International Journal of Mechanics, Energy Engineering and Applied Science (IJMEAS)
VOL. 2, NO. 1, January 2024, PP. 8-13
Print ISSN 3026-6815 | Online ISSN 3026-5673 | DOI prefix: 10.53893
https://journal.gpp.or.id/index.php/ijmeas/index

Comparison of Standard and Racing Roller Weight Variations on CVT on the Power and Torque of the Honda Beat 110cc

Adhim Gustiar Efendi[1,*], Hermanu Kusbandono[1]

[1]Sunan Giri University Surabaya, East Java, Indonesia

Email address:

adhim.3gustiarefendi@gmail.com (Adhim Gustiar Efendi), hermanu.m42@gmail.com (Hermanu Kusbandono)

[*]Corresponding author

To cite this article:

Fandi, adhim, & kusbandono, H. . (2024). Comparison of Standard and Racing Roller Weight Variations on CVT on the Power and Torque of the Honda Beat 110cc. *International Journal of Mechanics, Energy Engineering and Applied Science (IJMEAS)*, *2*(1), 8–13. https://doi.org/10.53893/ijmeas.v2i1.232.

Received: 12 12, 2023; **Accepted**: 01 08, 2024; **Published**: 01 31, 2024

Abstract: This automatic motorbike uses an automatic transmission system called CVT (Contynously Variable Transmission). CVT is a system that automatically changes speed according to engine speed. This machine does not use transmission gears, but instead uses two pulleys (front and rear) which are connected by a belt (v-belt. The advantege of a CVt automatic transmission is that it can provide speed changes in torque from the engine to the rear whells automatically. This research aims to determine the effect of roller weight on the power and engine torque of a 110 cc two wheeled vehicle. The background of this research is to determine the power and torque of motorbikes for each roller weight studied and to draw conclusions about better use of rollers weight. This research uses experimental research methods, the materials used are standard 12gr,11gr,10gr,9gr,8gr rollers, as a comparison and 110cc injection beat motorbikes. The toll used in this research is a dynamometer. This tool shows directly the maximum power results at a certain rpm. Changes in the weight of the Honda Beat 110cc CVT roller affect the power produced by the engine. Changes in roller weight can affect the size of the engine's power and torque. This in proven by data showing changes in engine power and torque during each test. Therefore, it is hoped that the result of this test can be used as a reference for improving engine peformance in vehicles.

Keywords: Roller Weight, Power,Torque

1. Introduction

In an era like today, we are required to live more effectively and efficiently in carrying out everything both at home and in the work environment because in this era we have been treated to technology which makes it easier for us to carry out our daily lives.

This automatic motorbike uses an automatic transmission system called CVT. The basic difference between a CVT compared to other power transfer units is the way torque or power is transmitted from the engine to the wheels. In a CVT, it no longer uses gears to decrease or increase wheel rotation, but instead uses two pulleys and a metal belt [1]. CVT tries to

create a rotation ratio by utilizing a belt and pulley. The pulley on this CVT is very flexible and can be reduced or enlarged in diameter and produce the desired ratio change.

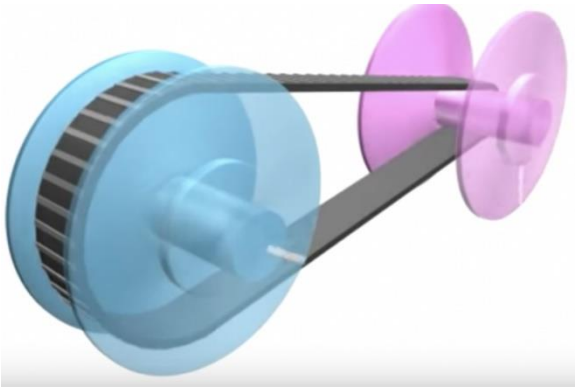

Figure 1. *CVT Automatic Components.*

This CVT system no longer uses gears to regulate the transmission ratio but instead uses a belt (V-belt) and variable pulley to obtain varying gear ratios, what are the advantages, construction and workings of automatic motorbikes. In a CVT there are important components, one of which is the roller [2].

Figure 2. *Roller Weight.*

This standard roller is a roller that comes from the factory that produces the motorbike, one of which is used by the Honda Beat 110 cc motorbike [3]. The standard or factory-built Honda Beat 110cc roller itself weighs 15 grams and is made of ordinary metal.

