

RAM FASHION EXPORTS PVT. LTD.

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August 2024

This document outlines my recent opportunity to intern with Ram Fashion Exports Pvt. Ltd., a leading shoe manufacturing company that produces over 10,000 pairs of shoes and sandals daily. I was particularly drawn to the intricate machinery utilized at each stage of production, sparking my interest in understanding the complex processes behind this highly skilled craft.



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INTRODUCTION

Ram Fashion Exports Pvt. Ltd. is a family-run business established in 1964, specializing in the manufacturing and export of men's and women's leather footwear. With over 1,000 employees at their modern, mechanized facility in Mahape, Navi Mumbai, Ram produces 1.6 million pairs annually. Their products are exported to major high street brands in key markets such as the USA, Canada, Europe, the UK, Japan, and Australia, with a daily production capacity of 10,000 pairs. Boasting a dedicated workforce and state-of-the-art manufacturing facilities, Ram is well-positioned to embrace future challenges and opportunities, maintaining long-term relationships with both vendors and buyers.

WHY I CHOSE RAM FASHION EXPORTS?

As a dedicated STEM student with a keen interest in robotics and AI, my curiosity has always been sparked by machinery and the underlying mechanics. During my internship at Greensole, I had the privilege of visiting Ram Fashion Exports and exploring their production facility. I was excited to witness the diverse array of machines and cutting-edge technologies at work, from basic heat chambers and pneumatic equipment to more sophisticated hydraulic systems. I am sincerely grateful to the management

at Ram Fashion for offering me the chance to not only understand the shoe manufacturing process but also to gain valuable insight into the complex mechanisms utilized in their operations.

VARIOUS STAGES OF SHOE MANUFACTURING

Following are the stages of shoe manufacturing, the machines used in the stage and the technology behind the machine

Sr. no.	Stage	Name of the machine	Technology Involved
01.	Cutting	Cutting clickers	Hydraulic & Electrical
		Laser Machines	Laser & Electrical
02.	Upper making	Stitching machines	Electrical
		Fusing machines	Pneumatic & Electrical
		Marking machines	Laser & Electrical
		Embossing machines	Pneumatic & Electrical
		Molding machines	Hydraulic & Electrical
		Conveyor belt	Electrical
03.	Assembly Line	Conveyor belt	Electrical
		Upper pounding	Electrical
		Counter molding	Pneumatic & Electrical
		Front Lasting machine	Hydraulic & Electrical

		Back Lasting machine	Hydraulic & Electrical
		Heat Setter machine	Pneumatic & Electrical
		Ruffing machine	Electrical
		Heat reactivators	Pneumatic & Electrical
		Sole bonding machine	Pneumatic & Electrical
		Chill master	Electrical
		De-lasting Machine	Hydraulic & Electrical
		Spray guns & booths	Pneumatic & Electrical
		Polishing machines	Electrical
04.	Packaging	Glue applicator	Electrical
		De-humidifiers	Electrical

As shown in the chart above, numerous machines are involved in the shoe manufacturing process. However, the technology behind these machines can be categorized into four main techniques:

1. **HYDRAULIC TECHNOLOGY**
2. **PNEUMATIC TECHNOLOGY**
3. **LASER TECHNOLOGY**
4. **ELECTRICAL TECHNOLOGY**

This document provides a detailed explanation of each of these technologies.

