**DOUBLE ACTING HYDRAULIC LINEAR ACTUATOR**

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**ABSTRACT**

This project investigates the design, development, and application of a double-acting hydraulic linear actuator coupled with a hydraulic power pack for operating heavy-duty doors in the rubber industry. Industrial doors in rubber processing facilities are subjected to extreme conditions, including high temperatures, humidity, and exposure to abrasive chemicals, necessitating a robust and reliable solution. The double-acting hydraulic actuator provides controlled and precise bidirectional motion, ensuring smooth and efficient door operation even under heavy loads. The hydraulic power pack is designed to deliver adequate pressure and flow rates for optimal performance while maintaining energy efficiency. The system incorporates advanced safety mechanisms to prevent sudden or uncontrolled movements, enhancing workplace safety. Its integration with automated control systems enables remote operation and synchronization with production processes, reducing manual labour and downtime. Emphasis is placed on durability, low maintenance, and cost-effectiveness by using high-quality materials and optimizing the system for prolonged service life. This solution demonstrates significant potential for improving productivity, reliability, and operational efficiency in rubber processing facilities, making it an ideal choice for industries requiring heavy-duty and automated door systems.

**1. INTRODUCTION**

Industrial doors play a critical role in the rubber industry, where they are used to facilitate the movement of materials, equipment, and personnel while maintaining controlled environmental conditions. These doors are often large, heavy, and subjected to challenging operating conditions, such as high temperatures, humidity, and exposure to abrasive chemicals. Traditional door operation methods may lack the precision, reliability, and efficiency required in such demanding environments. To address these challenges, hydraulic systems offer a robust and efficient solution. This project focuses on the application of a double-acting hydraulic linear actuator paired with a hydraulic power pack for operating heavy-duty doors in rubber processing facilities. A double-acting hydraulic actuator is capable of providing controlled bidirectional motion, making it suitable for precise and reliable door operation. The hydraulic power pack ensures a consistent supply of pressure and flow to the actuator, enabling smooth and efficient operation even under heavy loads. The adoption of hydraulic technology offers several advantages, including enhanced safety, reduced manual labour, and improved energy efficiency. Moreover, the system is designed for durability, ensuring reliable performance in harsh industrial environments while minimizing maintenance requirements. By integrating this hydraulic system with automated control mechanisms, the doors can be operated seamlessly, improving workflow efficiency and reducing operational downtime. This report details the design, functionality, and benefits of implementing a double acting hydraulic linear actuator with a hydraulic power pack for industrial doors in the rubber industry. The study highlights how this solution addresses industry-specific challenges, contributing to improved productivity, safety, and cost-effectiveness.

**1.1 PROBLEM STATEMENT**

Existing door actuation systems face challenges such as limited force, energy inefficiency, and complex maintenance. A double-acting hydraulic actuator can overcome these limitations by providing higher force efficiency and precise motion control.

**1.2 OBJECTIVES**

The objective of applying a double-acting hydraulic linear actuator with a hydraulic power pack for doors in the rubber industry is to enable smooth, reliable, and precise operation of heavy industrial doors. This system ensures enhanced safety, high load-bearing capacity, and durability in harsh environments, such as high temperatures and chemical exposure. It integrates seamlessly with automated control systems to optimize workflow, improve energy efficiency, and reduce manual labor. Additionally, the robust and low-maintenance design ensures long-term cost-effectiveness, making it ideal for demanding applications in rubber processing facilities. 1. Automated Door Operation: To design and implement a double-acting hydraulic linear actuator powered by a hydraulic power pack to enable smooth and efficient opening and closing of heavy industrial doors in rubber manufacturing facilities. 2. High Load Handling: To ensure the system can handle the weight and operational demands of large and heavy rubber industry doors, providing consistent and reliable performance. 3. Enhanced Safety: To integrate precise control mechanisms and safety features for smooth motion, preventing abrupt door movements and ensuring worker safety during operation. 4. Durability in Harsh Conditions: To develop a robust and durable system capable of withstanding harsh industrial environments, including exposure to dust, heat, and vibrations typically found in rubber industries. 5. Energy Efficiency: To optimize the hydraulic power pack and actuator for minimal energy consumption while maintaining high efficiency during repeated door operations. 6. Customizable Design: To enable flexibility in the design and functionality of the actuator system for integration with various types and sizes of industrial doors used in rubber manufacturing facilities. 7. Improved Workflow: To streamline operations by automating door movement, reducing manual labour, and improving overall workflow efficiency in the rubber production process.

**2.METHODOLOGY**

Start 🡪 Project Discussion 🡪 Project proposal 🡪Proposal Accepted 🡪 Material Selection 🡪 Concept Design 🡪 Analysis 🡪 Fabrication 🡪 Assembly 🡪 Testing 🡪 Objective Achived🡪 Result And Conclusion 🡪 Presentation 🡪Submit Report 🡪 End

**3. CONCLUSION**

The double-acting hydraulic linear actuator successfully demonstrated its ability to provide bidirectional motion by applying hydraulic pressure alternately on both sides of the piston. Experimental data showed that the actuator achieved a stroke length of 400 mm with a maximum load-carrying capacity of 650 bar. The response time and smoothness of motion were consistent under varying load conditions, ensuring reliable performance in both extension and retraction phases. The system demonstrated operational safety with controlled speed and accurate positioning, as per design expectations.

The double-acting hydraulic actuator proved to be an efficient and versatile device for applications requiring precise control and bidirectional linear motion. The design fulfilled the project objectives by offering high load-bearing capacity and stroke adjustability, making it suitable for industrial applications like material handling, presses, and robotics. The study highlighted the importance of proper seal selection, fluid management, and system maintenance to minimize leakage and maximize longevity. Optimization of hydraulic circuit design and material selection further enhanced the actuator’s performance and energy efficiency. This project validated the double-acting hydraulic actuator as a cost effective and reliable solution for heavy-duty operations, paving the way for future improvements in automation and fluid power systems.

**References**

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