



Whitepaper: Moving from Manual to Engineered Palletization

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1. Synopsis

The white paper authored by Premier Tech Systems & Automation covers the following key elements of Bag Palletization

- Introduction to bag palletization
- The advantages and use cases of bag palletizing
- Working of bag palletizing in practice
- Types of palletizations: Manual & Robots -enabled etc.
- The drawbacks of manual palletizing & dangers involved therein
- Advantages of Robotic palletizing over manual ones
- The Premier Advantage in Palletization
- The Role of Automation in bag palletization
- The role of ASRS for future business scenario

2. Introduction to Palletization

Palletization refers to the process of placing goods or materials, either packaged or bulk, onto pallets. The pallet provides a base for the goods and materials, thereby promoting the efficient storage, handling and transport for the combination of goods and the pallet base, referred to collectively as the unit load.

Palletizing is a way to transport goods that first appeared in the 1950s, and it completely revolutionized the way people work. By putting products on slotted wooden bases, pallets, the act of loading and unloading them for transport became dramatically more efficient. Unloading a truck or train wagon could take days, and palletizing reduced that process to one or two hours.

In fact, in the effort to continually improve supply chain operations, pallets are sometimes looked at as a technology to be avoided, in an effort to eliminate their cost, their weight or their cube (the space that they require in transport and storage.)

The pallet, typically a form of tertiary packaging, is a flat structure used as a base for the unitization of goods in the supply chain. The MH1-2016 standard defines the pallet as a “portable, horizontal, rigid, composite platform used as (a) base for assembling, storing, stacking, handling and transporting goods as a unit load; often equipped with (a) superstructure.” The superstructure is the assembly that is attached to the supporting base of the pallet.



Figure 1: A typical Pallet Source: Shutterstock

3. Bag palletizing

Bag palletizing is one of the most common ways of transporting products. It can be done using various types of bags, from paper, plastic or a hybrid depending on the type of product being carried. Bags are usually favoured because they can be filled directly on the production line and are very efficient for products sold by volume. There is a myriad of patterns that have been invented to optimize the way you set up the bags on your pallets but also to protect the product.



Figure 2: Bag palletization

3.1 The Advantages and Use Cases of Bag Palletizing

As previously mentioned, the main advantage of bag palletizing is the ability to quickly and efficiently load and unload products onto the mode of transportation. Since products are all placed on a pallet, one can also separate them into categories, prioritize which type of product gets unloaded first and organize them in the most optimal fashion possible.

Another major advantage of palletizing to transport goods is how it standardizes the loads one is carrying around. This in turn produces many benefits for the overall operation. You can plan your entire workflow simply with the measurements of the transport vehicle. If you are carrying perishable goods, you can ensure that they are moved quickly, saving on costly transit refrigeration.

Perhaps the most overlooked advantage of palletizing is that it protects the bags by keeping them off the ground. Whether it is a truck or a warehouse, we all know that the floors can be dirty, dusty or wet: All things you don't want anywhere near your bags. Since pallets are slotted, they also provide drainage and aeration for perishable products, which also ensures that your goods remain fresher longer.

3.2 Working of Bag Palletizing in Practice

Bag palletizing works best for industries where products are sold by volume or are not suited to being put in a box. Various types of animal feed, crops such as corn and soybeans, but also chemicals and minerals like ice-melting salt are all transported and sorted using bag palletizers. Bag palletizers are often key parts of production lines with spouts to fill bags with product directly integrated in the palletizer.

One of the big advantages of robotic bag palletizers is that they can have a variety of end of arm tooling, allowing delicate and precise handling of the bags. This is a key feature because bags can be prone to tear in a fast-paced environment, potentially causing expensive product loss.

Bag palletizing is a massive technological advancement for the manufacturing space that is often taken for granted. It's a simple concept at heart that is sure to be improved on for a long time still. Adding a robotic bag palletizer is an investment in the health of your business but also of your employees. It is a machine that will have a variety of positive outcomes and always ends up paying for itself.

