching assumption that investigating the problems.