This component functions to stretch the roller or pulley housing by utilizing the centrifugal force produced by the motor engine rotation. CVT (Continuously Variable Transmission) is a transmission system that shifts gears automatically depending on engine speed. This type of machine does not use transmission gears but instead uses two pulleys (front and rear) connected by a belt (V-belt) [4].

The advantage of a CVT automatic transmission is the ability to shift gears automatically and transfer torque from the engine to the rear wheels. With the ability to compare ratios very accurately without having to change gears like on a motorbike engine with a classic gearbox. Naturally, there are no jerks that often occur when shifting gears on conventional engines. The transmission system is the part of the motorbike engine that transmits power and engine to the rear wheels. Automatic motorbikes use an automatic transmission system, where power from the crankshaft is transmitted to the rear wheel via two pulleys connected to the drive belt. In this automatic transmission system, there is no need for a gear lever like on motorbikes in general. In an era like today, we are required to live more effectively and efficiently in carrying out everything both at home and in the work environment because in this era we have been treated to technology which makes it easier for us to carry out our daily lives.

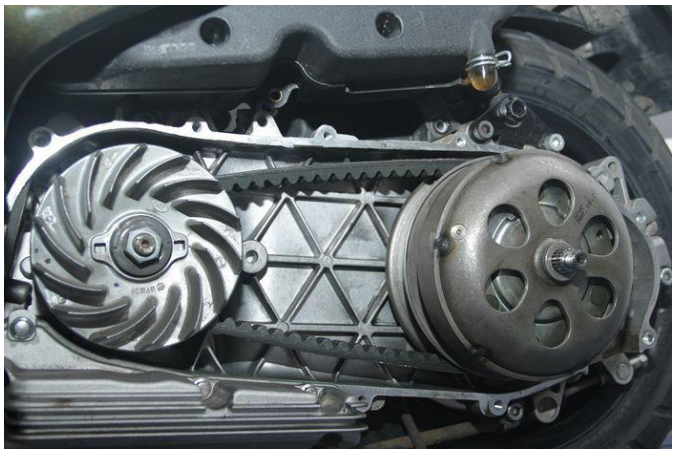

Figure 3*. Engine beat 110cc.*

This automatic motorbike uses an automatic transmission system called CVT. The basic difference between a CVT compared to other power transfer units is the way torque or power is transmitted from the engine to the wheels. In a CVT, it no longer uses gears to decrease or increase wheel rotation, but instead uses two pulleys and a metal belt. CVT tries to create a rotation ratio by utilizing a belt and pulley. The pulley on this CVT is very flexible and can be reduced or enlarged in diameter and produce the desired ratio change [5].

The CVT (Continuous Variable Transmission) system no longer uses gears to regulate the transmission ratio but instead uses a belt (V-belt) and variable pulley to obtain varying gear ratios, what are the advantages, construction and workings of automatic motorbikes. In a CVT there are important components, one of which is the roller [6]. This component functions to stretch the roller or pulley housing by utilizing the centrifugal force produced by the motor engine rotation. Many people think that replacing the roller with a lighter weight than the standard roller weight can improve the performance of an automatic motorbike [7].

This CVT system no longer uses gears to regulate the transmission ratio but instead uses a belt (V-belt) and variable pulley to obtain varying gear ratios, what are the advantages, construction and workings of automatic motorbikes. In a CVT there are important components, one of which is the roller. This component functions to stretch the roller or pulley housing by utilizing the centrifugal force produced by the motor engine rotation. [8]

***Figure 4**. Face Comp Movable Drive.*

2. Methods

2.1. Place and Time of Research

1. Time

Testing time "The Effect of Using Varying Roller Weights on Performance on the Honda Beat 110cc Motorcycle". in June 2023.

2. Place

Test location "Use of standard rollers and racing rollers" at the SURABAYA PEFORMANCE workshop laboratory. The research process was carried out by testing using a standard 12g roller and replacing it with a racing roller with varying weights of 8g, 9g, 10, 11g. Then analyze the comparison of power and torque produced by each roller and conclusions can be drawn.

2.2. Research Tools and Materials

This test was carried out using a dyno test tool in June 2023. The sample used in this test was 1 unit of Honda Beat 110cc with engine specifications of 110cc with a piston diameter of 47 mm and a stroke of 50 x 55 mm. The compression stroke used is 9.5:1. Other engine specifications, such as electricity, still use an electronic fuel injection system with a standard factory ECU installed in the motorbike itself.

