Short communication

Telescopic Conveyor System- A Review

Abstract:

A telescopic conveyor system is a versatile and efficient material handling solution designed to extend and retract as needed, making it ideal for loading and unloading goods in warehouses, logistics centres, and manufacturing facilities. Telescopic conveyors offer enhanced efficiency, adaptability, and cost-effectiveness by providing extendable and retractable mechanisms for streamlined operations. This research paper explores the design and analysis of telescopic conveyor systems, emphasizing their significance in modern material handling applications. The study examines various research findings related to structural integrity, automation, material selection, and energy efficiency. Additionally, the paper highlights key technological advancements and their impact on optimizing conveyor performance in logistics, warehousing, and manufacturing industries. Future developments in automation and sustainable materials are also discussed to improve operational efficiency and reduce maintenance costs.

Keywords: Telescopic conveyor systems, Efficiency, Material selection, Automation.

Introduction

A telescopic conveyor system is a type of material handling equipment that can be extended or retracted to adjust its length. This makes it ideal for loading and unloading materials from trucks, containers, and other vehicles. Telescopic conveyors are also used in warehouses and distribution centres to move materials between different areas.

A typical telescopic conveyor system consists of a fixed base section and one or more extendable sections. The extendable sections are typically mounted on wheels or rollers so that they can be easily moved. The conveyor belt is usually made of a durable material such as rubber or PVC. Telescopic conveyor systems are a game-changer in material handling, offering a flexible and efficient way to load and unload goods.

Their extendable design allows them to reach inside trucks or containers, significantly reducing manual labour and streamlining the flow of goods.

This not only boosts productivity but also minimizes the risk of injuries associated with manual handling. In essence, telescopic conveyors are a smart solution for businesses looking to optimize their logistics and warehousing operations.

A Telescopic Conveyor System is a versatile and efficient material handling solution designed to streamline loading and unloading operations. This innovative system features a retractable and extendable design, allowing for seamless adaptation to changing operational requirements. With its adjustable length, multi-directional movement, and customizable design, the Telescopic Conveyor System optimizes productivity, safety, and space utilization in various industries, including logistics, manufacturing, airports, and seaports

The telescopic conveyor system offers significant advantages such as time-saving operations, reduced labour costs, and enhanced safety. Its ability to adjust length based on the working environment makes it highly adaptable in dynamic loading docks and distribution centres.

To better understand the working and design aspects, a conceptual illustration of a telescopic

conveyor system is shown in **Figure 1** below.

Figure 1: Conceptual Design of a Telescopic Conveyor System

The image illustrates the extended and retracted views of a telescopic conveyor system. This design allows for efficient handling of materials by extending into trucks or containers, reducing manual effort and time during loading and unloading operations.

Literature Review

- Mr. Abhijith T J, et al(2018) “Design and Fabrication of Telescopic Conveyor" presents the paper that shows the innovative extendable conveyor system that addresses the challenges of material handling over varying distances. By stacking adjustable conveyor frames, the design achieves an operational range between 1.4 m and 2.5 m while requiring 62% less storage space than conventional conveyors. The study details the technical specifications, design calculations, and CAD modelling that demonstrate the system’s efficiency in reducing labour and space requirements.[1]
- Prof. M. M. Kulkarni, et al (2016) “Design and Development of Telescopic Conveyor” presents paper as a new telescopic belt conveyor that aims to revolutionize material handling in industries. The system integrates pneumatic cylinders and a belt drive mechanism, enabling efficient lifting and extension of loads up to 0.1 and 1.5 meters, respectively. Capable of handling up to 300 kg and achieving a throughput of 250-300 kg per hour, this conveyor offers higher efficiency compared to traditional systems. Experimental data highlights a 13% increase in velocity, a 33% reduction in operational time, and a 62% reduction in required storage space. [2]

- The research paper "Design and Manufacturing of Telescopic Conveyor" by Professor S.F. Rathod et al (2019) details the development of an innovative conveyor system that utilizes pneumatic cylinders, and belt drives to extend and retract for efficient material handling. The system is engineered to lift materials up to 0.1 meter and move them up to 1.5 meters, handling loads of up to 300 kg with a throughput of 250–300 kg per hour.[3]

- Alican YAKIN et al (2023) "Design and Automation of Telescopic Conveyor" that discusses the development of a telescopic conveyor system to improve industrial logistics efficiency. The study focuses on automation, energy efficiency, and ease of maintenance while designing the conveyor. The proposed system, modelled using Siemens NX, features a telescopic structure with three nested booms, extending from 7.5 meters to 22.5 meters, with a 600 mm wide belt. Safety measures such as emergency stops and collision detection are integrated. The research highlights the importance of optimizing logistics operations, reducing labour costs, and ensuring workplace safety through automation.[4]

