Design and Development Engine Modifications Noken (Camshaf) Stars In SMK Nusantara Thatch

M A Rais[1]
[1] Department of Mechanical Engineering, Faculty of Engineering, University of Bandar Lampung. e-mail: muhammadrais00@gmail.com

Abstract. The purpose of this thesis are: (1) designing a modifiedengine construction design *camshaft*, (2) to know the ingredients of engine components and to knowcalculation enginemodification, *camshaft* The (3) determining the transmission range of the engine, (4) with the ability to adjust the electrical power for small to medium workshop which is estimated at between 900 to 1300 watts.This design concept refers to the design concept darmawanie with several stages, among others needs, defining the project and a list of requirements, outlines prancangan product concept, then design products.The results of the design of this machine is made is the result: (1) The design of the engine modifications that are efficient, (2) transmission system engine modification is to change the rotation of the motor power from 1400 rpm to 700 rpm, with a component in the form of 2 puly diameter 3 "and 6 ", connected by v-belt and shaft diameter of 20 mm used with St37 material. From this machine is capable of producing a modified one *camshaft racing*/ hour.**Keywords.** Design; engine development;*camshaft*

1. Introduction

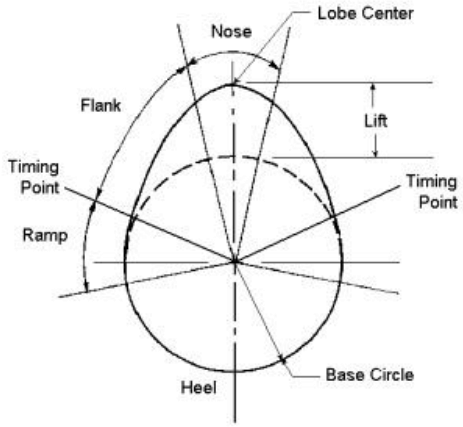
Motorcyclesare two-wheeled vehicle powered by an engine, use of motorcycles in Indonesia is very popular because the price is relatively cheap, affordable for most people and the use of fuel as well as well as operational cost saving enough. And also a motorcycle is a vehicle formed by some punyusun components, one of which is Nokens as(Camshaft).Noken is a component contained in the 4-stroke engine that servesto set up and move the valve / valve (valve) by pushing with two protrusions (lift). Noken driven by *thiming chain* (chain kamprat / cam chains), which relate to the crankshaft.Noken designed berdasdarkan four things:

A. The duration
is the time opening and closing of the valve in one work cycle is calculated based on changes in the position of the crankshaft measured in terms of degrees.

B. The lift
height is calculated from the valve forces completely closed valve position through a full open valve position is perfect.

C. Profile
is the shape of the *camshaft*,which distinguishes between the *camshaft*dengn the other one is seen from the *flank* and *nose*.Although the duration and *lift* the samecharacter is not necessarily *camshaft*histhe same.

D. Lobe saparation angle (LSA)
is the distance between the peak point bulgecamp*in* and camp *out* which translated into degrees of crankshaft angle.



Figuere 1. Tune lobe separation angle

Grinding process *of the camshaft* that is now used in two ways: manually and using tools orgrinding *camshaft*homemademachines.Grinding process is done manually, the grinding process using a grinding sitting alone in modifying *the*camshaft. This process only rely on the experience and skill of the mechanic so that if the poor mechanical finesse it will produce a *camshaft* which is not good. While the grinding process that uses a tool / homemade machine when compared to manual work much better for finesse not very influential, but the tool / enginemodification *camshaft* that exist today have some drawbacks.Disadvantages engines that exist today are still limited *camshaft* that can be done, the price of the machine is still too expensive, the movement ofholder *the camshaft* that can only be to the side alone and others. Therefore designercreate a "tool / engine modification *Camshaft"*so that all the above problems can be resolved. The function of this tool is that we can change theduration *camshaft* standardbecomes greater in rank in a matter of degrees of crankshaft as well as we can determine *the*lift.This engine is a development of existing machines.The purpose of this study is to get the design and working drawings of the camshaft modification machinery construction and determine the level of security on materials such camshaft engine component modification.The benefits of this research is as an application of theory and practice which is obtained when dibangku schools and diperkuliahan, as the process of character formation work in the face of world competition work later and provide reference for the community and students in opening new entrepreneurs and entrepreneurial development of industry, workshops and institutions.

