



DESIGN AND FABRICATION OF WIRE STRAIGHTENING MACHINE

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1. Abstract

In this project the attention is focused on developing a technique to straighten commercially used wire in an economical manner. There are machines developed by various industries to straighten drawn and coiled wire, but the commercial wires available in the market have differing cross section and material properties. Nowadays, straightening of these commercial wires are done manually in industries by hammering process. It is a very tedious job and time consuming too. So there is an industrial necessity to automate the process.

Now days, there are wide variety of wire products like welding electrode, weld mesh, heat treated kitchen baskets, automobile spark plugs and exhaust valves and various applications etc. For manufacturing all above products, wire is used as primary element and is to be straighten from coil form. The straighten wire is to be cut as per required length.

For these sequential operations, in wire straightening machine cutter can be used.

Wire straightening machines play a pivotal role in straightening wires that have become bent or crooked during manufacturing or handling processes. The content outlines the working principle of these machines, highlighting their key components such as rollers or dies. It discusses the importance of wire straightening machines in industries such as construction, manufacturing, and automotive, where

straightened wire is essential for various applications including fencing, reinforcement, and electrical wiring. Additionally, the paper emphasizes the efficiency and accuracy of these machines in improving product quality and production speed. Through a comprehensive analysis, this information provides insights into the critical role of wire straightening machines in modern industrial processes.

Although this review cannot be collectively exhaustive, it may be considered as a valuable guide for researchers who are interested to develop next generation of wire straightening machine.

Keywords –

Unwinding , Straightening , Cutting off

2. Introduction

In this project we are designing and fabricating Wire Straightening Machine which are widely used to extend wires from a roll or coil in order to straight it for using it as per the requirement.

Metal straightening process or machine are mostly heavy type in the metal working industries which are using straightness and flatness. This machine are offered with extensive features requiring diverse applications.

This machine is complied with three different processes such as unwinding, feeding and straightening. The wire straightener is easy to operate. We just need to fix the adjuster to the desired length and through the unwinder process the wire is feed into the machine. Then, the machine will automatically produce straight wire of uniformed length at a specific speed.

A wire straightening machine is a mechanical device used to straighten wires that have become bent or crooked during manufacturing or handling processes. It typically consists of rollers or dies through which the wire is passed, applying pressure to straighten it. These machines are crucial in industries like construction, manufacturing, and automotive, where straightened wire is needed for various applications such as fencing, reinforcement, and electrical wiring. The efficiency and accuracy of wire straightening machines contribute to improved product quality and production speed in these industries.

Wire straightening machines represent a vital component of this process, ensuring that wires meet the required standards of straightness and quality. This report aims to provide a comprehensive overview of wire straightening machines, exploring their functionality, applications, and importance in various industries.

The introduction will cover the significance of wire straightening machines in industrial processes, emphasizing their role in enhancing product quality, reducing manufacturing costs, and improving overall efficiency. It will also outline the structure of this paper, detailing the topics that will be discussed in subsequent sections, including the working principle of wire straightening machines, their key components, applications across different industries, and their impact on production processes. Through this paper, readers will gain deeper understanding of the critical role that wire straightening machines play in modern manufacturing and industrial operations.

3. Problem Statement

The wire straightening machine industry faces the challenge of balancing the need for high-speed production with the requirement for precise straightening of wires across various diameters and materials. Achieving optimal straightening accuracy while maintaining productivity levels poses a significant challenge due to factors such as material variations, roller wear, and machine maintenance requirements. Additionally, the complexity of wire

straightening processes increases with the demand for customization and flexibility to accommodate diverse wiretypes and applications. Addressing these challenges is crucial to enhancing the reliability, efficiency, and competitiveness of wire straightening machines in industrial manufacturing operation

4. Objectives

Primary goal is to straighten coiled wire with precision and accuracy.

To maintain high quality standards throughout the straightening process.

Easy unwinding of the coiled wire.

Ensuring the safety of operators and preventing accidents is a critical objective of designing this machine.

5. Scope

The scope of wire straightening machines encompasses their crucial role in industrial processes across multiple sectors, including construction, manufacturing, automotive, and electronics.

These machines offer the capability to straighten wires of varying diameters and materials, ensuring compliance with stringent quality standards and specifications.

With advancements in automation and control systems, wire straightening machines enable high-speed production while maintaining precision and accuracy.

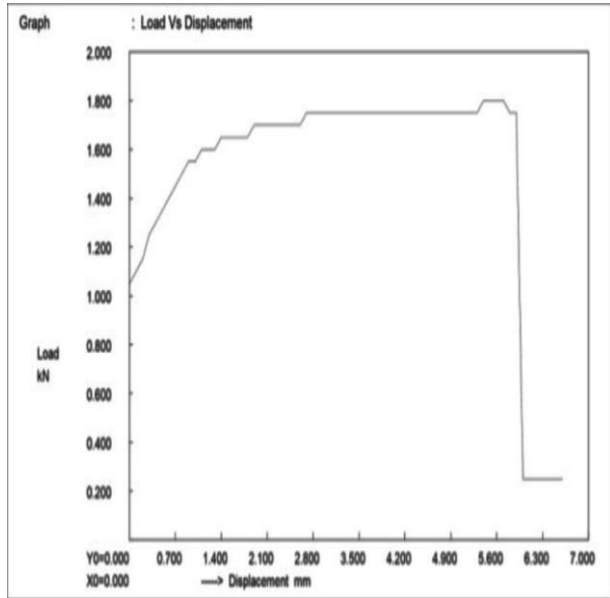
Additionally, their flexibility allows for customization to accommodate diverse wire types and applications, making them indispensable tools for enhancing efficiency and productivity in modern manufacturing operations.

