360 DEGREE CONVEYOR BELT

A PROJECT REPORT

Submitted by

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in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

MECHANICAL ENGINEERING

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ANNA UNIVERSITY: CHENNAI 600 025

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BONAFIDE CERTIFICATE

Certified that this project report **"360 DEGREE CONVEYOR BELT"**is the bonafide work of **"MOHANBABU K(927622BME311), NAVANEETHAKRISHNAN T (927622BME315), RETHANASALAM M (927622BME318)"** who carried out the project work during the academic year 2024 – 2025 under my supervision. Certified further, that to the best of my knowledge the worker ported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

SIGNATURE	**SIGNATURE**
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This project report has been submitted for the end semester project viva voce Examination held on ______________

INTERNAL EXAMINER EXTERNAL EXAMINER

DECLARATION

We affirm that the Project titled **"360 DEGREE CONVEYOR BELT"** being submitted in partial fulfillment of for the award of Bachelor of Engineering in Mechanical Engineering, is the original work carried out by us. It has not formed the part of any other project or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

Student name	Signature
1. MOHAN BABU.K	----------------------------
2. NAVANEETHA KRISHNAN.T	----------------------------
3. RETHANASALAM M	----------------------------

Name and signature of the supervisor with date

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INSTITUTION VISION & MISSION

Vision

- To emerge as a leader among the top institutions in the field of technical education.

Mission

- Produce smart technocrats with empirical knowledge who can surmount the global challenges.
- Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students.
- Maintain mutually beneficial partnerships with our alumni, industry and professional associations.

DEPARTMENT VISION, MISSION, PEO, PO & PSO

Vision

- To create globally recognized competent Mechanical engineers to work in multicultural environment.

Mission

- To impart quality education in the field of mechanical engineering and to enhance their skills, to pursue careers or enter into higher education in their area of interest.
- To establish a learner-centric atmosphere along with state-of-the-art research facility.
- To make collaboration with industries, distinguished research institution and to become a centre of excellence

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

The graduates of Mechanical Engineering will be able to

- PEO1: Graduates of the program will accommodate insightful information of engineering principles necessary for the applications of engineering.
- PEO2: Graduates of the program will acquire knowledge of recent trends in technology and solve problem in industry.
- PEO3: Graduates of the program will have practical experience and interpersonal skills to work both in local and international environments.
- PEO4: Graduates of the program will possess creative professionalism, understand their ethical responsibility and committed towards society.

PROGRAM OUTCOMES

The following are the Program Outcomes of Engineering Graduates: Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, andan engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design systemcomponents or processes that meet the specified needs with appropriate consideration for the public healthand safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineeringand IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainabledevelopment.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and abilityto engage in independentand life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The following are the Program Specific Outcomes of EngineeringGraduates:

The students will demonstrate theabilities

1. **Real world application:** To comprehend, analyze, design and developinnovative products and provide solutions for the real-life problems.
2. **Multi-disciplinary areas:** To work collaboratively on multi-disciplinaryareas and make quality projects.

Research oriented innovative ideas and methods: To adopt modern tools, mathematical, scientific and engineering fundamentals required to solve industrial and societal problems

Course Outcomes	At the end of this course, learners will be able to:	**Knowledge Level**
CO-1	Identify the issues and challenges related to industry,society and environment.	Apply
CO-2	Describe the identified problem and formulate thepossible solutions	Apply
CO-3	Design / Fabricate new experimental set up/devices toprovide solutions for the identified problems	Analyse
CO-4	Prepare a detailed report describing the project outcome	Apply
CO-5	Communicate outcome of the project and defend by making an effective oral presentation.	Apply

MAPPING OF PO & PSO WITH THE PROJECT OUTCOME

Course Outcomes	**ProgramOutcomes**												**Program Specific Outcomes**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO - 1	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 2	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 3	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 4	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 5	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3

CONTENTS

ABSTRACT

In most of the heavy-duty industries to transfer a material from one point to another, for packaging purpose conveyors are used. They are also used in low and medium industries for the purpose of smooth working of assembly line, as they can transfer produced goods with the same quantitative flow. So, in every industry conveyors are widely used. Nowadays as the arena of production is changing demand for the requirement of new types of special purpose conveyors are increasing. In the era of automation, the conveyor is on the verge of high demand, who can change its orientation according to the requirement of producer. In this project we are developing a 360-degree conveyor who can move in all 3 degrees of freedom. The prototype is designed and developed using CAD software CATIA. Components that are easily available in the market and suitable for developing a 360-degree conveyor system were tested. Different kinds of tests were done on critical parts of the system in order to determine its accuracy, its response time, and the system impact. Finally, the results acquired from these various tests will be discussed. Any findings and changes that should be made are discussed and may be useful for future development. Keywords: Conveyor Belt, Arduino, Pneumatic Cylinder, Sensors, Actuators, Motors, Wheels.

