ANALYSIS AND MANUFACTURE OF PIPE ROLL BENDING MACHINE

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ABSTRACT

Pipe rolling machine is a machine for rolling pipes or bending pipes. The purpose of the analysis and manufacture of the machine is to make pipe bending work easier because the machine bends automatically according to the desired degree. The design process for this pipe rolling machine includes: making design concepts, identification of materials, identification of machines and equipment used, and identification of drawings. The thing that needs to be considered in the manufacture of this pipe rolling machine is the density of the connections on the upper frame and lower frame legs so that vibration occurs when the machine is operating. This machine has dimensions of length 500 mm, width 320 mm, 500 mmn machine performance testing is carried out by testing directly to make pipe rolls. The results of testing the time needed to make one roll pipe is 20 minutes, with a rotation speed of 1400 Rpm.

Keywords: *pipe, Analysis, Pipe Roll Bending Machine, engine frame*

INTRODUCTION

The current era of technology is developing rapidly[1] this has an impact on all fields, both in the field of technology [2] and in the industrial sector[3]. Therefore, the industrial world is required to have high-quality human resources in balancing technological advances [4], especially in the industrial sector [5].

The more advanced the technology used, the faster the production rate produced by the industry itself. In addition to affecting faster and more production results, the products produced are also better in terms of quality and quantity. In the industrial world, a person is required to be more active and creative. A person is required to be able to have the ability to innovate the product or have the ability to innovate or innovate the product. In order to achieve progress and development in the industry itself. It is difficult to produce/make new tools/machines. Someone must be creative and able to have ideas and express those ideas.

Pipe is a term for a hollow cylindrical object and is used to transfer processed substances such as liquids, gases, vapors, liquefied solids or fine powders [6]. Pipe rolling is a pipe forming process that is mostly done to make industrial and household components, for example making buildings, canopies, fences, chairs and other components that use pipe materials [7]. The process of making machine components requires design[8] and analysis[9] of the forming process. One of them is a pipe roll machine. The existing pipe roller bending machine needs to be developed towards a more automated, effective and efficient use. The function of this pipe roller bending machine is generally used to make canopies, trellis windows, trellis fences, trellis doors and others that can be formed by a roller bending machine pipe.[10]

METHODS

The research method is a research design that provides direction for the implementation of research so that the necessary data can be collected. To find out how the concept and design of this pipe roll bending machine need to be carried out in the field survey, field observations, data collection, compilation and data management with mathematical and theoretical steps arranged in a research method The methodology used for this research consists of of the following stages:

1. Field observation
   This is the first step used to obtain information related to the object of research.
2. Literature study
   It is a step of writing and reviewing reference books, to add broader theoretical insight.
3. Collecting data in the completion of this research, there are several stages carried out from the beginning until the results are obtained. The stages carried out in this study can be seen from the flow chart.
4. Consultation
   Consultation with resource persons or other experts to get instructions on the design of the pipe roll bending machine
5. 5. Survey
   The initial step taken in this study was to conduct a survey on the design of the pipe roll bending machine which aims to obtain problems that can be used as an initial basis for research.
6. Literature review
   In addition to getting data from places of observation, a library search was also carried out through book references, where there was data that could not be obtained from the field. This literature review is also useful for obtaining a supporting formula for research data processing.

DISCUSSION

Pipe roll bending machine is a bending machine that is controlled by an automatic system driven by a motor. The point is to roll the pipe, the main movement is rotation. In the industrial world, the existence of pipe roll bending machines currently plays an important role, especially in the manufacturing industry. In the process of making a product, pipe roll bending machines are very fast and accurate when compared to manual ones. Seeing the importance of the pipe roll bending machine in the manufacturing industry, the price of this pipe roll bending machine is very expensive.

Therefore, several workshop business groups in particular still rarely use pipe roll bending machines. In this case the author wants to make a pipe roll bending machine with materials that are easily available in the market. And of course with cheap materials but produce a good engine. Produces good production and can also shorten production time for its users.