1. Hydraulic Technology

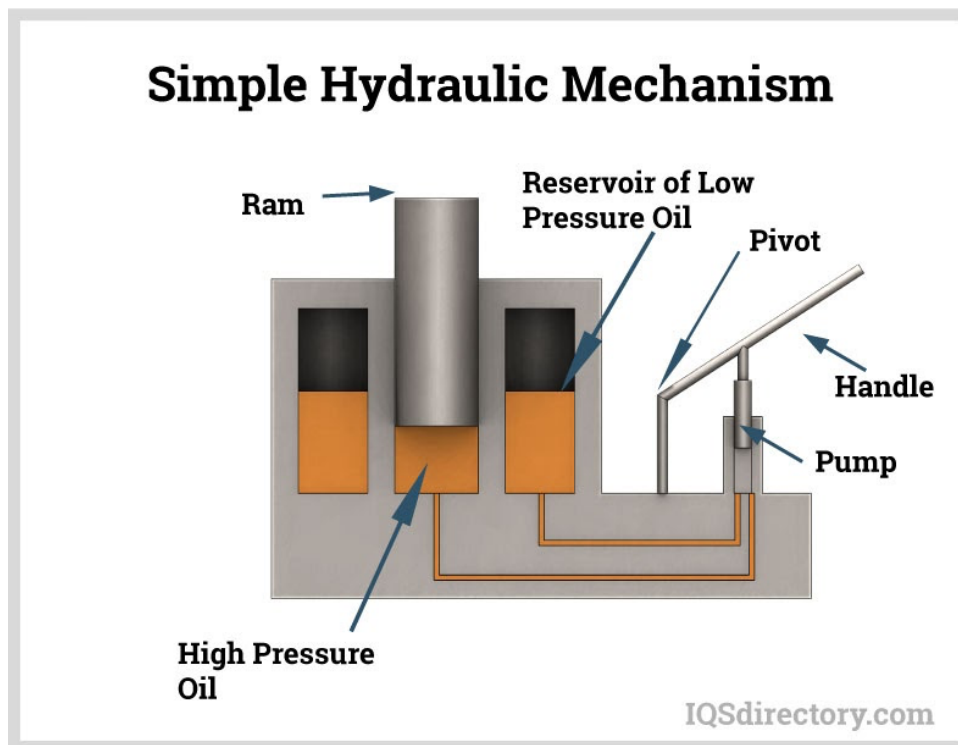
Hydraulic systems operate based on Pascal's law, which states that pressure applied to a fluid at rest is distributed uniformly in all directions. These systems typically use hydraulic oil, either mineral oil, water, or a blend of both, as the working fluid. In a hydraulic machine, the fluid is pumped to various hydraulic motors and cylinders, where it becomes pressurized in response to the resistance encountered, enabling the system to perform mechanical tasks.

Here's how a hydraulic system functions:

1. An engine or motor drives the pump.
2. The pump generates pressure by moving fluid through the system.
3. Pressurized fluid flows through control valves to the hydraulic actuator.
4. The hydraulic actuator transforms the hydraulic energy into mechanical energy.
5. This mechanical energy is then utilized to perform the required work.

In the footwear industry, the hydraulic system is used in machines of the following stages:

- a. Cutting
- b. Molding
- c. Front Lasting
- d. Back Lasting
- e. De-Lasting



The working of a hydraulic system



Example of a hydraulic clicker used in the footwear industry

2. Pneumatic Technology

Pneumatic systems operate by converting force into potential energy, which is subsequently used to drive an actuator or cylinder, typically through kinetic energy. This often results in linear motion via a piston rod, though other forms of actuation, such as rod-less systems, are also common.

The quality and consistency of compressed air are critical to the system's performance. For optimal functionality, a pneumatic system must be equipped with key components, including a filter-regulator-lubricator (FRL) unit. The FRL conditions the compressed air by removing moisture, particulates, and potentially harmful vapors, ensuring reliable operation.

Here's an overview of how a pneumatic system function:

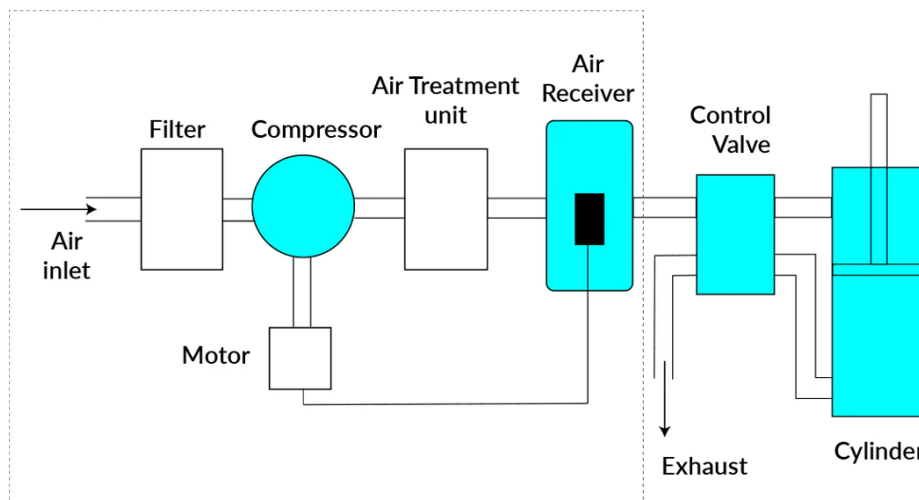
1. **Compress air:** An air compressor reduces the air's volume, increasing its pressure.
2. **Control airflow:** Valves with ports regulate the airflow by opening and closing.
3. **Convert energy:** The energy from compressed air is transformed into mechanical motion through pneumatic components, such as a pneumatic cylinder, where a piston moves within the cylinder.