- Ravindra Y. Daspute, et al (2019) "Study on Loading and Unloading Telescopic Conveyor" that shows paper of design and working principle of a telescopic conveyor system. The paper highlights the importance of automation in material handling to reduce labour costs, save time, and improve workplace safety. The proposed telescopic conveyor uses a sliding mechanism with one fixed and multiple movable links to extend into trucks or containers, making loading and unloading easier. The system is compact, mobile, and adaptable, reducing operational space requirements while increasing efficiency. The study aims to develop a cost-effective and adjustable telescopic conveyor that can also be height-adjusted using a pneumatic cylinder.[5]

- Sangam Suresh Dhanwade et al (2021) "Telescopic Conveyor Development to Save Production Time" represent the paper on the advantages of using telescopic belt conveyors for industrial material handling. The study highlights the inefficiencies of traditional manual loading and unloading, which consume more time, labour, and energy. The telescopic conveyor, with its extendable design, reduces operational costs, minimizes human labour, and enhances workplace safety. The research includes design calculations, fabrication methodology, and testing results, demonstrating that the system significantly improves efficiency in material handling processes. The conveyor is designed with a 6m base length, expandable up to 4.5m, and operates with a 1HP motor to handle 50kg/m loads.[6]

- Nalam Surya Sandeep et al (2014)"Design and Detail of Telescopic Material Unloader" shows the paper on developing a hydraulic and chain-driven telescopic material unloader to improve efficiency in industrial material handling. The study highlights the limitations of traditional loaders, such as limited weight capacity, continuous manpower requirements, and inefficiency in handling heavy materials. The proposed unloader can lift materials up to 2 meters in height and move them up to 5 meters using a hydraulic system and geared motors. The system has a loading and unloading capacity of 15–20 tons per hour and is designed to be portable, compact, and easy to maintain. The research also includes design calculations, material selection, and an analysis of its efficiency compared to traditional loaders.[7]

- Suhas M. Shinde and R.B. Patil (2012) "Design and Analysis of a Roller Conveyor System for Weight Optimization and Material Saving" represent the paper on optimizing the weight and material usage of a gravity roller conveyor system. The study aims to redesign critical components like rollers, shafts, bearings, and chassis to reduce the overall weight while maintaining structural integrity. Using ANSYS Parametric Design Language (APDL), the researchers conducted static, modal, and transient analyses to optimize the conveyor system. The optimized design reduced the conveyor's weight by 30.93%, making it more efficient, cost-effective, and easier to manufacture without compromising performance.[8]

- Pradnyaratna A. Meshram et al (2016), "Design, Modeling, and Analysis of Conveyor System Used for Transportation of Cartons" represents paper on the development of a conveyor system for automating a liquid-filling plant. The proposed system is designed to transport cartons with two different chamber sizes (4x4 and 5x5 configurations). The conveyor system aims to reduce labour costs, minimize transportation and material handling expenses, and enhance efficiency. Using CAD modeling and ANSYS analysis, the authors designed and tested a Single Strand Chain Driven Live Roller (SSCDLR) conveyor, which can fill 420 cartons per day, each chamber taking 3 seconds to fill. The research also emphasizes reducing material and assembly costs while ensuring safety and reliability.[9]

Literature Summery

The research papers collectively highlight the design, development, optimization, and automation of telescopic conveyor systems to improve material handling efficiency across various industries. Several studies emphasize the importance of automation and smart control systems, integrating sensors, PLCs, to enhance performance and safety. Energy and cost efficiency are also a major focus, with researchers optimizing materials, motor power, and structural components to reduce weight and operational costs. Finite Element Analysis (FEA) and CAD modelling are widely used to refine roller, shaft, and frame designs, ensuring greater load capacity and durability.

Many studies also focused on the importance of workplace safety and ergonomics, incorporating emergency stop systems, anti-slip belts, and mobile adaptability to reduce manual labour risks and injuries. Structural innovations, such as hydraulic and chain-driven mechanisms, improve load capacity and ease of movement, making telescopic conveyors ideal for loading/unloading trucks, warehouse

logistics, and industrial applications. Research on lightweight yet strong materials, such as aluminium alloys and reinforced PVC belts, further enhances conveyor and performance.

Authors across the studies conclude that telescopic conveyors significantly reduce operational time, labour costs, and energy consumption, making them a cost-effective and reliable solution for modern industries. While various designs cater to specific applications, future research should focus on AI-driven automation, real-world experimental validation, and the use of sustainable materials to further improve efficiency, durability, and environmental impact.