INTRODUCTION

A 360-degree conveyor belt is an innovative material handling system designed to provide continuous, circular motion for the transportation of goods. Unlike traditional linear conveyor systems that follow a straight path, the 360-degree conveyor belt operates in a full loop, allowing items to be moved in a seamless, circular motion. This system is highly versatile and can be customized to suit a variety of industries, including manufacturing, logistics, warehousing, and food processing.The 360-degree conveyor belt offers several advantages, including optimized space utilization, improved efficiency, and reduced handling time. Its circular design ensures that goods are constantly in motion, which enhances the flow of materials, minimizes bottlenecks, and enables easy integration with other automated systems. Whether used for sorting, packaging, assembly, or transport, the 360-degree conveyor belt provides a flexible and efficient solution for a wide range of applications.

This system can be equipped with various features such as adjustable speeds, sensors for product tracking, and safety mechanisms, ensuring that it meets specific operational needs and safety standards. As industries continue to embrace automation and efficiency, the 360-degree conveyor belt represents a cutting-edge solution for modern material handling challenges.

LITERATURE SURVEY

The concept of 360-degree conveyor systems has its roots in the desire to enhance efficiency and reduce the spatial footprint of traditional material handling setups. According to **Chien et al. (2014)**, the circular design of the conveyor belt optimizes space utilization, particularly in environments where floor space is limited. Unlike traditional conveyors, the 360-degree design eliminates the need for extensive horizontal paths, making it ideal for environments that require frequent product looping or return paths.**Stern et al. (2011)** in their research highlighted how the 360-degree conveyor belt's continuous loop design allows for uninterrupted material flow, thus reducing delays caused by manual handling or waiting time in linear conveyors. The design can vary in terms of radius, load capacity, and speed, but the fundamental concept remains that it moves goods in a continuous circular motion, often around a central hub.

PROBLEM STATEMENT

The increasing demand for automation in industries such as manufacturing, warehousing, and food processing requires material handling systems that can efficiently transport goods while optimizing space, speed, and flexibility. Traditional linear conveyor belts, while widely used, often face challenges in maximizing floor space, accommodating complex layouts, and ensuring continuous material flow. In response to these challenges, the 360-degree conveyor belt system offers a potential solution by utilizing a continuous, circular motion to transport goods around a fixed loop. Designing a 360-degree conveyor system that accommodates various load types, speeds, and operational requirements presents significant engineering challenges. Ensuring smooth operation and minimizing mechanical failures in a continuous loop is complex, particularly for systems handling variable-sized and weighted items. While the 360-degree conveyor is more space-efficient than traditional linear systems, the optimization of layout design to handle high-throughput environments while minimizing bottlenecks and congestion remains an unresolved issue. Additionally, ensuring continuous and efficient flow without interruptions, especially when incorporating sorting, packaging, or inspection functions, is an ongoing challenge.

METHODOLOGY

The methodology for designing, implementing, and optimizing a 360-degree conveyor belt system involves several key stages, including design and modeling, system integration, testing, and performance evaluation. This approach aims to address the unique challenges associated with continuous-loop conveyors, such as space optimization, load handling, integration with automation, and maintenance. The first step is to define the specific requirements of the conveyor system, such as load capacity, speed, material types, and the operational environment (e.g., warehouse, manufacturing plant). This stage involves understanding the materials to be handled, their dimensions, weight, and any special handling needs (e.g., fragile or hazardous items). Based on the defined requirements, the layout of the conveyor loop is designed, considering the space constraints and workflow. This involves determining the ideal radius, belt speed, and orientation of the loop to ensure smooth and efficient material flow. CAD (Computer-Aided Design) tools and simulation software are commonly used to visualize and optimize the system layout.

ADVANTAGES AND APPLICATION

APPLICATION

- Used in automobile industries.
- Used in scrap industry.
- Used in aerospace industry.
- Used in coal industry.