With the hope of maximizing pipe roll management products and can be used by all people from the middle to lower classes in the manufacture of this pipe roll bending machine, the author also conducted a survey to several workshops aimed at knowing the needs of the community, such as racing motorcycle exhaust necks and others. other. which are usually sold in the market or are usually made in the workshop industry. U channel iron cutting has many sizes for each cut according to the size of the length of U channel material that will be needed in making pipe roll bending machine tools.

As follows :

1. 420 mm for pipe roll bending frame length.
2. 390 mm for the height of the bending tool.
3. 190 mm for the width of the bending frame.

Figure 2. U . Channel Iron Cutting

a. Bending Frame Welding

U channel iron that has been cut to size is then connected using a SMAW (shielded metal arc welding) welding machine. Then the weld connection uses a lap joint and a corner join.

Figure 3. Welding

b. Manufacture of a dynamo motor holder.

The electric motor holder and loler mat use U-channel iron with a thickness of 5mm. Then the loler mat is tied using bolts, to make the bolt holder itself we use a drilling machine. The motor holder contained in the frame formed by the UNP channel frame uses a distance of 40 cm to the side from the side of the table which has a table length of 80 cm.

Figure 4. Dynamo Mount Drilling

c. Bearing Stand Manufacturing

In making the bearing holder we use UNP channel iron and elbows, where the thickness of the elbows we use is 5mm. The UNP canal iron is cut along 410 mm and then at the top of the UNP canal a 14 mm bolt hole is given as a fastener for the bearing.

Figure 5. Making the Bearing Stand

d. Roller Mattress Center Setting

The iron shaft is cut by 120 mm to make the left and right center equal to the front and back of the roller mat, so that the center of the roller mat is straight so that the bending process is equal to the pipe being rolled.

Figure 6. Flashlight Roller Settings

Discussion

After the machine is finished and tested so that it meets the desired conditions, the next step is discussion. In this case, the discussion is carried out in writing and in the form of a research report so that it can be used properly.

1. Assembly process

a. Bearing and shaft installation

The bearings are installed and tied/tightened using bolts 14. For the type of bearing used is an inner angle ball radial bearing with ASB P205 where the first number represents the type of bearing, the second number represents the bearing series, the third and fourth numbers represent the diameter of the inner hole. bearing, the last two letters represent the type of bearing cover material. As for the shaft material used is ST 60 with a diameter of 25mm, which has a length of 150 mm.

b. Center Installation

The center of the pillow block is flattened into the flashlight shaft pipe that has been made on the pillow block holder frame to use the shaft lock.

c. Motor drive installation

The driving motor is installed and the seat is made using the elbow and the bolt is tightened 10. For the motor power that is used 12 Volts, the installation of this driving motor must be parallel to the size of the loler mat truss shaft which places the driven gear in the loler mat rod truss.

d. Installation of pulleys and chains

The pulley is locked with a weld, where the weld acts as a pin, so that the roll does not move back and forth. For pulleys that are moved, the diameter is 98 mm. The type of gear used is a motorcycle chain.

2.. Installation of on/off switch

For the installation of the switch, that is by installing a switch with a dynamo using a direct cable with the battery to rotate the dynamo driving the loler mat.

3. Pipe Roll Bending Machine Working Principle

The bending process is a machining process that uses roll bending with two bending rolls to bend pipe material that rotates back and forth. The working principle of the bending machine that will be made is:

The workpiece is inserted between 2 rolls, which has 3 bending rolls and the bottom is for the drive and the top is for the press. Then the electric motor will rotate the workpiece in a way that the rotation of the driving motor is transmitted using gears and chains that are connected directly to the roll bending shaft. Then the motor will rotate according to the rotation of the suppressor, where later this motor will move the loler mat below which follows the rotation of the motor. As a result, the workpiece will bend as desired.

Figure 7. Pipe rolling results

The calculation of the Pipe Roll Bending Machine is as follows:

Pipe Roll Bending Machine Frame Design. The process of designing the engine frame using welding methods such as welding with SMAW is now widely used in the manufacture of machines. Weld strength calculation:

Formula : P : 2.0,707.s.l.σt (library 4 page 349)

Where : P : Tensile stress strength (N)

s : Foot/base or weld size = plate thickness (mm) : Weld length (mm)

t : Tensile stress (Mpa) Dic : s : 5 mm

: 54 mm t : 49 mpa

Dit : P ?