4. **Generate force:** This force is applied to move loads by pushing, pulling, lifting, or holding.

In the footwear industry, the pneumatic system is used in machines of the following stages:

- a. Fusing machines
- b. Embossing machines
- c. Counter molding
- d. Heat setter
- e. Heat reactivities

- f. Sole bonding machine
- g. Spray guns



The working of a Pneumatic System



Example of a Pneumatic Counter Molding Machine used in footwear industry

3. Laser Technology

The application of laser technology in the footwear industry is relatively recent. Currently, laser machines are primarily used during the cutting and branding stages of production.

Laser cutting involves directing a high-power laser through optics and computer numerical control (CNC) systems to guide the laser beam or material. Typically, a motion control system follows a CNC or G-code to cut the specified pattern onto the material.

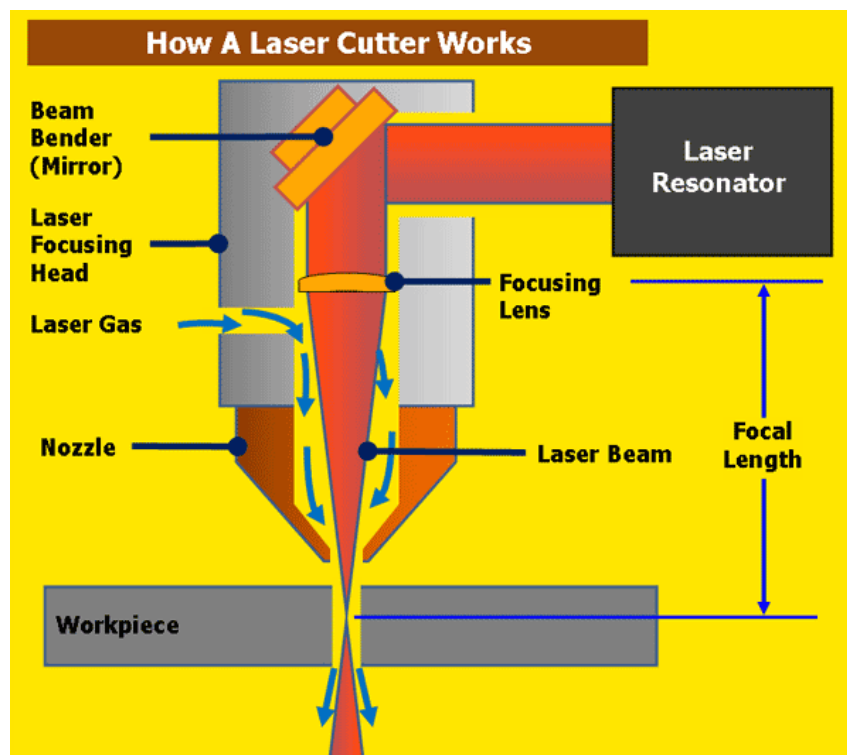
This process relies on a focused high-power-density beam, which causes the irradiated material to melt, vaporize, ablate, or ignite rapidly. The molten material is then blown away by a high-speed airflow aligned with the laser beam, effectively cutting the workpiece.

Here's an overview of how a laser system operates:

1. **Material Preparation:** Prepare the material for cutting.
2. **Laser Beam Generation:** The laser is activated to generate the cutting beam.
3. **Beam Focusing:** The laser beam is precisely focused onto the material.
4. **Setting the Cutting Parameters:** Adjust the cutting speed, power, and other parameters.
5. **Cutting Process:** The laser cuts through the material following the set pattern.
6. **Motion Control:** The motion control system guides the laser or material for precise cutting.
7. **Collection and Finishing:** The cut material is collected, and finishing touches are applied.