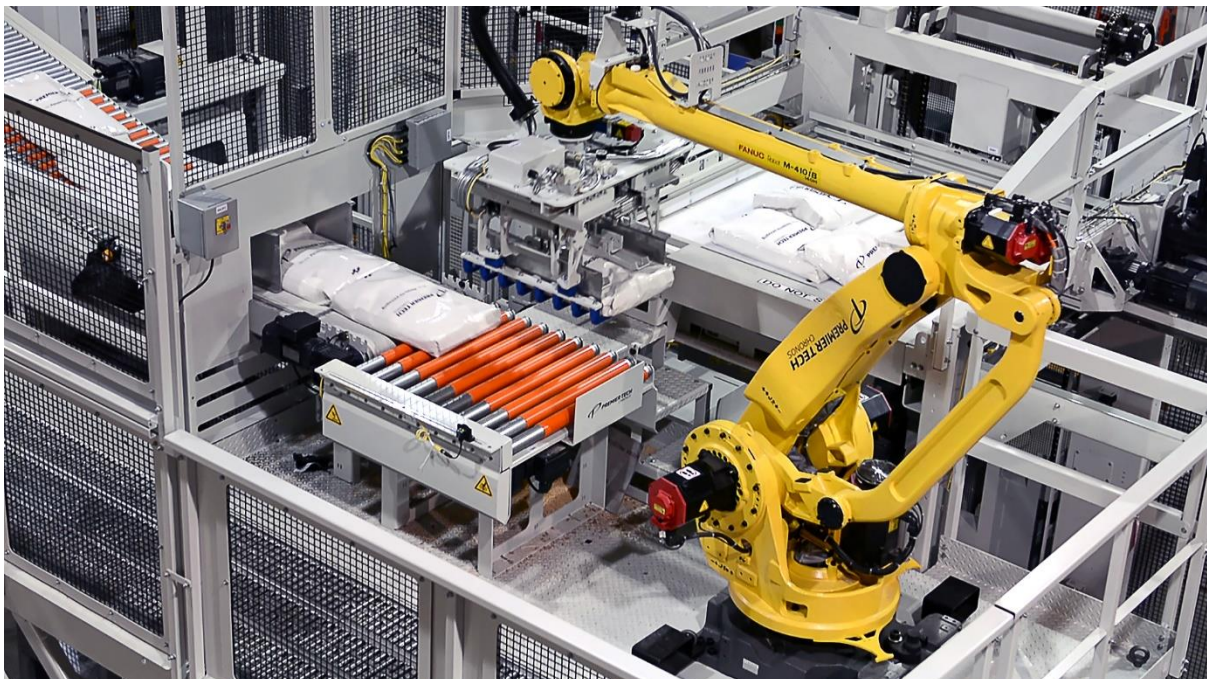


Figure 3: Premier Bag Palletizing System

4. Types of Palletizations

There are four types of palletizations. These are manual palletization, semi-automated palletization, automated palletization, and robotic palletization.

4.1 Manual or Conventional vs robotic

When bag palletizing was first invented, it relied on a rudimentary machine that would feed stacked pallets one at a time onto a conveyor belt. The pallet would then be filled by hand by workers, and then moved with a pallet jack. This method is still used today, although the machines have been greatly improved upon and made faster. While fully manual palletizing is still quite risky for workers, conventional palletizing has come a long way and can still allow a high output per minute. Conventional palletizing also has a larger footprint simply because of the size of the machines involved, but certain conventional palletizers could still surprise you with their compact size.

Like many industries across the world, palletizing was revolutionized by the advent of automation and robotics. Robotic palletizers are essentially large robotic arms that load products onto pallets and then move the entire pallet to its next location. Not only can they lift much heavier weights than human workers, but they also eliminate repetitive movements that can have long term consequences on the bodies of your employees. They are also extremely precise and can be customized with a variety of end of arm tooling to perfectly fit your needs.



Figure 4: Robot-Enabled Palletization from PT Systems & Automation

Robotic palletizing refers to a variety of different options, and not all of them are as costly as you might think. The main goal when considering robotic palletizing is to pinpoint tasks that are specifically dangerous to human workers, even when using proper techniques. Robotic palletizers can also handle much higher outputs than humans, up to 200 cases/minute for certain applications.

4.2 Drawbacks of Manual Palletization

Palletizing to efficiently transport goods has been around for a long time. Manual palletizing is centered around one major innovation, the pallet itself. These wooden structures acting as a base for crates or bags of merchandise allowed companies to organize and load products faster. However, it relies on manual labour to carry the products, and that practice is still surprisingly common today. Not only is manual palletizing a practice that requires more space, it's also significantly more dangerous to the workers than the alternatives.

4.3 The dangers of manual palletizing

While there have been several improvements over the last few decades, warehouses and production floors are still considered by most people and organizations as dangerous workplaces. As an employer, there are countless ways you can make your workforce's environment safer, but several risks related to manual palletizing simply don't have a good solution.

Heavy weights being carried by workers cause back strain, even when correct lifting techniques are being used. The same can be said for repetitive motions causing stress on muscle tissue. Industrial workplaces and techniques have greatly evolved but these are limitations of the human body. Even the best methods of lifting weights and managing the movements found on a production line are never optimal for your employees in the long run.



Figure 5: Injury risks using manual palletization

Another often overlooked danger is related to the pallet themselves. Wooden pallets can easily cause splinter wounds to workers, especially when working quickly. Pallet wear can also cause products to fall over, potentially hurting workers in the vicinity. Robots obviously are not affected by weight, and since robotic palletizers operate in gated off areas, falling products are less of a threat to your labor.

