International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 04 | April - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Plastic Strip Making Machine – A Design and Development Approach

Dr. S.R.Ikhar[1] , Dr. A. P. Ninawe[2], Dr. P.G. Mehar[3], Tushar Khandekar[4]

1,Associate Professor, Department of Mechanical Engineering, KDK College of Engineering, Nagpur, Maharashtra.

2,3,Assistant Professor, Department of Mechanical Engineering, KDK College of Engineering, Nagpur, Maharashtra

4,PG Scholar, Department of Mechanical Engineering, KDK College of Engineering, Nagpur, Maharashtra.

Abstract -

Plastic is a significant environmental pollutant, making recycling essential. This project focuses on the development of a plastic recycling machine aimed at converting plastic bottles into plastic strips, which will contribute to efficient waste management. The design is similar to a plastic bottle crushing machine, but instead of crushing, it transforms plastic containers into long strips. This method helps in reducing the volume of plastic waste and promotes sustainable waste management practices. By reducing the overall bulk of plastic waste, this system will also help optimize storage and transportation of waste materials. Consequently, this project stands to provide valuable benefits, offering an environmentally friendly solution to tackle the growing plastic pollution problem. In the long run, it will play a crucial role in supporting waste reduction and enhancing recycling processes.

Keywords: PET bottles, Cutting, Design, Machine, Environment, Plastic waste, Packaging, recycling.

I. INTRODUCTION

This paper explores the research and analysis of a cutting machine designed for repurposing plastic waste into usable strips. In the plastic industry, plastic strips are commonly used for packaging and box strapping. These strips are typically created using hot air guns; however, if the plastic material contains impurities, the process can be interrupted, leading to inefficiencies and wastage. To reuse plastic strips, a softening process is usually applied, but it is both time-consuming and expensive. This machine aims to efficiently convert waste plastic bottles into strips in a short amount of time and at a lower cost. By utilizing pressure rollers, blades, and a hot air gun, the machine can effectively transform waste plastic material into strips. The motivation behind developing this machine is the environmental impact of plastic, which is often discarded in large quantities. This machine offers a solution by converting plastic waste into usable material, reducing its environmental footprint. The process involves the cutting and reshaping of PET bottles, which are widely used and disposed of on a large scale, into plastic strips that can serve a variety of purposes. Thes strips can be used in household applications, such as replacing traditional materials for ropes, wires, or even packaging straps. Furthermore, after cutting, the plastic strips can undergo additional processes like heat-forming, which removes the plastic's memory of its original shape and allows for the creation of new products. The versatility of these plastic strips enhances their potential for various applications, from home crafts to industrial uses, such as packaging and textiles. This project presents a practical solution for reusing plastic waste and contributes to reducing overall plastic pollution.

II. Problem Identification

A significant challenge persists as most existing machines fail to comprehensively address plastic bottle waste management. Current plastic bottle strip cutters exhibit limited functionality, primarily processing portions of bottles with uniform diameters to yield strips of a consistent width. A key deficiency in the present cutter designs lies in their inability to accommodate adjustments in the dimensions of the produced plastic strips. Furthermore, these machines lack the adaptability required to handle the diverse range of plastic bottle sizes and unique designs prevalent in the market today.

Consequently, the current designs struggle to effectively extract strips from these varied bottle forms. The conversion of plastic bottles into strands is crucial, as these strips can be subsequently woven into practical items such as seating, greenhouses, and more. The sale of these products can generate income, thereby improving the livelihoods of individuals facing poverty. Importantly, enhancing the design of these machines offers a pathway to reduce the accumulation of plastic waste by enabling its repurposing into desirable and usable products

III. RESEARCH METHODOLOGY.

A. LITERATURE REVIEW

Gedam, S., Sharma, S., Shahu, R., & Ninawe, A. P. (2020). " Plastic Bottle Strip Cutting Machine - An Approach". International Journal for Research in Applied Science &Engineering Technology (IJRASET),

This paper examines the opportunities and challenges associated with the logistics model for post-consumer PET bottle recycling in India, offering insights into the practices along the recycling chain. The results emphasize the need for educating individuals directly and indirectly involved in the process and highlight the importance of reducing consumption to minimize the volume of waste generated.

