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DESIGN OF LEAD SINKER MANUFACTURING MACHINE

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ABSTRACT

The current scenario in rope industries is that they need the sinkers, and more prominently they need lead sinkers. But the problem lies in the cost which is incurred for buying the lead sinkers and also the cost for importing it in India as the lead sinkers are not available in India and currently, they need to be imported from China.

The objective behind this project is to design a machine which can produce the lead sinkers at considerably high rate and without the need of human too. The machine is so designed that it is a fully automatic process.

Implementing this idea in actual practice is a very crucial part as the cost incurred by rope manufacturers today to import these is very high. By implementing the idea of this machine a lot of money is going to be saved and thereby allowing the companies to better manage their expenditures and not last but least, it will provide them the flexibility of buying the sinkers anytime as they will be produced in India itself.

I.INTRODUCTION

The marine industries are rapidly growing in developing country like India in recent years. Ropes play an important role in marine industries. There are numerous applications of various types of ropes depending upon the type of load it carries or its intended function. This project specifically focuses on marine application of ropes. These ropes are generally used for anchoring the boats or provide reinforcement for the parts of mountains which are prone to landslides and even in fishnets. As the density of the nylon ropes is less, it tends to float around in water. For this purpose the sinkers are used. Sinkers are the small dead weights tied together with the help of strong thread and embedded in the nylon rope so as to increase the weight of the rope and to help it stay stable and strong.

Currently, these sinkers are not easily available in Indian market and the sinkers which are available are either of different shape or too costly. Our aim is to design such a machine which can efficiently manufacture these sinkers, with no labor needed. This can give us the flexibility of increasing the production rate which is necessary for the industry whose sponsorship we are carrying as these sinkers are required in very large volume. With no labor cost, the overall cost of manufacturing these sinkers will be greatly reduced and overall financial efficiency of the firm will also increase.

This project is capable of manufacturing the sinkers at very less initial cost and in return providing high production rate.

II. PROBLEMSTATEMENT

Currently, there are no manufacturers of lead sinkers in India. The rope industry is in need of lead sinkers as they have various uses. On the contrast, rope manufacturing industries are growing rapidly in recent years. Ropes are highly produced as they are having large number of application.

Almost 35% of ropes produced today need lead sinkers as marine applications of ropes are increasing with increase in development of technology in marine sector in a developing country like India. As the lead sinkers are not available in India to purchase them, companies need to buy the lead sinkers from China. China is the largest market where lead sinkers are highly produced.

If numbers are considered, India also imposes a 7.5 percent basic customs duty, 12.5 percent additional duty.The requirement of lead sinkers from the manufacturer with whom we are developing this project is approximately 1 ton which costs approximately 6,00,000 INR which is costly if we import it to India

III. METHODOLOGY

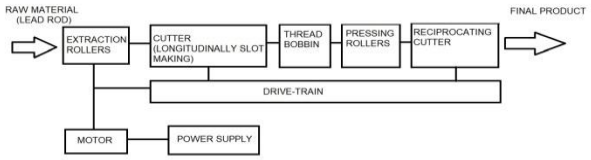

Figure 1: Block diagram of the process

Initially the extraction rollers are being powered by the motor (0.5 HP, 0.37 Kw). The function of these extraction rollers is that they grip the lead rods which are stored in coil form and these rollers are maintained at 10mm/sec (linear speed) and the material is sent to towards the cutter. The motor is initially at 1440 RPM, it is brought to 46 RPM with the help of a gearbox attached to it. The gearbox ratio is 1:31.30.

The cutters make a vertical slot just below the centre of lead rod which is later used to insert a thread into it. The cutters are static as the material is very soft and can be pierced easily with slight pressure. These cutters are mounted on a

shaft which is supported by 'C' channels. These C channels have a vertical slot which helps us to adjust the height of cutters from the surface of raw material.

Once the cutter operation is done it is sent to thread bobbin and the function of thread bobbin is to hold the thread and guide it into the slot simultaneously when the material has arrived. These thread bobbins are also static.

