

DESIGN AND FABRICATION OF TREADMILL TRICYCLE

Prof. Pramod Jadhao , Sarvesh Gaikwad , Tejas Mandhare , Shubham Jagtap , Shubham Rane

Department Of Mechanical Engineering

Smt. Indira Gandhi College Of Engineering, Navi Mumbai , Maharashtra

***_____

Abstract - The Treadmill Tricycle project merges fitness with mobility, offering a novel solution for urban transportation and promoting active lifestyles. Through thorough research, precise calculations, and innovative fabrication, the project delivers a cost-effective and ergonomic transportation option. By integrating a treadmill into a tricycle design, users can commute while engaging in physical exercise, contributing to a healthier and more sustainable urban environment. Future directions include exploring advanced materials and smart technology integration to further enhance performance and user experience. In summary, the Treadmill Tricycle project represents a significant step towards redefining urban transportation and fostering a culture of active living.

Key Words: Treadmill Tricycle, fitness, mobility, urban transportation, active lifestyles, research, calculations, fabrication, cost-effective, ergonomic

INTRODUCTION

Urbanization has transformed the way we live and move within cities, necessitating innovative solutions to address the challenges of congestion, pollution, and sedentary lifestyles. The Treadmill Tricycle project emerges at the intersection of these issues, offering a novel approach to urban mobility that integrates fitness and transportation. By leveraging the principles of treadmill exercise and tricycle design, this project seeks to revolutionize the way people commute and stay active in urban environments. Through a multidisciplinary approach that combines research, design, and fabrication, the Treadmill Tricycle project aims to provide a sustainable and enjoyable alternative to traditional modes of transportation. This paper introduces the objectives, methodology, and key findings of the Treadmill Tricycle project, highlighting its potential to promote healthier lifestyles and reduce environmental impact in urban areas.

PROBLEM STATEMENT

The issue with transportation is that we don't have a small, easy-to-carry, human-powered device that's like a mix of a treadmill and a tricycle. Such a device would let people travel in an eco-friendly way while also staying active.

A lot of city people don't move around much because it's so easy to use cars and other motorized transportation. But this lack of physical activity can lead to health issues like obesity and heart problems.

OBJECTIVE

- Eco-friendly transportation
- Promote physical fitness
- > Affordable option
- ➢ User-friendly design
- Minimize environmental impact
- Comprehensive design calculations
- CAD modeling
- Efficient assembly procedures
- Documentation
- Precision manufacturing
- Compliance with standards

LITERATURE SURVEY

The literature review for the Treadmill Tricycle project encompasses a diverse range of studies that delve into the innovative intersection of exercise and transportation.

R.Harsha et al. [1] delve into the intricate process of converting a conventional bicycle into a treadmill bicycle, emphasizing the meticulous adjustments required to accommodate the treadmill component within the bicycle frame. This integration enables users to engage in walking or running activities while propelling the bicycle forward, showcasing the potential for multitasking between exercise and commuting.

Similarly, Sameer Ghanshyam Parmar et al. [2] introduce a pioneering concept of repurposing stationary treadmills into mobile tricycles, thus liberating exercise from indoor confines and integrating it seamlessly into daily commuting routines. Their model employs a sophisticated chain and sprocket system, complemented by three wheels for enhanced stability and cost efficiency, thereby broadening the scope of treadmill utility beyond traditional fitness settings.

Furthermore, Nehal Ahmad et al. [3] present a multipurpose treadmill designed not only to facilitate exercise but also to generate electrical energy, thus aligning with sustainable practices and addressing



environmental concerns. Their treadmill bicycle amalgamates standard bicycle components with a treadmill platform, harnessing human movement to produce electricity while simultaneously providing a mode of transportation. This innovative approach underscores the potential for eco-friendly commuting solutions that prioritize physical activity and environmental sustainability.

In addition, Mr. Gavli Somnath D. et al. [4] and Shoeb Ahemad et al. [5] contribute valuable insights into the conversion of conventional bicycles into treadmill bicycles, focusing on intricate frame modifications and the synchronization of treadmill and wheel movements. These studies collectively highlight the multifaceted nature of treadmill tricycles, emphasizing their role in revolutionizing urban mobility and promoting active living. The synthesis of existing literature underscores the potential of treadmill tricycles to address contemporary challenges related to sedentary lifestyles, urban congestion, and environmental degradation

METHODOLOGY

- Problem Identification
- Literature Review
- Design Calculations
- CAD Modeling
- Material Selection
- Precision Manufacturing
- Assembly Instructions
- Documentation
- Validation

LIST OF PARTS AND MATERIALS

1) FRAME (1 Qty):

The frame serves as the structural backbone of the treadmill tricycle, providing support and stability to the entire assembly. Fabricated from mild steel (M.S), the frame is designed to withstand the rigors of daily use while maintaining structural integrity. Its sturdy construction ensures durability and reliability throughout the tricycle's lifespan.

2) WHEELS (3 Qty):

The tricycle is equipped with two rubber wheels, essential for smooth and efficient movement. These wheels provide traction and support, enabling the tricycle to traverse various terrain types with ease. The rubber material offers excellent grip and shock absorption, enhancing overall ride comfort and stability.

3) CONVEYOR BELT (1 Qty):

The conveyor belt is a vital element of the treadmill tricycle, enabling the smooth movement of the user's feet during operation. Crafted from robust polyvinyl chloride (PVC) material, the conveyor belt guarantees dependable performance and extended durability. Its textured surface offers excellent grip, effectively preventing any slipping and ensuring a stable footing while walking or running.