B. STUDY AND PRINCIPLE OF WORKING

Plastic waste and waste management represent two major challenges, with PET bottles being one of the primary contributors. Several machines have been developed for recycling plastic bottles, such as plastic bottle crushers and shredding machines. However, these machines have limited functionality, mainly reducing the volume of bottles for recycling purposes. This, however, does not fully address the problem of plastic bottle waste management. Our approach aims to design a system that not only recycles plastic bottles but also converts them into plastic strips, which can be further used in waste management. The plastic bottle strip cutter utilizes plastic waste while simultaneously producing raw materials that can be used to create new products, providing opportunities for economic value creation

C. NEED OF PROJECT.

The growing accumulation of waste in the environment, particularly those harmful to human health, has become a significant concern. PET bottles are widely used and discarded, posing an opportunity for industrial recycling. This project aims to design a machine that cuts plastic bottles into strips, which can then be used as raw material for various applications. The strips produced offer solutions to domestic challenges, and the machine's development within this socio-economic context is intended to provide an alternative approach to waste management. The goal is to implement an appropriate technological solution that will improve waste collection practices, facilitate the sale of household waste, and support the needs of socially vulnerable groups (such as the unemployed, disabled, and low-income communities) by fostering economically viable micro-businesses

V. DESIGN OF STRIP MAKER

A. CAD MODEL

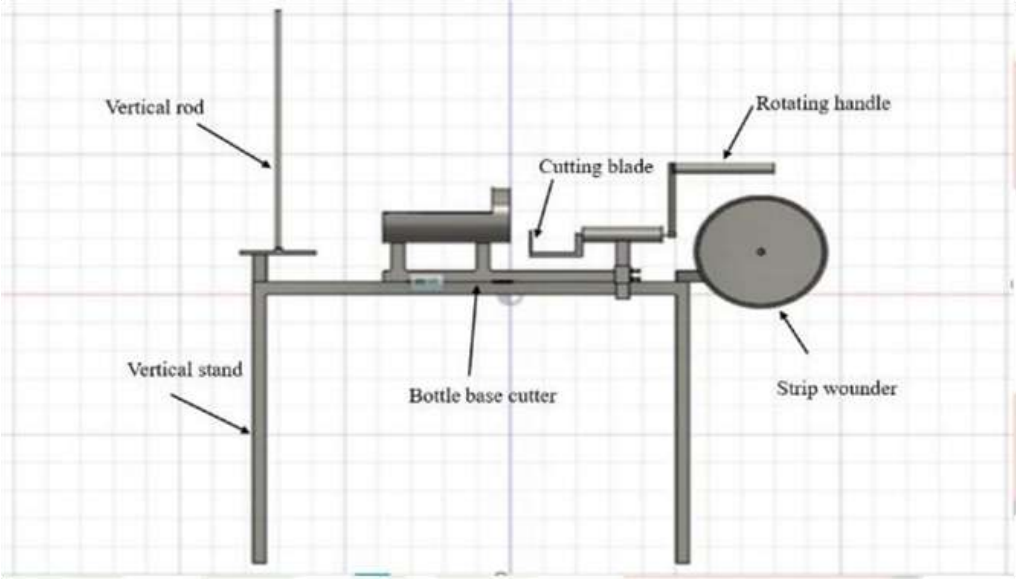

Figure 1 Front View

B. FRAME

The frame, built with square iron bars and featuring a flat top and four supporting legs, provides a solid base for assembling components of a plastic bottle strip-making machine. It is engineered to maintain specific distances between parts for smooth operation. The primary function of the frame is to support and organize the machine's elements in a structured manner

Figure 2 Frame

C. CUTTER BLADE

Blades are the sharpened portions of tools or weapons designed to cut, chop, or scrape different materials. They are usually made from materials that are tougher than what they are meant to cut. In earlier history, blades were crafted from stone, such as obsidian, and later from metals like copper or iron. In modern times, steel is the material of choice for blade production due to its strength and ability to hold a sharp edge. Blades have been used by humans for thousands of years

and remain crucial in tasks ranging from food preparation to various industrial uses. Their effectiveness lies in the ability to focus force on the sharp edge, which enables them to cut through even tough materials