In the footwear industry, the laser system is used in machines of the following stages:

- a. Laser Cutting machines
- b. Branding machines



The working of a laser cutter



Example of a Laser Cutter used in the footwear industry

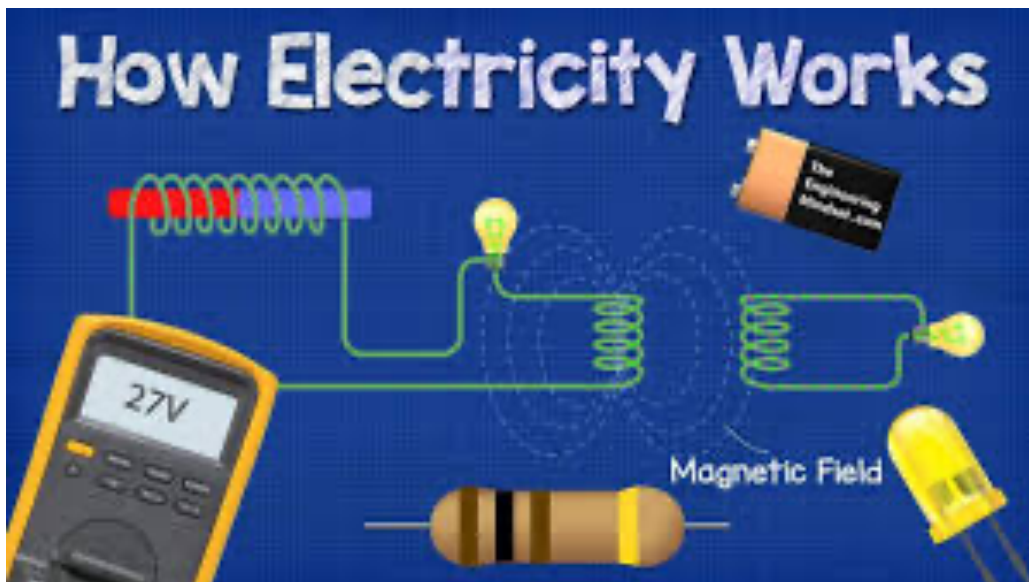
4. Electrical Technology

Electricity flows from the service panel to home appliances via the hot conductor and returns to the main panel through the neutral conductor. A third wire, known as the “grounding” wire, is connected to all outlets and metal boxes throughout the home for safety.

Electrical technology focuses on the study of systems, equipment, and machines that generate and transmit electricity. It encompasses the design, installation, and maintenance of various electrical systems, including:

1. **Electrical distribution systems:** These regulate the amount of energy delivered to appliances.
2. **Wiring systems:** Professionals install wiring systems and circuit boards.
3. **Electrical voltage systems:** These systems include components such as generators, motors, heaters, and circuits.
4. **High-voltage systems:** Experts in electrical technology design and implement high-voltage systems.

In the footwear industry, the electrical system is used in all the machines.



The working of Electrical Technology



Example of a Chill Master that uses Electrical Technology in the footwear industry

FUTURE OF THE FOOTWEAR INDUSTRY

The footwear industry is traditionally a highly labor-intensive sector. In India alone, it employs over 4 million people, making it one of the country's largest employers, alongside the textile and apparel industries.

However, with rapidly changing fashion trends, rising labor costs, and increasing demand for innovative products, technology is playing an increasingly significant role in footwear production. Robotic arms are being used to replace expensive skilled labor in certain areas, and automated stitching machines are now producing cleaner, more precise products.

While these advancements may sound impressive, they come at a high cost. Manufacturers face challenges in adopting more automated systems due to the fast pace of fashion changes, which require frequent updates to designs and patterns. This, in turn, necessitates new parts and components with each style, driving up production costs. As a result, traditional production methods often remain more cost-effective in certain scenarios.

Nonetheless, footwear manufacturers are some of the most skilled craftsmen in the world, passionate about their work and continually striving to enhance productivity, quality, and efficiency. They are always open to embracing new technologies that simplify the lives of their workers and improve the quality of their products.

ACKNOWLEDGEMENTS

I would like to extend my sincere gratitude to Mr. Bhanudas Popalghat, Manager, HR, Ram Fashion Exports Pvt. Ltd., and the entire team at Ram Fashion Exports Pvt. Ltd. for giving me the invaluable opportunity to intern with their esteemed organization. This experience has greatly enriched my understanding of the footwear industry, particularly in how technology and mechanical systems are utilized in various stages of production.

The team's support and guidance throughout my internship have been instrumental in helping me grasp the intricacies of the manufacturing process. I am especially grateful for the exposure I gained to the advanced machinery and technology used, which has deepened my appreciation for the craftsmanship and innovation that drive the industry.