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Yarn Winning Machine Design

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ABSTRACT

A mop is a very simple tool, but it is very much needed in society, especially to help with household work. In this final project the author tries to make a thread roller to process the manufacture of mops. The basic material for making mops is 0.85 cotton yarn and the waste material is clothing waste. The design of a tool with results that can support the need for the manufacture of basic materials in the production of mops, which is expected to be useful for the textile industry, which can meet market needs and can be used as a home industry so that it can improve people's living standards. In the design of the Yarn Winding Machine above, it can be produced: the diameter of the driving pulley is 100 mm and the diameter of the pulli being driven is 100 mm. The ratio of the pulli on the drive shaft to the pulli being driven is 1: 1, the main shaft of 19 mm can deliver 144 watts of power. These machines have a transmission system driven by an electric motor HP/1400 rpm/1 phase by using a large pulley of 210 mm with a small pully diameter of 45 mm. Belts used with L = 813 mm with a total of 2 pieces can connect a power of 144 watts.

Keywords:
Appropriate Technology, Design, Yarn Roller, Yarn

INTRODUCTION

In the development of an increasingly sophisticated industry where the production process does not use human power anymore but by using machinery and computerization due to better production efficiency[1]. In this case, an engineer must be required to have an idea to design a mechanization to meet human needs in life based on technological developments[2]. The purpose and objective of the design of this tool is to design a tool with results that can support the need for the manufacture of basic materials in the production of mops, which is expected to be useful for industries in the textile sector, which can meet market needs and can be used as a home industry so that can improve people's standard of living[3].

A mop is a very simple tool, but it is very much needed in society, especially to help with household work. The role of technology to help economic recovery is very important[4]. One form of strategic technology is technology that can support the development of small and medium scale industrial units (SMEs) based on local natural resources available in various corners of the country. This kind of strategy is to encourage independent efforts in engineering and design to create the appropriate technology needed for the development of SMEs based on natural resources, so that they can really help accelerate economic recovery while producing more equitable development throughout the country.[5].

Appropriate Technology (TTG) is technology that is in accordance with the needs of the community, is dynamic, in accordance with capabilities and can be utilized by the community in increasing added value.[6]. The development of appropriate technology is based on the interests of the community[7]. The purpose of making these tools is to increase recycling productivity so that processing time can be accelerated with optimal results. Thus, the work process which usually uses manual results is less productive and optimal, it is necessary to increase the

productivity of the work. So it is necessary to design a tool that is efficient and technologically appropriate, so that yarn recycling producers feel the benefits of their production and are more efficient and economical.[8].

Although the manufacture of a simple tool can be completed and can be used to roll used yarn from cotton with good results, this simple tool model still needs to be developed again so that it can produce a better production process and it is hoped that manufacturing costs can be reduced to a minimum.[3].

METHOD

Basically, the design begins because of a need in society (consumer goods) or industry (capital goods). These needs are considered as imperfections of the machine or its work process, so that a new machine/process that is more perfect is needed. This perfection along with the changing times. A new product can be said to be perfect today, but not necessarily perfect in the future, and so on along with technological advances. This need ultimately drives the product cycle as well as technological progress.

The materials used can be divided into several groups, namely:

a. Coarse Iron (cast iron). Is an unalloyed tool iron, consisting of iron (Fe) and carbon (C) 1.7% to 4.5%, whether used in leg construction or standard machines.
b. Steel For Buildings and Steel Construction. It is an unalloyed steel, consisting of a maximum of iron and carbon (0.45% C). Used on profile iron, zinc, dowels, wire, standard or machine feet.
c. Unalloyed Tool Steel. Steel consisting of 0.45% to 1.7% carbon and iron. When hardened, this steel can be used as a simple machine tool material. Without hardening this steel is usually used for hand tools only.
d. Armored Tool Steel. It is a steel made from Fe and a mixture of chromium, cobalt, tungsten and nickel. Used for the manufacture of good quality hand tools or high efficiency machine tools.
e. Hard Metal. A metal consisting of tungsten and carbon (C) carbon plus synthetic cobalt, used for machine tool materials.

The rotation generated by the driving motor is transmitted to the transmission belt via pulleys to rotate the axis of the shaft / axle to wind the yarn. These machine tools have a transmission system driven by an electric motor Hp/1400 rpm/1 phase. In this design there are several main components and there are also other supporting components. These components have their respective duties and also these components, support each other so that this machine can run as it should.

RESULTS AND DISCUSSION

The pulley calculation is carried out with the aim of knowing the diameter of the distance circle and the diameter of the pulli, as well as the ratio of the speed ratios between the existing pulleys based on the size of the pulley.

Known:

a. Drive pulley diameter (D1) = 100 mm = 0.01 m
b. Motor rotation speed (n1) = 1400 rpm
c. Acceleration of gravity (g)= 9.81 m/s2
d. Diameter of driven top pulley (D2) = 100 mm = 0.01 m
e. Driven top pulli diameter (D3) = 100 mm = 0.01 m

Based on the data above, it can be calculated the speed of the driven pulley (D2), namely n2 = 1400 rpm. Transmitted power, Pr (kW) = 0.144 kW, Design twisting moment, T (Nm) T1 = 3.694, Nm T2 = T1, Permissible shear stress = 8.46 kg/mm2. Belt linear speed = 0.11 (m/s).