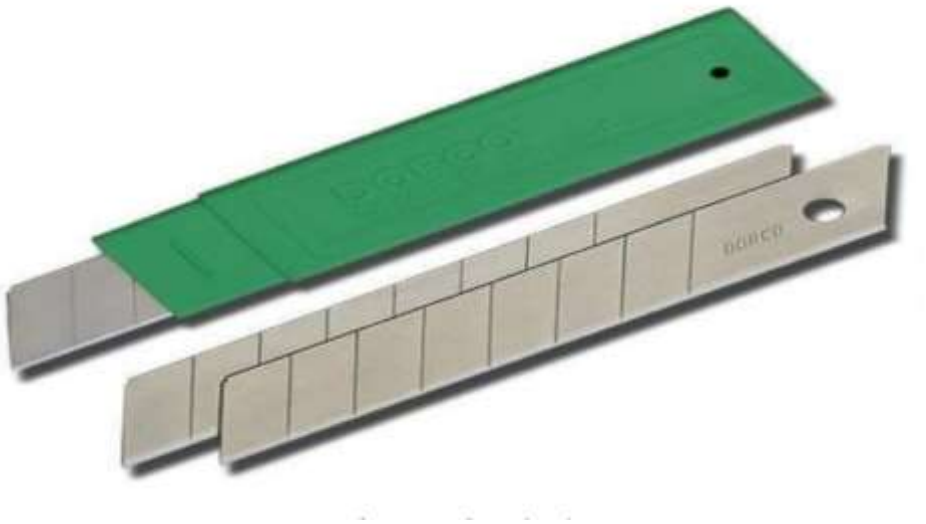

Figure 3 Blade

D. STRIP WOUNDER

A cable reel is a round, drum-like object used for winding and storing different types of wires, including electrical and fiber cables. These reels, or drums, have been in use for decades to manage wire products. In the same way, a cable reel can serve as a strip winder, efficiently gathering plastic strips into neat rolls.

Figure 4 Woulder

E. GEARED MOTOR

A DC motor is an electrical motor that converts direct current into mechanical energy, creating rotary motion. The most common types of DC motors operate based on the magnetic fields they generate. To control the direction of current flow within the motor, they contain internal mechanisms, either electro-mechanical or electronic. This functionality is essential in applications like driving wounders and pressure rollers, where consistent rotational movement is needed.

Figure 5 Motor

V. PROPOSED IDEA

The plastic bottle strip shaper machine is a more advanced version of the traditional strip shaper, designed to address the shortcomings of previous models. It uses a vertical shaft where a bottle is placed, with extra weight applied to create tension that pulls the strip off the bottle as it rotates. The bottom of the shaft holds a horizontal cutting blade fixed in place by nuts and screws. The distance between the blade and the fixed position can be adjusted by tightening or loosening the nut, which also contains a spring for flexibility. The blade is slightly angled, ensuring easier cutting of strips from the bottle. To operate the machine, the user places the bottle on the shaft, adds the weight, and rotates the bottle to pull the strip from the blade. The beginning of the strip is attached to the opposite end, where a motor and pulley system winds the strips. The machine can handle bottles of different sizes and shapes, cutting strips with adjustable widths from 5mm to 15mm. This design provides consistent cutting results, accommodates various bottle types, allows for simple blade replacement, reduces manual labor, and ensures safety during use.

VI. ADVANTAGES

- low cost required to manufacture.
- No or negligible maintenance is required.
- very easy to operate.
- It is lighter in weight.

- Less power consumption.
- Less number of mechanical moving parts, hence less friction and gives higher accuracy.
- Converting waste polluting plastic bottles in useful product.

VII.DISADVANTAGES

- It required external power supply to work.
- Initially manpower is required to cut bottle base.
- Careful while strips cut by operator initially.
- No other raw material is used rather than plastic bottle.

VIII. REFERENCES

- Gedam, S., Sharma, S., Shahu, R., & Ninawe, A. P. (2020). *" Plastic Bottle Strip Cutting Machine - An Approach"*. International Journal for Research in Applied Science & Engineering Technology (IJRASET), 8(IX).
- Vaggar, G. B., Sameer, M., Chitragar, M., Sharif, M. R., & Kareem, A. (2022). *"Plastic Extrusion Machine: A Review."* International Journal of Engineering Research & Technology (IJERT), 11(06).
- T.M Coelho, J.A.Gobbo Jr.(2011)."PET containers in Brazil: Opportunities and challenges of a logistics model for post--- consumer waste recycling." Resources Conservation and Recycling.
- Miguel Friedenbach, Buenos Aires (AR) May 13, 2004, "Tool For cutting Used Containers of Recyclable Plastic Material into Ribbons"
- A Khoironil, S Anggoro.2019 Community behavior and single-use plastic bottle consumption. Doctoral Program of Environmental Sciences, Diponegoro University
- Kazisemon ,Mohammad milad dec 2019 "developing a model for a recycling plastic bottle into synthetic fiber," international university of business agriculture and technology.
- Mullah Irfan Faiyyaj, Rushabh, Pradip, Adarsh Institute of Technology, Vita. Shivaji University, Kolhapur "Design and Development of Plastic Shredding Machine," International Journal of Engineering Technology Science and Research. Volume 4, Issue 10 October 2017.
- Foolmaun RK, Ramjeawon T. "Life cycle assessment (LCA) of PET bottles and Comparative LCA Of Three Disposal Options In Mauritius." Journal Environment And Waste Management 2008;2(1/2):125–38