***Tabel 1.** Specifications Honda Beat 110cc.*

Parameters	Information
Brand	: Honda
Type	: Beat
Machine type	: 4 step, SOHC
Diameter x step	: 50 x 55 mm
Cylinder Volume	: 108.3 cc
Compression Ratio	: 9,5: 1
Trasmission gear	: Automatic, V-belt
Ignition System	: Full Transisterized
clutch	:Automatic
Fuel	: Gas
Starter	: ACG starter,pedal
Fuel System	: injection (PGM-FI)
Maksimum power	: 8,68 PS/7500 rpm
Maksimum Torque	: 9,02 Nm / 6500 rpm

2.3 Data Collection Techniques

1. Identify variables

Research variables are everything in whatever form determined by the researcher to be understood so that information about it can be obtained, then conclusions can be drawn [9].

2. Independent variable

Independent variables or also called independent variables are variables that influence or cause changes or emergence of the dependent variable [10]. The existence of this variable is not determined by the presence or absence of other variables.

3. Dependent variable

The dependent variable is a variable that is influenced or caused by the existence of an independent variable. In other words, whether a dependent variable exists or not depends on the presence or absence of the independent variable. [11]

4. Control variables

Control variable is a set of a number of symptoms that have various aspects or elements in them, which function to control so that the dependent variable appears not because of other variables, but is actually caused by certain independent variables. [12]

Controlling this variable is intended not to change or eliminate the independent variable whose influence will be revealed. Likewise, controlling this variable is intended so that it does not become a variable that influences/determines the dependent variable.

5. Data Collection Techniques

The data collection technique in this research is to measure the performance of the object under study and record the necessary data.

The data required is power & torque The was carried out according to the procedures for using the Dyno test tool by starting the engine and accelerating repeatedly until maximum results were obtained The required data results are Power and Torque data results at each stationary rotation of the engine (Rpm) [13].

6. Data analysis technique

After testing, the data analysis technique used is the descriptive analysis method. This was done as an effort to provide an overview of the phenomena that occur after changing the weight of the CVT roller [14].

The following is the percentage calculation using the following formula.

$$((V^2 - V^1)/V^1) \text{ X } 100 \quad (1)$$

3. Result and Discussions

3.1. Research result

In testing the effect of variations in roller weight on engine power and torque using a dyno test equipment, it was carried out with 5 different types of test samples.

1. The first test of the Honda Beat 110cc with the original roller weight (standard 12) grams will be changed to a roller weight of 8 grams.
2. Second test of the Honda Beat 110cc and the roller weight was changed to 9 grams.
3. 3rd test of the Honda Beat 110cc and the roller weight was changed to 10 grams.
4. Testing the 4th Honda Beat 110cc and changing the weight of the roller weight to 11 grams.
5. 5th test Honda Beat 110cc with factory default roller weight weighing 12 grams.

The sample used in this test was a Honda Beat 110cc engine with engine specifications of 110cc with a piston diameter of 47 mm and a stroke of 50 x 55 mm. The compression ratio used is 9.5:1. Other engine specifications, such as electricity, still use an electronic fuel injection control system with a standard ECU installed in the motorbike itself.

Tabel 2. *Honda Beat 110cc Engine Power Test Results.*

RPM	8 gr	9 gr	10 gr	11 gr	12 gr
	Power	Power	Power	Power	Power
5800	2.31	2.33	2.11	3.22	7.48
6000	3.99	3.22	3.09	4.85	6.95
6500	7.06	7.72	8.37	8.28	7.17
7000	7.76	8.52	8.48	8.53	7.37
7500	8.57	8.02	7.92	7.45	7.33
8000	7.21	7.31	7.22	7.09	6.99
8500	6.56	6.42	6.69	6.86	6.32
9000	6.73	6.88	5.66	6.53	5.54
9500	6.51	7.79	5.98	5.97	5.89

Based on the graph above, you can see the comparison obtained from each test. It can be seen from the tables and graphs of the power and torque test results of the Honda Beat 110cc engine that the test results using the dynotest tool produce several differences. These results show the amount of power and torque produced by the engine.