2. Methods

2.1 Components Designed

In planning the concept of modification Camshaft engine mechanism is designed and known main components required. The machine is made of several main components, namely for the propulsion electric motors 1 hp 1400 rpm, the transmission belt use V-belt 3 "and 6" and for *cashing* or *body* using elbows plate and plate slabs with a thickness of 5mm.

2.2 Image design Build Engineering Modification Camshaft

Caption:

1. Theseat pully
2. table board
3. Transmission Parts
4. camshaft holdersection
5. Catok cross
6. grinding wheel / Sandpaper
7. FrameMachine

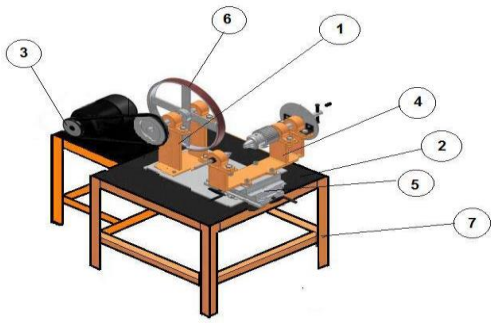


Figure 2. Camshaft Machine Design Modifications

2.3 FrameMachine

Framemachine is a structure that became the basic form that sustains and forming machine , Order on the enginemodification*camshaft* formed from the composition of the L profile bars measuring 40 x 40 x 3 mm.

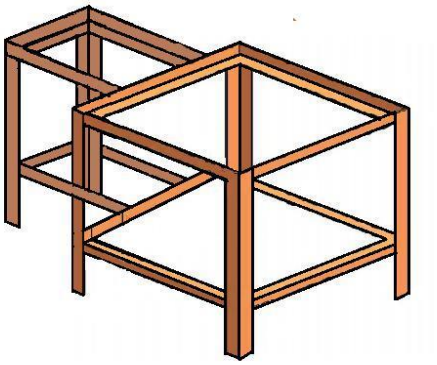


Figure 3. Framemachine

Figure 4. Wheel Sandpaper

Frameis coupled with the welding connection. Welding is to connect two metal parts by heating to its melting temperature. Welding is done on the enginemodification*camshaft* is using SMAW*(ShieldMetalArc*Welding)to the connection type I and fillets.Chosen using SMAW welding because it can be used to weld carbon steel of any kind, according to weld L profiles are used as the framework enginemodification. *camshaft*Moreover, it can save on production costs compared to other types of welding. These components are useful to support other components such as seat-component camshaft, motorcycles, grinding wheels, cross clamp.

2.4 Abrasive Wheels

This component is useful to scrape camshaft from the standard diameter shape until kebentuk predetermined diameter. At this stage the speed of rotation of the wheel sandpaper very decisive result of the erosion of the camshaft. The workings of this abrasive wheel is motor driven through an intermediary v-belt and abrasive wheels spinning. Ampals tip wheel will slide against the body and produce camshaft racing camshaft.

2.5 Cross Catok

This component is useful as a sledge on a modified engine camshaft and also to regulate the thickness of the erosion.

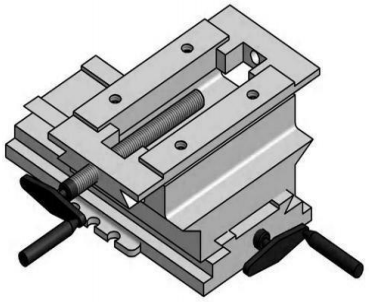


Figure 5. CrossVise

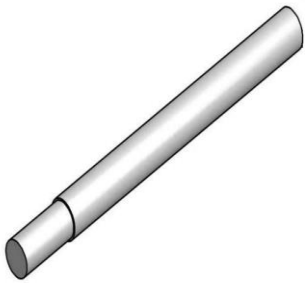


Figure 6.transmission shaft

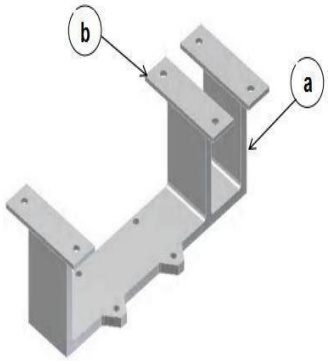


Figure 7. Standcamshaft

2.6 Axis

This component serves to rotate the wheel amplaspada when etching camshaft. This shaft is rotated by an electric motor melaalui intermediary v-belt.