Area for Improvement

Although telescopic conveyor systems are widely used in logistics, warehousing, and manufacturing, several research gaps remain unaddressed. There is limited exploration of energy-efficient designs, including the optimization of power consumption, regenerative braking, and variable speed drives. The integration of automation, IOT, and AI for predictive maintenance, real-time monitoring, and smart control remains underdeveloped. Additionally, ergonomic improvements such as vibration reduction, noise control, and enhanced worker safety measures need further study. Research on advanced materials, such as lightweight composites and high-strength alloys, for improved durability and reduced weight is also lacking. The adaptability and flexibility of telescopic conveyors for multi-functional, modular applications across various industries remain unexplored. Sustainability efforts, including eco-friendly conveyor belts, recyclable materials, and carbon footprint reduction, require more attention. Furthermore, comprehensive cost-benefit analysis models, maintenance costs, and operational savings are scarce. Addressing these gaps will drive the development of more efficient, intelligent, and sustainable telescopic conveyor systems for modern industrial applications.

Conclusion

The telescopic conveyor system has become an essential solution in modern material handling, significantly improving efficiency, reducing manual labour, and optimizing space utilization. Its ability to extend and retract allows for seamless loading and unloading of goods, making it highly valuable in industries such as logistics, warehousing, manufacturing, and e-commerce. By enhancing operational speed and minimizing human effort, these systems contribute to improved productivity and workplace safety.

Despite its benefits, several areas require further development to enhance performance and adaptability. Energy efficiency remains a key concern, with limited research on optimizing power consumption through variable speed drives, regenerative braking, and energy-efficient motors. Integrating automation, IOT, and AI-driven predictive maintenance can further improve system reliability, reduce downtime, and enhance overall operational efficiency. Additionally, ergonomic improvements, including noise reduction, vibration control, and user-friendly interfaces, can create a safer and more comfortable work environment.

.Cost-benefit analysis is also necessary to assess long-term return on investment, operational savings, and maintenance costs, helping industries make informed decisions regarding their adoption. While telescopic conveyors have revolutionized material handling, addressing these gaps through innovation and research will lead to more efficient, intelligent, and sustainable conveyor systems. Moving forward, advancements in energy efficiency, automation, ergonomics, and sustainability will shape the future of telescopic conveyors, making them indispensable for modern industrial applications.

References

1. Abhijith T J, Ajith C R, Aravind V, A.Gokul Karthik, (2018), "*Design and development of telescopic conveyor*", International Journal of Engineering Trends and Technology(IJETT), Vol. 61, No. 2
2. Prof.M.M Kulkarni1, Miss Gayatri N. Chavan, Mr. Shubham A. More, Mr. Anil S. Mechkar, Miss Vishakha A. Hinge (2016), "*Design and Development of Telescopic Conveyor*", International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395 - 0056, p-ISSN: 2395-0072.
3. Prof. S.F. Rathod, Mr. Siddhant Pandhre, Mr. Swarup Gajbhiye, Mr. Ravish Kumar, Mr. Brahmanand*," Design and Manufacturing of Telescopic Conveyor"*