The next operation is the pressing of the open slot of the lead rod. This operation is carroed out by the pressing rollers. These rollers have a narrow opening which results in pinching of the slot and it closes and traps the thread inside of it. In this manner the thread is inserted into the lead rod and the next and final operation is to cut the rod into small beads.

The beads are made by the cutter which looks identical to a gear. They are being driven by the bevel gears through the motor and finally they cut the lead rod into the small beads and final product is made ready in this manner.

1. Advantages

- The lead has high density than most of the materials available.
- Lead sinkers are cheaper than the other sinkers.
- The lead has a property which allows easy machinability and it is available easily.
- The material is soft and ductile and achieve shape and size which required.
- The lead has high corrosion resistance.

2. Disadvantages

- The lead material is toxic so that it is dangerous to human being.
- According to some governments lead is the toxic for the human beings and for all the animals.
- Ongoing research and assessments have revealed that lead material poisoning from sinkers or jigs ingestion is an issue of serious concern with regard to the protection of certain marine life.
- Also lead is subjected to creep at normal temperature.

IV. LITERATURE REVIEW

Materials used for sinkers are stone, clay, ceramic, cement, glass, lead, iron, tungsten in past times 1) and that have been identified from the archaeological sites which are located in southeast Arabia.

According to the identified sinkers from archaeological sites the first sinker was flat oval pebble, and notched roughly in the middle 3). There are different shapes of sinkers mostly spherical, barrel shape and ring like shape structures 10).

Also as per the conducted survey in June 2004 to January 2005 to study the fishing sinkers used along the region, they have collected some details about the material types and the different types of material for sinkers. Samples of sinkers were collected from some industries for further studied 12). The use of sinkers was started in the ancient times and is still continued in some different areas. 3)

Materials like granite, baked clay, cement, iron, mostly lead material 1). Among all these materials lead material is considered to be the best for sinkers due to their special properties like high density and high corrosion resistance12).There are different types of sinkers depending on their materials shapes, sizes, weight, and the materials available according to the regions5).

Few details has been given according to the length, diameter of hole and weight of the sinkers 8). However, Very little information is available on fishing sinkers and their use. The shape and size of the sinkers plays very important role during fishing operation and hence designed in such a way that they should not be entangled with the gear during the operation of fishing or entanglement should be minimized.

Lead is the most common material used for the manufacturing of the sinkers.it was noted that the traditional fishermen are switching over to lead sinkers along to coast owing to its ready availability and the ease of use. This is available in the numerous shapes and sizes suiting the different needs. Countries like UK USA CHINA CANADA non-toxic sinkers made out of bismuth, tin, stainless steel tungsten, ceramic, recycled glass, natural granite etc.

Shape and the size of the lead material sinker is very critical for successful operation of fishing gear and hence they are designed in such a way that the entering of the sinker with the gear during operation is minimized. There is a trend to use the lead sinkers replacing all other materials due to its ease of use, less bulkiness corrosion resistance etc

V. DESIGN

Observations:

Weight of the cutter = 1.5 KG = 14.715 N

Power to be transmitted (P)= 0.37 Kw

RPM (N) = 46

Dia of cutter = 126mm

FOS = 3

For Mild Steel :

G= 77 GPa

S_{yt} = 247 Mpa

S_{ut} = 841 MPa

$\tau_{per} = 0.3 \times S_{yt}$

$\tau_{per} = 0.18 \times S_{ut}$

$\tau_{per} = 0.3 \times 247$

$= 55.575$ N/mm^2

$\tau_{per} = 0.18 \times 841$

$= 189.225$ N/mm^2

Consider the value which is minimum out of the two.

$$M_t = \frac{60x10^6x0.37(kw)}{2\pi x46(rpm)}$$

M_t=76809.559 N.mm

$$\tau_{per} = \frac{16}{\pi d^3}\sqrt{(M_t)}^2$$

$$55.575 = \frac{16}{\pi d^3}\sqrt{(76809.559)}^2$$

d= 19.165 mm

As per the standard size, the 25mm diameter shaft is considered as 19.165 is not available.

