

Design of Automated Pallet Cleaner

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Abstract: This study documented the current status of Metal pallet repair in the TATA MOTORS by identifying the types of processing and equipment usage in repair operations from an automation perspective. In 2012, the study's metal pallet repair companies received an average of 1.28 million cores (used pallets) for recovery. The majority of the received cores were pallets in the stringer form. The 48 x 40 inch pallet was the most typical size that was received and fixed. The application of companion stringers was the stringer repair technique that was most frequently utilised. It was found that most firms utilized high levels of manual labour, with limited machinery support. The board pallet sorting/stacking processes had the highest level of automation, while the inspection, nailing, and processes utilized manual labour.

Keywords: Pneumatic, Motors, Cup Type wire brush, Nozzles

I. INTRODUCTION

Over the past 30 years, the world's merchandise commerce has increased tenfold, making up more than half of the global economy. As a result of the fact that items may be moved and transported very effectively and consistently using common devices, pallets are the most popular unit-load movable platform in the world. Pallets save handling costs since without them, commodities would have to be transported manually or with more sophisticated technology, as stated by the National Wooden Pallet and Container Association, which asserts that "pallets move the world." Pallets are also crucial, for instance, in the air transportation of various goods.

II. EXISTING SYSTEM

Pallets are cleaned in what ways? A plastic pallet can be cleaned using a variety of methods. It's crucial to accomplish this with the least amount of downtime possible. Operations will only use an ordinary hose or pressure washer to wash them. This process is quick, easy, and doesn't cost much additional money. Automated pallet washers are a choice for high-volume applications. These devices swiftly process many pallets while removing grease, dust, and other contaminants. Some include a high-temperature steam

How to Clean a Pallet

There are three primary techniques for cleaning plastic pallets. • Use the hand-cleaning method. Pallet cleaning by hand is a type of manual cleaning. Employees can clean off dirt, grime, and unwelcome pathogens from plastic pallets using soap, water, and sanitization supplies.

Power washing. Power washing can be done manually or automatically. Pallets can be put into a machine that sprays and uses an industrial washer to clean them. With this extremely effective technology, there is no need for physical labour because the feeding procedure is handled by automated sets.

Pressure-wash. High-pressure washing is best for tough to-clean substances because it uses a focused water stream to blast off materials. High-pressure washers offer an ideal automated process for removing difficult pollutants, including grease, because everything is contained in a single unit..

III. PROPOSED SYSTEM

1. Currently a team of assigned cleaners were appointed to do scheduled cleaning of the pallets.

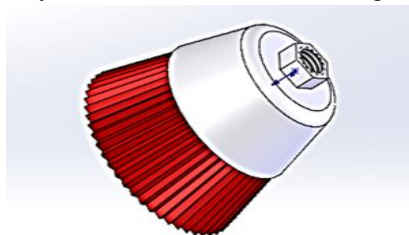
2. But the pallets being a crucial part of the line it is not possible to remove the pallets from the line as it might affect the production.
3. Hence it was necessary for a system to be inculcated on the line to clean the pallets after every cycle without interrupting the line
4. According to industry standards it is necessary to maintain cleanliness in the assembly line. Pallets being one of the most important elements of the line they are the ones getting frequently dirty because of oil grease and adhesives used on the transaxle job.
5. Types of Stains:
 - Oil and grease (From the Front and rear housing)
 - Sealant
 - Anabond
 - Adhesive
6. The purpose of a pallet is to enable the rapid moment.
7. Pallet being a material which reduces the cost of production, this inexpensive movement of goods by making them easily accessible to mechanical handling, i.e., forklifts and pallet jacks.

IV. OPERATION

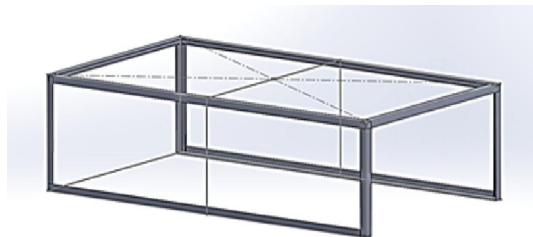
Cylindrical brushes: Cylindrical brushes are used in a production line to wide face brush a product substrate or clean a conveyor. Based on our strip brush technology, spiral wound cylinder brushes are specially created to satisfy the needs of the client. Our strip brush technology is also used in paddle wheel-style conveyor cleaning brushes, which have a reusable brush core. Here, we employ them in order to fill in the spaces between the revolving plates.



Cup Type wire brush: Wire cup brushes are made specifically for deburring, polishing, and removing paint, rust, scale, and other surface contaminants.. They have a threaded hole and nut and are primarily designed to be used with portable power tools, such as an angle grinder. While stainless steel brushes may be used on aluminium, stainless steel, and other high tensile metals to prevent contamination or corrosion, carbon steel brushes are the most typical and are used as a "general purpose" wire brush. They are used in this instance to wipe the tops of pallets.



Frame: Custom frame designed based on the available space assigned at the end of the line



Pneumatic Blower line: The pneumatic line is basically used at the start and the end of the line to blow off the settled dirt which is scraped by the brushes used in the previous operation.