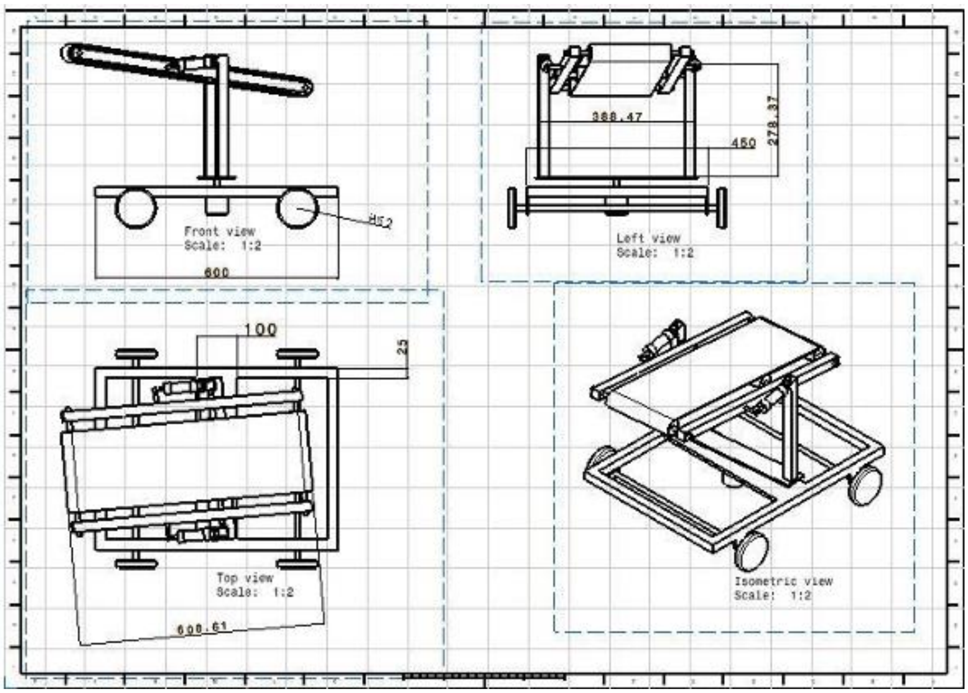
ADVANTAGES

- Less cost as compared to fixed conveyor system.
- Semi-Skilled labor can be operated this system.
- The whole system can be easily operated automatically.
- Less man power will be needed.

MATERIALS USED AND COST

S.No	Components	Cost
1	Polyester Black belt	800/-
2	D C Motor (0.5 HP)	2500/-
3	Wheel (Nos-4)	500/-
4	Switch	54/-
5	Wire(1 meter)	200/-
6	Nut & Bolt	127/-
	TOTAL	4181/-

DIAGRAM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R52
Left view
Scale: 1:2
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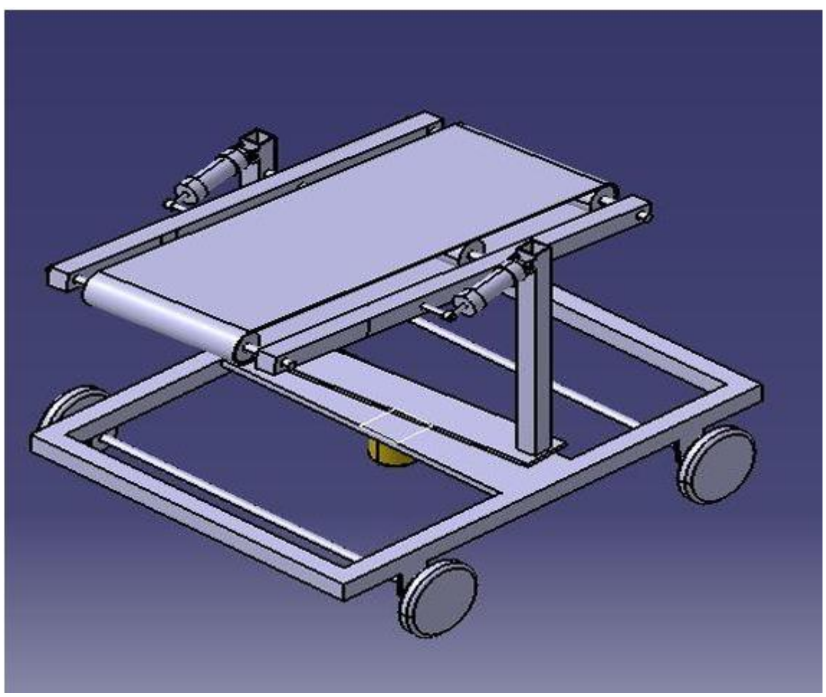
278.37
100
25
Top view
Scale: 1:2
608.61
Isometric view
Scale: 1:2



CONCLUSION

The 360-degree conveyor belt system represents a significant advancement in material handling technology, offering unique benefits such as optimized space utilization, continuous product flow, and the potential for seamless integration with automation. By employing a circular, continuous-loop design, this system overcomes the limitations of traditional linear conveyors, making it ideal for applications where space is limited or where high-throughput and efficiency are essential.Through the methodology outlined, including thoughtful design, integration with automation, and rigorous testing, the 360-degree conveyor belt system can be optimized for various industrial settings, including manufacturing, warehousing, and food processing. Its ability to reduce downtime, streamline operations, and enhance throughput makes it a valuable solution for industries increasingly relying on automation and precision.However, the successful implementation of 360-degree conveyor systems requires addressing challenges related to system complexity, integration with other automated technologies, maintenance, and cost-effectiveness. Ongoing research and innovation are necessary to further refine these systems, ensuring they meet the evolving needs of modern industries.

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