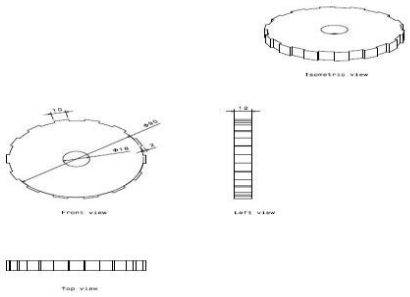

Figure 5.1 : Extraction rollers

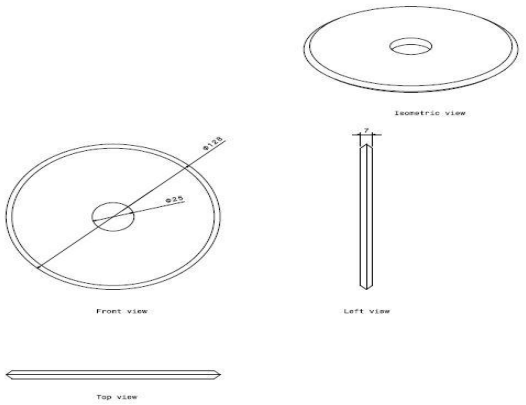

Figure 5.2 : Slot cutters

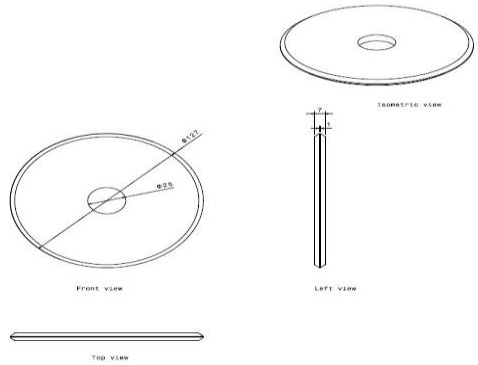

Figure 5.3 : Thread bobbin

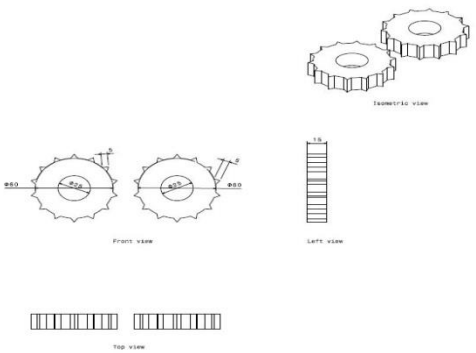

Figure 5.4 : Rotary cutters

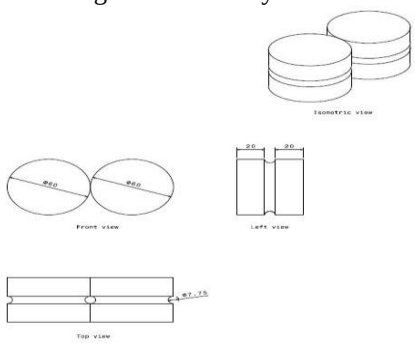

Figure 5.5: Pressing rollers

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CONCLUSION

Considering the above design and the process on how to manufacture the lead sinkers, there is a scope of fabricating such machine and to launch it in the market to fulfill all the needs. Currently, the machine's prototype is yet to be fabricated and once the prototype is fabricated, further research and development will take place and the machine can further be improved and as it has the potential to manufacture the lead sinkers rapidly there is a high chance that rope manufacturers will be interested in either buying the machine or in purchasing them from their vendors.

There is a very dense possibility that we will fabricate this machine and soon will approach the rope manufacturing industries that need the sinkers and are currently importing them from China, and supply them the sinkers. By doing this, the extra cost which the rope industries are paying for the import duties will cut down to a great level and also the delivery time will be reduced as manufacturing will be in India itself.

Considering all the possible factors, fabricating the machine and making it work to produce sinkers is very crucial as it is the need of the rope industries which is needed to be fulfilled and we have a great chance of serving the industry with a machine which has the potential to do that.

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