2.7 Stand camshaft

This component serves as a place tumpuaan to be modified camshaft and holder *camshaft* in the engine modification *camshaft* is one component that is vital, because this holder will hold the *camshaft* during the process of modification. Construction holder *camshaft* using paired bearing holder above *camshaft* as a pedestal the shaft and *drill* chuck. Use of *bearings* also to reduce friction with the shaft. Holder *Camshaft* put on sledge transverse and longitudinal sledge that can be driven back and forth or right to left.

2.8 Pully holder

Puly holder on the engine modification *camshaft* serves as a place of attachment of *the* bearing, shaft and puly sandpaper. Puly holder construction is the same withholder, *the camshaft* which together are *bearing* supported by the strip plate thickness of 5 mm.

Figure 8. Mounting pulleys and wheels sandpaper

Figure 9. dibble drill

2.9 DibbleBor

This component serves as a brace camshaft at the time of execution. And this drill dibble placed on the camshaft holder component.

2.10 MethodMachine Work

Machinecamshaft modification will work when the electric motor is turned on, then will rotate rotary motion of the engine is transmitted to the pulleys 1, of the pulley 1 is transmitted kepuli 2 Use v belt to drive the shaft. Once the shaft rotates the grinding wheel or wheels which have been coated abrasives will spin and camshaft which is mounted on the drill dibble ready to be modified.

3 Results and Discussion

3.1 Preliminary data

Construction Design modifications camshaft engine is determined on the following considerations:

a. ergonomic machine specification making it comfortable for the operator and easily adjusted with a den or small business space and can be moved in place. Estimated engine dimensions length x width x height that is 500x500x410 mm.
b. Source AC electric motor tailored to the capabilities of electrical power for small to medium sized business workshop is expected to average ranged from 900 to 1300 Watt.
c. Easy in operation, maintenance and replacement of machine parts.

3.2 The design of the transmission system

Transmission system consists of a reductant in the form of *a V-belt* and *pulley*.The transmission system is expected to reduce the rotation of the motor according to the desired rotation, increasing torque and fulfill the safety requirements for operators. As for the *V-belt* and *pulley* selected with consideration capable of connecting the shaft relatively long distance and not meimbulkan noise. Table 3 is the comparison value *(ratio)* rounds the result of the reduction transmission system modification Camshaft.

Description:

n1 = 1400rpm

kerja1 n = 1400rpm x i1

n kerja2 = 1400rpm x (i1 x i2)
= 1400rpm xitotal
final= n

Table 1. Comparison of rotation ratio transmission system modifications engine camshaft.

No.	Transmission	Ø (mm)	i work	n work (rpm)
1	*Pulley* motors	76.2	1	1400
2	*Pulley* shaft	152	0.5	700
	i total (i1 x i2)		0.5	n end = 700

3.3 Analysis of Torque spindle

For every object spun suffered centripetal and centrifugal force. Centripetal force is the force acting on an object moving in a circle in which the direction of the force is always towards the center of the circle. Or it can also be said Fs (centripetal force) is the force that makes the object to move in a circle. In this case the pulleys sandpaper undergo centripetal force, which amount as follows.Style Sentripental happened

Fs = m. — (1)

Where:

M = mass of sandpaper (0.07 kg)
r = fingers finger puly (0.15 mm)
R = fingers sandpaper wheel spokes (150 mm)

V sought by the following equation: Cs =
Cs =

v = 10.99

then: —

Fr = m.
Fr = m. —

= 56.4 N

Then the torque experienced by the shaft, namely:

Torque (TA) = F x R (2)

= 5.7 kgx 150 mm

= 855kg.mm

So the magnitude of the torque experienced by the shaft is 855 kg.mm or 8.4 Nm.