IJARIIE-ISSN(O)-2395-4396 Vol-5 Issue-3 2019

4. Alican YAKIN1*, İdris GÜLTEKİN2, Adnan AKKURT 3, Serkan YETER 4, *“Design and Automation of Telescopic Conveyor”* 4 th International Conference on Engineering and Applied Natural Sciences November 20-21, 2023: Konya, Turkey
5. R. Daspute, V. C. Patil, and R. C. Pokar*, "Study on Loading and Unloading Telescopic Conveyor,"* International Journal of Innovations in Engineering Research and Technology, pp. 1- 3, 2019.
6. Sangam Suresh Dhanwade1, Dr. Satish Takalikar 2, *“Telescopic Conveyor Development to Save Production Time”* International Research Journal of Engineering and Technology (IRJET), Vol: 08 Issue: 02 | Feb 2021
7. Nalam Surya, (2014), *“Design and Detail of Telescopic Material Unloader”*, International Journal of Innovative Research in Science, Engineering and Technology
8. Suhas M. Shinde and R.B. Patil, (2012*),” Design and Analysis of a Roller Conveyor System for Weight. Optimization and Material Saving”*, International Journal on Emerging Technologies, 168-173
9. Pradnyaratna A Meshram, Dr. A R Sahu, (2016), *“Design, Modeling and Analysis of Conveyor System used for transportation of Cartons”*, International Journal of Research in Advent Technology, Vol. 4, No. 1
10. R.S.khurmi & J.K.gupta “Design of machineelements.” Eurasia publishing house (pvt.) Ltd, fifth edition
11. Groover M.P., “*Automation, Production Systems and Computer Integrated Manufacturing*”, Prentice-Hall of India Pvt. Ltd., New Delhi, 2002
12. Mechanical Conveyors: Selection and Operation by Mohammad E. Fayed, Thomas Skocir
13. V.B.Bhandari “*Design of Machine Element*,” Tata McGraw Hill publishing company, eighth edition (2003).
14. Design and its Verification of belt driven Conveyor System using concept by Chetan Thole Director of Vrushabhnath Industries G 39/2 Waluj MIDC Aurangabad
15. “Survey of research in modeling conveyor based automated material handling system in wafer Fabs”. - Dima Nazzal, Ahmed El-Nashar, Department of Industrial Proceedings of the 2007 Winter Simulation Conference S. G. Henderson, B. Biller, M.-H. Hsieh, J. Shortle, J. D. Tew, and R. R. Barton, eds
16. “A investigation into design an manufacturing of mechanical conveyors systems for food processing” S.H. Masood · B. Abbas · E. Shayan · A. Kara Int J Adv Manuf Technol (2005).
17. ” Development of Concept Design CAD System” C. Sekimoto Energy and Mechanical Research Laboratories Research and Development Center Toshiba Corporation.
18. CEMA (Conveyor Equipment Manufacturers Association) “Belt chain drive live roller Conveyors for Bulk Materials, Chaners Publishing Company, Inc. For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation.
19. Masood S.H.,· Abbas B., Shayan E. and Kara A. "An investigation into design and manufacturing of mechanical conveyors Systems for food processing", Springer Verlag London Limited (2004)
20. Nazzal Nazzal and EI-Nashar Ahmed. "Survey of Research In Modeling Conveyor-Based Automated Material Handling Systems In wafer fabs" Proceedings of the Winter Simulation Conference (2007).
21. Usher John, John, R. and Taylor G. Don "Availability modelling of powered roller conveyors".
22. Sekimoto C. "Development of Concept Design CAD System", Energy and Mechanical Research Laboratories, Research and Development Center, Toshiba Corporation.
23. WANG Ying and ZHOU Chen "A Model and an analytical method for conveyor system in distribution centers", J Syst Sci Syst Eng., 19(4): 408-429 (Dec. 2010).
24. Rohini N. Sangolkar, Vidhyadhar P. Kshirsagar, International Journal of Technical Research and Applications e-ISSN: 2320-8163, www.ijtra.com Volume 3, Issue 4 (July-August 2015), PP. 178 181
25. Richardson J F, Harker J H and Backhurst J R (2002), Particle Technology and Separation Process, 5th Edition, Vol. 2, pp. 29-35, Elsevier Publisher, New Delhi, India.
26. Fenner Dunlop (2009), “Conveyor Handbook”, Conveyor Belting Australia, pp. 1-70.
27. “Conveyor Equipment Manufacturers Association (CEMA)”, Belt Conveyors for Bulk Materials, 6th Edition, pp. 200-205.
28. Anath K N and Rakesh V (2013), “Design and Selecting Proper Conveyor Belt”, Int.

Journal of Advanced Technology, Vol. 4, No. 2, pp. 43-49.
29. “ABB-Process Industries Variable-Speed Drives for Belt Conveyor Systems”, pp. 1-7, (2000).
30. M. A. Alspaugh, E A Bud Viren,(2003), “Latest developments in belt conveyor technology”, International journal of advance engineering technology (IJAET), Vol. 23, No. 3
31. Phillip J. Gilmore, Healdsburg, Richard J. Micheletti, Sebastopol, (1993), “MULTIPLE-STAGE EXTENDABLE CONVEYOR”, Patent Number: 5,351,809.
32. Kaj B. Calundan, Skanderborg, Denmark Caljan A/S, Hasselager, Denmark (1984), “TELESCOPIC BELT CONVEYOR” U.S. PATENT DOCUMENTS, Patent Number: 4,643,299.
33. R K Bhoyar,,C C Handa “Design consideration for radial adjustable belt conveyor system” International journal of mechanical engineering and robotics research.
34. HgDaniel A. Fogg, White Cloud, Mich,(1968) “TELESCOPIC CONVEYOR” assignor to Rapistan Incorporated, a corporation of Michigan Filed, Ser. No. 573,02313 Claims. (C. 193-35)

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