4.4 A few tips when switching to robotic palletizing

Bringing a robotic palletizer into your operation must be done carefully. The main concern from an operator point of view will be the cost. While it is undeniable that robotic palletizers can have steep upfront costs, they pay for themselves extremely quickly in increased productivity. No matter the robotic palletizer company you decide to go with, your first task should be working with them to crunch the numbers behind the project. This is also a great opportunity to gage their service and how they answer your questions. Robotic palletizers are complex machines,

Another important step that should be handled early is putting in place a health and safety plan around the use of the robotic palletizer. For most of your employees, this will be a new experience, and can be perceived as dangerous. After you've reassured your employees that this new equipment won't replace them but rather help them, explain to them all the safety measures you've put in place to ensure the operator's safety as well as the workers around the new robotic palletizer. Have everything in writing, plainly explained to make this a positive experience for everyone involved.

Human workers will always have a role in industrial operations, there is simply too many touchpoints that can't realistically be handled by robots. However, there is no reason to keep your workers in situations that are dangerous, or that have long term effects on their health. Adding a robotic palletizer is not only an investment in your productivity, but also an investment in your most important resource: your team.



Figure 6: A case for Robotic palletization

5. The Premier Value Proposition for Automation & Robotic palletization

The Premier Advantage

1. Moving from Manual Palletizing to Automation

a) *Increase in efficiency.*

In early days, Pallet loads were created by labors to product arranging on a row forming area and pushed onto a layer forming area. However, this was very lengthy process with lots of risk, efficiency and time taking process. But now a days using automatic palletization is something most facilities rely on to increase customers loading and unloading efficiency and to protect their products during transportation and reduce strain on their workforce.

b) *Better organization for batch-wise production*

Using an automatic palletizer machine, we can increase packaging's consistency. Loading pallets by hand often leads to issues with consistency due to human error and normal variation. Even the best manual palletizer in the business can't make every pallet exactly the same. Still, consistency is necessary to protect products. The products are kept safe during transport by palletization only when the containment force is exactly right. To achieve this, the pallets should be stacked with square boxes / bags that fit snugly on the pallet. This is very important for batch wise production facilities.

c) *Better Aesthetics for customer visits*

d) *Realtime warehouse talk management possibilities in future*

Many industries and market drivers continue to push the supply chain community to innovate. Automation is rapidly changing the palletizing industry and robotics continues to emerge as a large and influential market. Now a days, WMS integrated palletizer system is providing following benefits to the customers-

- Labor optimization
- Increasing overall efficiency
- Improve inventory management
- Order accuracy
- And final customer satisfaction

e) *Ready for ASRS implementation in Future*

As e-commerce transforms the marketplace, manufacturers and warehouse and distribution operators must adapt to greater consumer demand and more SKU varieties. Further, industries such as Chemical, Petrochemical, food and beverage, FMCG and pharmaceutical operate under stringent regulations that require safe and secure product handling in sometimes temperature-sensitive environments. With all such operational concern of manufacturing industries are exerting huge amount of pressure on the supply chain through uncertainties, sporadic supply-demand cycles and unavailability of workforce. To tackle these challenges, building supply-chain

resilience is the key & Automation coupled with ASRS Integrated palletizer system is the stepping-stone to it.

Leveraging a palletizing system such as the one described above can help customer operation realize a number of benefits, regardless of whether you choose to pursue conventional or robotic palletizer automation. These include:

- Save up to 50% of otherwise wasted floor space
- Improved ergonomics and fewer injuries
- Increased efficiency and throughput
- Reduced labor costs
- More efficient use of floor space
- The ability to build taller pallets

f) *Integrity of Pallet compared to Manual Stacking.*

Manual palletizing has many drawbacks when it comes to productivity. There can be many different reasons for this, but the following reasons are-

Staff not able to keep up with palletizing when the production process is running at full capacity, and as a result the production process is not run at full capacity. Production stops when staff stop for breaks, forklift movements, to fill out paperwork etc.

- Revenue Loss
- High Op-Ex
- Low OEE – Overall Equipment Effectiveness
- Inefficient utilization of upstream and downstream machinery
- Low Productivity
- Bottlenecked Palletizing Area

Automation loves predictability and simplicity. That is why, Automated palletizer systems not only remove these issues and enable your production process to function at full capacity, but also have additional benefits as well-

- Multi-fold increase in turnover
- ROI less than one to two year
- 100% Visibility & Traceability with real time track and trace – cross check serial numbers & codes with intelligent product scanning technology
- High palletizing throughput
- Reduction in Operational Expenditure through High Productivity
- Optimize manpower
- Zero damages & pilferages
- Seamless integration with upstream and downstream systems
- Process safety
- AI & Machine Learning, Video analytics driven annunciations for product discrepancies or anomalies
- Consistent 24x7 performance

6. Conclusion

Robotic palletizers continue to prove themselves as valuable enhancements to many bagging operations. Regardless of the motivating factors leading to your consideration of automated bag stacking, a review of the factors affecting reliability, stack appearance and functionality will be key to a successful implementation of this technology.