3.4 Analysis power requirement

Knowing the magnitude of the torque experienced by the shaft in the above calculations, the power requirement can be known by entering the amount of torque to the equation.Assuming the efficiency*(η)*= 90% and a correction factor*(fc)*belt = 1.3 (the enginemodification*camshaft* is expected to work every 3-5 hours / day, (Sularso and Suga, 2004: 165). The following is the calculation of the power kebutahan motor (N)

= 720.06 watts = 0.96 Hp

3.5 PropulsionTorque Analysis

by knowing the magnitude of the torque experienced by the shaft in the above calculations, the power requirement can be known by entering the amount of torque to the equation.assuming efficiency*(η)* = 90% and a correction factor*(fc)*belt = 1.3 (the enginemodification*camshaft* is expected to work every

3-5 hours / day, (Sularso and Suga, 2004: 165). the following is the calculation of the power kebutahan motor (N)

= 720.06 watts = 0.96 Hp

3.6 Transmission shaft Calculation

Given:

Power dtranmisikan (p)= 0.746

rotation axis (n)= 700 rpm

moment= 11.91 Nm

axis= 1215.3kg.mm

Material St 37

shear stress allowed ($\tau_{a)}$= 3.08 kg / mm^2Kt ⟶ (collisioncorrection factor) is determined=

bending correction factor2)were determined = 2 {cost between 1.2 to 2.3, if it is not expected to occur then the bending load is taken = 1.0} (Sularso and kiyokatsuSuga, 2004: 8)

Calculation of shaft diameter (ds)

{()} T = 1215.3 kg..mm

{()}

3.7 Selection Belts -V

Given:

P = ½ Hp = 0.746 kwn_1 1400 rpm= n_2 = 700 rpm

I = = 2

moment: T_1 = 259.1 kg.mm

T_2 = 519.1kg.mm

V-beltsPenampang selected: type A

circle diameter range for puly: d_p = 76.2 mm (3 ")

D_p = 152,4 mm (6 ")

belt speed (v)

Round belts is lower than the maximum kecepatn (1.778 m / s <30 m / .s) Good

nominal number selected V-belts and the market = 46

4 Conclusion

4.1 Conclusion modified engine design results camshaft are as follows:

1. machinea modified *camshaft*usespuly coated sandpaper to grind*camshafts.*This machine also uses a sledge crosswise and lengthwise to scrape thecradle*camshaft* and engineusing*driil chuck* as pencekam*camshaft,*so that all the brands *camshaft* can be done. And the specifications of this machine are as follows:

a.Engine capacity: 1 *camshaft racing*/ h
b. machine size: 500 mm x 500 mm x 410 mm
c. Propulsion: electric motor 1 HP
d. Frame machine: profile steel L measuring 40 mm x 40 mm x 3 mm
e. Axles: *St 37* diameter 20 mm
f. Transmission: pulleys 6 "and 3" with *v-belt* type A-44

2. the security level of the construction of this machine is based on some analysis from the shaft, machine frame to the transmission system can be classified quite good because it meets several conditions, among others:of
   a. Constructiona powerful engine to handle the weight and the forces acting on the machine.
   b. Meet safety for the user.

4.2 Suggestions

Designengine modification *camshaft* is still far from perfect, both in terms of quality of materials, panampilan, and work systems / functions. Therefore, in order to enhance the design of this machine need their ideas further with every consideration. Some suggestions for steps that can build and memyempurnakan this machine is as follows:

1. It is necessary to cover or protector on the part of the transmission system so that security is more assured and add value to the product.
2. On the legs of the machine frame should be given a vibration-damping rubber as a result of the electric motor.
3. Should choose a good quality sandpaper so as not frequently change sandpaper.
4. Because this machine requires a fairly high precision, preferably at the time penyetting this machine must be done carefully so that it can produce a quality product.

References

[1] Sularso, and Suga, K. 2004. *Planning and Selection Basic ElementMachine.*Jakarta: Pradnya Paramita.

[2] Shigley, JE, and Mitchell, LD (2000). *Planning Mechanical Engineering EditionFourth Volume 1* (Harahap, G. Translation). Jakarta: Erland.

[3] DarmawanHarsokusoemo. (1999). *Introduction to Engineering*Design.Jakarta: Directorate General of Higher Education.

[4] Saito, S and Surdia, T. 2005. *Knowledge of Materials*Engineering.Jakarta: Pradnya Paramita.

[5] Mujisetio, ST, MT. Module motorcycle engineering practice Muhammadiyah University of Magelang: magelang,

[6] http://repository.usu.ac.id/bitstream/handle/123456789/47147/Chapter%20II.pdf. 20:3020/072017

[7] Https://campromaster.wordpress.com/2010/11/19/apa-itu-noken-as-durasi-lift/20:3020/072017