As industries continue to evolve, the scope for innovation and optimization of wire straightening machines remains vast, promising further advancements in performance and versatility.

6. Calculations

The graph load vs displacement is plotted by testing the wire on Universal Testing Machine (UTM).

By referring the below graph, following calculations are being performed.



1. Force :

$$\text{Stress} = \text{Load} / \text{Area}$$

$$\text{Area of Wire} = (\pi/4) d^2$$

Where, d=diametre of wire=2mm

$$\text{Area of Wire} = (\pi/4).2^2$$

$$\text{Area of Wire} = 3.14 \text{ mm}^2$$

From the graph, Load = 1.70 N

Therefore,

$$\text{Stress} = 1.70 / 3.14$$

$$\text{Stress} = 0.5414 \text{ N/mm}^2$$

$$\text{Stress} = \text{Force} / \text{Area}$$

$$\text{Force} = \text{Stress} * \text{Area}$$

$$\text{Force} = 0.5414 * 3.14$$

$$\text{Force} = 1.70 \text{ N}$$

2. Speed :

$$N = (120 * f) / p$$

Where, N=Speed of Motor in RPM

f=Frequency in Hz =50Hz

p=Motor pole =4

Therefore,

$$N = (120 * 50) / 4$$

$$N = 1500 \text{ RPM}$$

3. Speed Ratio :

Speed ratio of pulley= (Speed of larger pulley) / (Speed of smaller pulley)

$$\text{Speed ratio of pulley} = (350) / (700)$$

$$\text{Speed ratio of pulley} = 1 / 2$$

$$\text{Speed ratio of pulley} = 1:2$$

4. Pulley Ratio :

Pulley ratio= (Diameter of driven pulley) / (Diameter of driving pulley)

$$\text{Pulley ratio} = (8 \text{ inch}) / (4 \text{ inch})$$

$$\text{Pulley ratio} = 2 / 1$$

$$\text{Pulley ratio} = 2:1$$

As Pulley ratio is greater than 1, it signifies a speed reduction, which means the driven pulley will rotate slower than the driving pulley.

7. Material Selection

8. Methodology

Sr.no	Part Name	Specification
1.	AC Motor	1 Phase 220/240volt
2.	Larger Pulley	8 inch Dia.
3.	Smaller Pulley	4 inch Dai.
4.	Frame	2feet/2.5 feet
5.	Belt	V A56
6.	Bearing	Bush Type

The process of wire straightening in a wire straightening machine involves several steps to transform bent or crooked wire into straightened wire suitable for various applications. Here's an overview of the typical process:

1) Unwinding: The coiled wire will be unwinded from the bundle and feed into the straightening mechanism.

2) Feeding: The wire is fed into the wire straightening machine from a coil or spool. This can be manually loaded or automated using feeding mechanisms.

3) Alignment: As the wire enters the machine, it passes through alignment guides or pulley that help to position it correctly for the straightening process. This step ensures that the wire is properly oriented and supported as it moves through the machine.

4) Straighten: The wire is then fed through straightening mechanism arranged in a specific configuration. These mechanism gets rotated with th help of motor, gradually bending it back into a straightened form.

5) Tension Control: Tension control mechanisms may be employed to regulate the speed and tension of the wire as it passes through the straightening mechanism. This helps to prevent excessive stretching or deformation of the wire during the straightening process.

6) Inspection: After passing through the straightening mechanism, the straightened wire exits the machine and may undergo inspection for quality control purposes. This may involve visual inspection or measurement of key parameters such as straightness deviation, diameter variation, and surface defects.

7) Cutting or Coiling: Depending on the specific application, the straightened wire may be cut to length using a cutting mechanism integrated into the wire straightening machine. Alternatively, it may be coiled onto spools or reels for further processing or distribution.

8) Output: The straightened wire is then ready for use in various applications, such as reinforcement bars, wire

meshes, springs, cables, electrical conductors, or other industrial components.



9. Conclusion

In conclusion, wire straightening machines play a critical role in modern industrial processes by ensuring the straightness and quality of wires used in various applications. Throughout this paper, we have explored the design, functionality, applications, and significance of wire straightening machines in diverse industries such as construction, manufacturing, automotive, and electronics.

The paper has highlighted the importance of wire straightening machines in improving product quality, reducing manufacturing costs, and enhancing overall efficiency. By straightening bent or crooked wires, these machines enable the production of high-quality components such as reinforcement bars, wire meshes, springs, cables, and electrical conductors, contributing to the reliability and durability of end products.

Moreover, we have discussed the working principle of wire straightening machines, tension control mechanisms, and adjustment features in achieving optimal straightening performance.

Advances in technology, such as automation, sensor integration, and real-time monitoring, have further enhanced the efficiency and accuracy of wire straightening processes.

Through experimental studies and performance evaluation, researchers continue to explore ways to optimize wire straightening machines, improve their productivity, and minimize material waste. This ongoing research aims to address challenges such as straightening accuracy, speed,

energy consumption, and maintenance requirements, ensuring that wire straightening machines remain at the forefront of innovation in industrial manufacturing. In conclusion, wire straightening machines represent a cornerstone of modern industrial processes, enabling the mass production of high-quality wires essential for a wide range of applications. By understanding their design, operation, and significance, manufacturers can leverage the capabilities of wire straightening machines to achieve greater efficiency, productivity, and competitiveness in today's dynamic market landscape.

10. References

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