Answer: P : 2.0,707.5.54.49 = 18,707.22 N (Rounded) = 18.78 N

So here the welding strength using a SMAW welding machine using ST 42 iron, the strength of the frame is equal to = 18.78 N using ST 42 iron

Design of a roll bending machine driving dynamo

=2πnT/60

Where :

P : Power (Watt) T : Torque (N.m)

n : Shaft rotation (rpm)

= 60xp/2xπxn60XP

Where :

T : Motor Torque P : Power (N.m)

n: Speed (rpm)

Bro: P: 35 watts

n : 50 rpm

Dit : T ?

Answer : =60x35/2x3.14x50 2100/314=6.68 N,m

Then the resulting torque is = 6.68 N.m

Looking for the power of the bending machine driving motor
Dik : T : 6.68 N.m
n : 50 rpm
Dit : P ? Motor power
Answer: = 2n/60= = 2x3.14x50/60= 314/60= 5.24 watts

Then the power produced by the pipe roll bending machine is 5.24 Watts to rotate the bending machine

CONCLUSION

From the makers of the pipe roll bending machine above, the authors can draw conclusions as follows: 1) This pipe roll bending tool requires 5.24 watts of power to rotate the roller mat. 2) This machine has a pipe capacity of 1 inch and to roll the pipe it takes 15 minutes to 90 degrees. 3) This tool is faster in pipe bending time, more efficient and safer.

REFERENCES

[1] N. Azis, "Analisa dan Perancangan Konsep Aplikasi Birdshield." pp. 23–28, 2021.
[2] N. Azis, G. Pribadi, and M. S. Nurcahya, "Analisa dan Perancangan Aplikasi Pembelajaran Bahasa Inggris Dasar Berbasis Android," *J. IKRA-ITH Inform.*, vol. 34, no. 4, pp. 101–108, 2020.
[3] M. . Ghufron, "Revolusi Industri 4.0: Tantangan, Peluang, Dan Solusi Bagi Dunia Pendidikan," *Semin. Nas. dan Disk. Panel Multidisiplin Has. Penelit. dan Pengabdi. Kpd. Masy. 2018*, vol. 1, no. 1, pp. 332–337, 2018.
[4] N. Azis and B. A. Handoko, "JURNAL INFORMATION SYSTEM Analisa dan Perancangan Aplikasi Pengadaan Barang di PT . Sintra," *J. Inf. Syst.*, vol. I, no. November, pp. 38–42, 2021.
[5] H. Hamdan, "Industri 4.0: Pengaruh Revolusi Industri Pada Kewirausahaan Demi Kemandirian Ekonomi," *J. Nusant. Apl. Manaj. Bisnis*, vol. 3, no. 2, p. 1, 2018, doi: 10.29407/nusamba.v3i2.12142.
[6] K. Zamrozi, N. Imansyah, and A. Zain, "Rancang bangun sistem informasi geografis jaringan pipa pdam tirta taman," *J. JARPI*, 2020.
[7] S. Kuntoro, "Analisis Kekuatan Dies Frame Link Pada Mesin Roll Pipa 2 in," *J. SIMETRIS*, vol. 9, no. 2, pp. 941–946, 2018.
[8] N. Azis, "Perancangan aplikasi enkripsi dekripsi menggunakan metode caesar chiper dan operasi xor," *Ikraith-Informatika*, vol. 2, no. 1, pp. 72–80, 2018.
[9] N. Azis, M. S. Hartawan, and S. Amelia, "Rancang Bangun Otomatisasi Penyiraman dan Monitoring Tanaman Kangkung Berbasis Android," *J. IKRA-ITH Inform.*, vol. 4, no. 3, pp. 95–102, 2020.
[10] S. Alamsyah and A. Saleh, "Perancangan sistem kontrol plc pada mesin bending rol pipa," *TEDC*, vol. 13, no. 3, pp. 228–232, 2019.