Belt circumference length – V = 801.57 mm. Fornumber nominalbelt got belt typeA, with number 32, length (L)= 813 mm = 0.813 m.Shaft axis distance, C in calculation (mm) C = 196.243 mm = 0.19624 m. For the nominal belt number, the belt is type A, with number 32, length, L = 813 mm = 0.813 m.

Discussion

Frame materials used in terms of tension and stress:

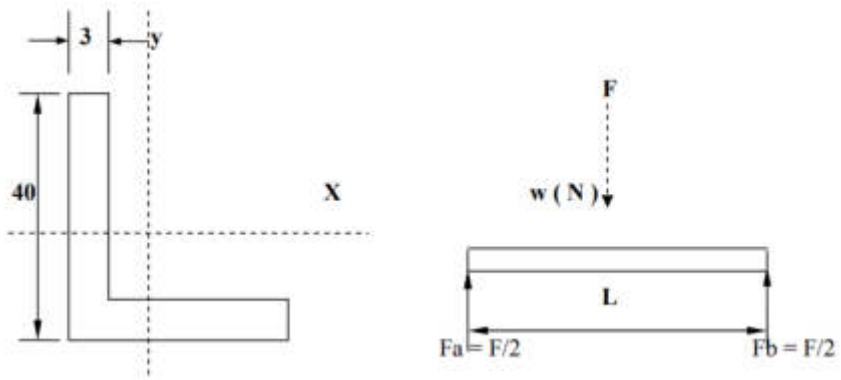

Figure 1. Dimensions and forces that occur in the frame

It is known that the dimensions of the elbow are 40 x 40 mm, and the load carried is 30 kg. From the above data can be calculated.

a. The load carried by the frame = 294 N
b. Maximum vertical shear force Q (N) = 147 N
c. At zero shear point the maximum bending moment is: M = 24.5 Nm
d. Moment of Inertia about the neutral axis (I) = 1.73. 10-10 m4, because Iy < Ix then the price I selected is the smaller price, namely Iy
e. Bending Stress = 7873. 108 N/m2
f. Static Moment (S) = 2,306.10-6 m3
g. The maximum shear stress that occurs on the neutral axis = 48.99. 106 N/m2

CONCLUSION

The frame can support a load of 294 N. It is proven that the elbow profile with dimensions of 40 x 40 mm has a shear stress of 48.99 x 106 N/m2. The ratio of the pulleys on the drive shaft to the driven pulleys is 1: 1. The engine speed is 1400 Rpm which drives three pulleys of the same size D1 = D2 = D3 = 100 mm. Belt calculation – V from the belt standardization data, the transmitted power (Pr) = 0.144 kW, torsional moment T1 = T1 = 3.694 Nm, allowable shear stress a 8.46 kg / mm2, linear speed v = 0.11 m/s, for this type is a type A belt with number 32 which has a belt circumference length of L = 813 mm and a axis distance of C = 0.19624 m.

REFERENCE

Jeshika, “Perkembangan Industri Nasional Menuju Industri,” *J. Ilm. Mhs.*, vol. 8, no. 1, 2019.

Pusdatin Kemenperin, “Analisis perkembangan industri,” *Kementerian Perindustrian RI*. 2019.

Suhendra, A. Hidayat, F. Nopriandy, and B. Setiawan, “Pengembangan Desa Sumber Harapan sebagai Desa Sentra Tenun Songket di Kabupaten Sambas,” *J-Dinamika J. Pengabdi. Masy.*, vol. 5, no. 1, 2020, doi: 10.25047/j-dinamika.v5i1.1253.

A. Hafidz, M. Faruk, and A. Rizanul, “MEMBANGUN SINERGI USAHA KECIL DAN MENENGAH (UKM) DENGAN TENAGA KERJA DI DESA MOJOSARIREJO, KECAMATAN DRIYOREJO, KABUPATEN GRESIK,” *J. Layanan Masy. (Journal Public Serv.*, vol. 1, no. 2, 2017, doi: 10.20473/jlm.v1i2.2017.89-97.

M. Sulaiman, R. Wahyu, and D. T. Wibowo, “ANALISIS PRODUKTIVITAS TENAGA KERJA PADA BENGKEL SKALA KECIL MENENGAH DI MALANG,” *J. Teknol. Terap. G-Tech*, vol. 2, no. 2, 2020, doi: 10.33379/gtech.v2i2.340.

A. Rahardjanto, N. Nurwidodo, and M. Mas’odi, “Implementasi Teknologi Tepat Guna untuk Mengatasi Permasalahan IRT Ramuan Madura di Kabupaten Sumenep,” *Int. J. Community Serv. Learn.*, vol. 3, no. 4, 2019, doi: 10.23887/ijcsl.v3i4.21788.

N. Juniati, “Kajian Tentang Tenun Sesek dari Desa Pringgasela, Lombok Timur, Nusa Tenggara

Barat," *KELUWIH J. Sains dan Teknol.*, vol. 1, no. 1, 2020, doi: 10.24123/saintek.v1i1.2786.
A. . A. Meitridwiastiti, I. G. A. Vony Purnama, and I. G. Waisnawa, "Penerapan Teknologi Tepat Guna dan Pelatihan Bahasa Inggris Pada IRT Jajan Bali," *WIDYABHAKTI Jurnal Ilm. Pop.*, vol. 2, no. 3, 2020, doi: 10.30864/widyabhakti.v2i3.200.