4) ROLLER (2 Qty):

The rollers play a vital role in guiding and tensioning the conveyor belt, ensuring smooth and consistent movement. Made from mild steel (M.S), these rollers are designed to withstand high loads and provide reliable operation over an extended period. Their precision machining ensures optimal alignment and minimal friction, contributing to the tricycle's overall efficiency.

5) SPROCKET (2 Qty):

The sprockets are integral components of the tricycle's drive system, responsible for transferring power from the pedals to the wheels. Fabricated from durable steel, these sprockets feature precision teeth profiles to ensure smooth engagement with the chain. Their robust construction enables efficient power transmission, enhancing the tricycle's performance and reliability.

6) CHAIN (1 Qty):

The chain serves as the link between the pedals and the rear wheel sprockets, facilitating power transmission during operation. Crafted from high-quality steel, the chain is designed to withstand high tension and repeated stress, ensuring reliable performance under various conditions. Its durable construction and precise manufacturing ensure smooth and efficient power transfer, optimizing the tricycle's performance.

7) BEARING WITH BEARING CAP (6 Qty):

Bearings with bearing caps are essential components that support and facilitate rotational motion within the tricycle's moving parts. Manufactured from mild steel (M.S), these bearings provide low friction and smooth operation, enhancing overall efficiency and performance. The bearing caps ensure secure housing and proper alignment, prolonging the lifespan of the bearings and reducing maintenance requirements.

I



8) SPUR GEAR (2 Qty):

Spur gears are utilized in the tricycle's drive system to transmit power between the pedal assembly and the rear wheel sprockets. Constructed from cast iron (C.I), these gears feature precision-machined teeth for smooth and efficient power transfer. Their robust design and durable material ensure reliable operation and long-term performance, even under heavy loads and constant use.

DESIGN CALCULATION

Power Calculations :

Torque (τ) = Force * Radius of Wheel

Human force for sliding (f) = 225N

Radius of cycle wheel:

Outer wheel (r0) = 325 mm

Inner wheel (ri) = 265 mm

 $\tau=73125~N/mm$

Without considering the polling Resistance and drag.

Average velocity of tricycle = Vavg

= 15.5 km/hour

= 4.3056 m/s

Find Speed (N)

angular velocity

 $\omega = 13.248 \text{ rad/sec}$

$$N = 126.5 = 127 \text{ rpm}$$

Power Required (P)

P = 0.972 kW

Calculation for belt:

Width of Belt = 305 mm ... Take a standard value of width of belt [PSG 7.52][6]

Belt speed = 0.2659 m/s ... [PSG 7.53][6]

Length of belt (L)

L = 2C +
$$\frac{\pi}{2}$$
 (D + d) + $\frac{(D-d)^2}{4C}$...[PSG 7.52][6]

D = Diameter of large pulley = 40 mm

d = diameter of small pulley = 40 mm

L = length of belt = $2 \times 1000 + \frac{\pi}{2}(40 + 40) + \frac{(40-40)^2}{4C} = 2125.66 \text{ mm}$

Belt Tension

Belt of 8 piles

0.5% mm per meter of length shorter...[PSG 7.53][6]

Belt tension = 10.62 mm

Length after standard deduction for initial tension = 2115.04mm

Roller width for belt 305 mm belt = 343 mm

ASSEMBLY CAD MODEL



RESULT AND DISCUSSION

The Treadmill Tricycle project innovatively combines fitness and mobility, drawing from extensive research and design calculations. Utilizing sustainable materials like mild steel and PVC, the prototype was meticulously crafted for optimal performance and user comfort. This groundbreaking initiative presents a promising solution for promoting active lifestyles while reducing carbon emissions. Opportunities for future refinement and enhancement underscore its potential impact in addressing modern challenges.



CONCLUSIONS

Introducing the Treadmill Tricycle: merging fitness and eco-commuting for a healthier, greener urban lifestyle. Compact, portable, and human-powered, it's the future of personalized sustainable transport, inspiring well-being on the move.

REFERENCE

- R.Harsha "Design And Fabrication Of Treadmill Bicycle" JETIR February 2018, Volume 5, Issue 2,P.P 349-362 (ISSN-2349-5162)
- Sameer Ghanshyam Parmar "Design And Fabrication Of Treadmill Tricycle" IJARIIE Vol-7 Issue-6 2021 P.P. 237-244 ISSN (O)-2395-4396
- Nehal Ahmad, Dr. Salim Sharieff, Saleem Ahmed.B "Design & Optimisation Of Versatile Treadmill" @International Research Journal of Modernization in Engineering, Technology and Science, Volume: 04/Issue:12/December-2022 P.P 1889-1899 ISSN:2582-5208
- Mr. Gavli Somnath D., Mr. Mote Vaibhav D , Mr. Zargad Ganesh B, Mr. Markad Vaibhav T. "Design & Fabrication Of Treadmill Bicycle" ResearchGate Thesis. March 2019 https://www.researchgate.net/publication/33195

<u>0519</u>

- Shoeb Ahemad, Tanveer Ahmad, Sohil Sk, Danish Sk, Aadil Khatik "Design And Fabrication Of Treadmill Bicycle". International Journal of Innovations in Engineering and Science, Vol 4, No.10 ,2019 P.P 129-132 ISSN: 2456-346
- "Design Data" Data book of Engineers published by Kalaikathir Achchagam complied by the Faculty of Mechanical Engineering PSG collage of Technology Coimbatore -641 037 Tamilnadu India ISBN 978-81-927355-0-4

GROUP PHOTO