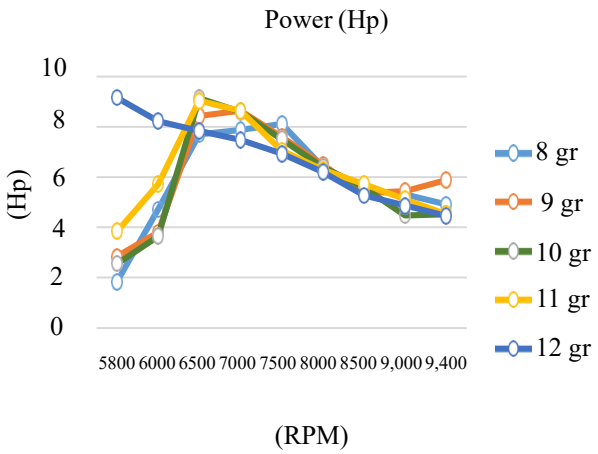

Figure 5. *Comparison graph for engine power testing.*

Based on the graph above. you can see the comparison obtained from each test. test 1 with a roller weight of 8 grams obtained a power of 8.57 Hp. test 2 with a roller weight of 9 grams obtained a power of 8.52 Hp. test 3 with a roller weight of 10 grams obtained a power of 8.48 Hp. testing 4 rollers weighing 11 grams got a power of 8.53 Hp. testing 5 rollers weighing 12 grams got a power of 7.48 Hp.

This test was carried out to determine the results of changes in roller weight on engine torque. The following is a table of torque results from all tests.[15] The following table will describe the test results obtained from changes in the CVT roller weight variable on engine torque. The following is a comparison table of engine torque from each test.

***Tabel 3**. Honda Beat 110cc engine Torque Testing.*

RPM	8gr	9gr	10gr	11gr	12gr
	Torque	Torque	Torque	Torque	Torque
5800	1.84	2.84	2.56	3.85	9.16
6000	4.71	3.79	3.64	5.71	8.22
6500	7.7	8.43	9.14	9.04	7.83
7000	7.87	8.63	8.59	8.64	7.47
7500	8.28	8.53	7.71	7.63	7.16
8000	6.4	6.48	6.4	6.29	6.2
8500	5.48	5.36	5.58	5.73	5.27
9000	5.31	5.43	4.47	0.52	1.07
9500	4.91	5.88	4.51	4.51	4.45

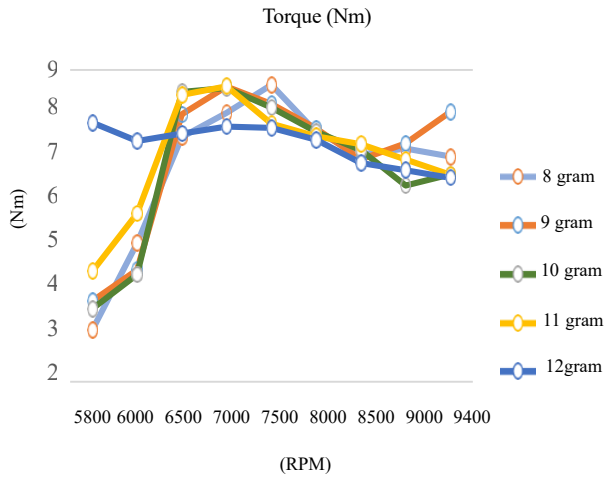

***Figure 6.** Comparison Graph For Engine Torque Testing.*

According to the graph above, you can see the comparison of test results for each roller test 1 got a result of 8.28 Nm. test 2 got a result of 8.63 Nm. test 3 got a result of 9.14 Nm. test 4 got a result of 9.04Nm. the 5th test obtained a result of 9.16Nm.

Thus it can be concluded that the weight of the roller greatly influences the torque produced by the engine. The heavier the roller used. It can affect the power produced by the machine and the weight of the roller used can also affect the torque produced by the machine.

4. Conclusion

Based on the results of research and discussion. research on the effect of CVT roller weight on engine power and torque. The research results with the highest power were in test 1 with an engine using a 8 gram roller weight of 8.57 HP. while the research results with the lowest power were in the test 5 with a machine using a roller weight (standard) of 12 grams of 7.48 HP.

The research results with the highest torque were in test 5 with a machine using a 12 gram roller weight of 9.16 Nm. while the research results with the lowest torque were in test 1 with a machine using an 8 gram roller weight of 8.28 Nm. So it can be concluded that the weight of the roller affects the torque produced by the engine.

References

[1] C. J. Brace *et al.*. "Preliminary Results from Driveability Investigations of Vehicles with Continuously Variable Transmissions." https://www.researchgate.net/profile/Chris-Brace 2/publication/266334217

[2] E. Widodo. M. Mulyadi. I. Iswanto. P. H. Tjahjanti. and S. B. M. Anggara. "Effect of pulley primary angle variation and roller 11 grams on 110 cc Scoopy injection engine." in *Journal of Physics: Conference Series*. IOP Publishing Ltd. Dec. 2019. https://doi.org/10.1088/1742-6596/1402/4/044039.