V. OBJECTIVE

Immediate action is required for the assembly line because the increasing number of unclean pallets directly affect the efficiency of the line as the manual cleaning takes time.

1. To develop a system to clean pallets during the cycle
2. Reduce the level of dirt settling on the pallets.
3. To reduce efforts by using automation and sensors.

Pallets serve as a unit load's main interface. They protect goods as they pass through the supply chain, endure blows from fork trucks, take pressure, and support weight.

VI. ADVANTAGES

- **Follow a repeatable process:** Automation allows for machinery to accomplish repetitive tasks continually and without deviation from set standards. Without a margin of error, manual washing cannot accomplish repeatable procedures.
- **Deliver consistent results:** No hand washing technique can match the consistency of cleanliness provided by an automated pallet washer. With an automated pallet washer, you can achieve maximum uniformity with each pallet wash.
- **Produce higher-quality work:** A second significant benefit of using an automatic pallet washer is that it will allow you to perform cleaner jobs. If you are manually cleaning your pallets, germs may be hiding in difficult-to-reach or inaccessible places. Automatic machinery enables a thorough cleaning that hand washers are unable to achieve. It is also important to keep in mind that workers are probably going to pay less attention to detail later on in the day than they did at the beginning.
- **Improve productivity and efficiency:** In a mid to high volume shop, you'll benefit from improved productivity and efficiency when you invest in an automatic pallet washer. When the rate is increased to 100 to 200 pallets per hour, the investment return and associated advantages quickly multiply. You may expand your portfolio with more washing and drying machines as your company and financial resources expand for even quicker performance.
- **Higher sanitation standards:** You cannot achieve the same high levels of hygiene with a hand washing method. The primary advantage of an automatic pallet washer from an FDA and FSIS standpoint is excellent sanitation.
- **Higher safety standards:** Here, both your employees and your end consumers gain. Automatic pallet washers are easy to use pieces of equipment that remove other impurities, guaranteeing that goods are kept and delivered in a hygienic and secure environment.

VII. DISADVANTAGES

- **Cost:** Automated pallet cleaners can be expensive to purchase and maintain, which may not be feasible for small businesses or those with limited budgets.

- **Size and Space Requirements:** Automated pallet cleaners can be large and require significant space for installation and operation. This can be a challenge for businesses with limited floor space.
- **Maintenance:** Automated pallet cleaners require regular maintenance to ensure they function properly. If maintenance is not performed regularly, the equipment can break down, leading to downtime and increased costs.
- **Complexity:** Automated pallet cleaners can be complex to operate and require trained personnel to operate them. This can increase labor costs and require additional training for employees.
- **Limitations on Pallet Types:** Automated pallet cleaners may only be compatible with certain types of pallets, which can limit their functionality for businesses that use a variety of pallets.

VIII. APPLICATIONS

- **Manufacturing:** Automated pallet cleaners can be used in manufacturing facilities to clean pallets used for transporting raw materials, finished products, and packaging materials. This helps to maintain hygiene standards and prevent contamination.
- **Food and Beverage:** In the food and beverage industry, pallets are frequently used for transporting ingredients and finished products. Automated pallet cleaners can be used to clean and sanitize these pallets, preventing cross-contamination and maintaining food safety standards.
- **Retail:** Retail stores often use pallets to transport products from the warehouse to the sales floor. Automated pallet cleaners can be used to ensure that the pallets are clean and free from any dirt or debris that could damage the products being transported.
- **Logistics:** Automated pallet cleaners can be used in logistics and transportation companies to clean and sanitize pallets used for transporting goods. This helps to prevent the spread of diseases and ensure that products arrive at their destination in a clean and hygienic condition.

IX. FUTURE SCOPE

- **Increased Efficiency:** Automated pallet cleaners could become even more efficient, with faster cleaning times and the ability to handle a greater volume of pallets. This could help reduce operating costs and improve productivity for businesses that rely on pallets for their operations.
- **Enhanced Safety Features:** As safety regulations become more stringent, automated pallet cleaners could include enhanced safety features such as sensors that can detect potential hazards and automatically shut down the machine if necessary.
- **Integration with Smart Technology:** Automated pallet cleaners could be integrated with smart technology to enable remote monitoring and control. This could help businesses optimize their operations and reduce downtime by allowing them to monitor and control the cleaning process from a centralized location.
- **Sustainability:** As businesses become more environmentally conscious, automated pallet cleaners could be designed to be more sustainable, using eco-friendly cleaning agents and incorporating recycling or repurposing features for waste materials.
- **Improved Compatibility:** Future automated pallet cleaners could be designed to handle a wider range of pallet types, including those with non-standard sizes or shapes. This could expand their usefulness across a broader range of industries.

X. CONCLUSION

Learned about the problem identification and what measures should be taken immediately after such a massive problem.

Built a problem solving mindset to overcome the difficulties faced in cleaning the complex structure of pallets with the help of automation and mechanical design.

Gained insights in logic building and basics of PLC.

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