[3] H. H. Sutrisno. "The selection of flying roller as an effort to increase the power of scooter-matic as the main power of centrifugal pump for fire fighter motor cycle." in *IOP Conference Series: Materials Science and Engineering*. Institute of Physics Publishing. Apr. 2018. https://doi.org/10.1088/1757-899X/324/1/012055.

[4] K. Van Berkel. T. Fujii. T. Hofman. and M. Steinbuch. "Belt-pulley friction estimation for the Continuously Variable Transmission." in *Proceedings of the IEEE Conference on Decision and Control*. Institute of Electrical and Electronics Engineers Inc.. 2011. pp. 6672–6677. https://doi.org/10.1109/CDC.2011.6161072.

[5] V. Seelan. "Analysis. Design and Application of Continuously Variable Transmission (CVT)." 2015. [Online]. Available:www.ijera.com https://www.academia.edu/download/51160672/Analysis__Design_and_Application_of_CVT_Vishnu_Seelan.pdf

[6] A. Kampanakis. E. Siampis. E. Velenis. and S. Longo. "A Torque Vectoring Optimal Control Strategy for Combined Vehicle Dynamics Performance Enhancement and Electric Motor Ageing Minimisation." in *IFAC-PapersOnLine*. Elsevier B.V.. 2016. pp. 412–417. https://doi.org/10.1016/j.ifacol.2016.08.061

[7] K. Van Berkel. T. Fujii. T. Hofman. and M. Steinbuch. "Belt-pulley friction estimation for the Continuously Variable Transmission." *Proc. IEEE Conf. Decis. Control*. no. February 2014. pp. 6672–6677. 2011. https://doi.org/10.1109/CDC.2011.6161072.

[8] S. Nomura. K. Okubo. and T. Fujii. "Shifting speed and belt behavior of model CVT (continuously variable transmission) with push and pull type v-belt driven on semi-transparent pulleys influence of stiffness of V-belt in clamping direction." in *VEHITS 2018 - Proceedings of the 4th International Conference on Vehicle Technology and Intelligent Transport Systems*. SciTePress. 2018. pp. 474–480.

https://doi.org/10.5220/0006781604740480.

[9] Widiyatmoko. Arfan Ishartanto. Mike Elly Anitasari. Ma'rifat Al Hakim. and Khoirul Mu'allif. "Effect of Changing Primary Fixed Sheave Angle and Roller Weight on Torque. Power. Top Speed. and Acceleration on Matic Motorcycles." *J. E-Komtek*. vol. 6. no. 2. pp. 327–336. Dec. 2022. https://doi.org/10.37339/e-komtek.v6i2.1060

[10] D. Dwi Jatmoko. R. Kurniawan. A. Primartadi. Suyitno. and A. Susanto. "Modification of the Four-Step Motorcycle Camshaft Used in Making Salwa Cars (Go Card)." *J. E-Komtek*. vol. 5. no. 2. pp. 265–276. Dec. 2021. https://doi.org/10.37339/e-komtek.v5i2.787

[11] D. Rockwood. N. Parks. and D. Garmire. "A continuously variable transmission for efficient urban transportation." *Sustain. Mater. Technol.*. vol. 1. pp. 36–41. Dec. 2014. https://doi.org/10.1016/j.susmat.2014.10.002

[12] H. Wang. J. Zhu. Z. Yang. and J. Tang. "Study on administrative and educational measures of China urban public fire safety education." in *Procedia Engineering*. Elsevier Ltd. 2014. pp. 151–165. https://doi.org/10.1016/j.proeng.2014.10.421

[13] J. Wang. "Problems and solutions in the protection of historical urban areas." *Front. Archit. Res.*. vol. 1. no. 1. pp. 40–43. Mar. 2012. https://doi.org/10.1016/j.foar.2012.02.008

[14] J. H. Wang. J. H. Sun. S. M. Lo. L. J. Gao. and R. K. K. Yuen. "Statistical analysis on the temporal-spatial characteristics of urban fires under typical urbanization features." in *Procedia Engineering*. Elsevier Ltd. 2011. pp. 437–444. https://doi.org/10.1016/j.proeng.2011.04.680

[15] J. Cai. G. Li. J. Li. and Y. Hu. "Study on effects of the secondary fuel manifold unfold pressure on engine starting performance." *Propuls. Power Res.*. vol. 6. no. 4. pp. 253–258. 2017. https://doi.org/10.1016/j.jppr.2017.11.005.