This paper describes the options available for palletizing cases, trays or bundles, hereafter grouped under the term “cases.” It will be a useful resource for those faced with filling a need for palletizing in their manufacturing operation. Over the past several years we have had the opportunity to work with each type of system and a number of the industry’s top manufacturers. At Hixson, we neither sell nor represent any products or systems. We are proud of our independent “bias” and are pleased to bring you this type of information.

**Palletizing Types and Descriptions**

**Manual Palletizing**

Simply put, Manual Palletizing uses people to select, transport, orient, count and stack cases on pallets. If needed, slip sheets and tie sheets can also be manually placed. Manual Palletizing is most often applied where the case rates and weights are relatively low or as a quick and inexpensive way to “get into the business.”

A Manual Palletizing station can be fed from one or more sources. Each source can deliver a different product, size or weight. The stacker(s) then sorts the incoming cases and palletizes them accordingly. While Manual Palletizing can be a labor-intensive chore, ergonomically designed work stations can mitigate this aspect.

In the example shown below (See Fig. 1.), cases are delivered by conveyor to the Manual Palletizing Station. The conveyor elevation minimizes the need for the worker to reach or bend to retrieve cases for stacking.

![Fig. 1 - Manual Palletizing Station](image)
Additionally, a simple lift table has been installed to raise or lower the stacking point to a level that also minimizes the need to reach or bend. Thus, the worker is always working in the so-called “golden zone” – roughly defined as the space between chest and waist. The load is transferred laterally, rather than up or down, which minimizes the strain on the worker.

To further ease the burden of the worker, the lift table can be equipped with a platen that can be manually rotated. The pallet sits on the platen. The worker can turn the platen to spin the pallet to a convenient location to avoid the need to reach across, or walk around, the entire load to position cases.

The advantages of Manual Palletizing are:

- Low initial cost
- Ultimate flexibility
- Minimal space requirements
- 100% case inspection
- Low - or no - energy, maintenance or training requirements

The disadvantages of Manual Palletizing are:

- Potential for worker injury
- Potential to incorrectly stack a given load when multiple stacking patterns are in use
- Potential for the wrong case to be stacked on a pallet when multiple products of similar size and appearance are run concurrently
- Tightness of the finished pallet load can vary

### Conventional Palletizing

Conventional Palletizers are what most people picture in their minds when they hear the term “Palletizer.” Conventional Palletizers can be defined as machines that receive cases from a conveying system, properly orient them into a layer and then stack the entire layer on a pallet in the proper stack pattern.

Conventional Palletizers have the advantages of high case feed rates and the ability to handle cases of nearly any weight. Pallets, slip sheets and tie sheets can be fed automatically as needed. Multiple stack patterns can be stored in the palletizers electronic memory and can be called up by the operator for use.

When properly equipped, the conveyors that feed product to Conventional Palletizers can monitor incoming cases and reject those with open flaps - or those of the wrong product type, both of which can cause jams in the stacking process.
Palletizing Of Cases, Trays Or Bundles; Equipment Types and Operation

Fig. 2. Major Components of Conventional Palletizers

The major components of Conventional Palletizers (See Fig. 2.) are:

- Case metering and infeed conveyor
- Case orientation device to rotate the case to the proper position
- Row forming section
- Layer forming section
- Layer compression device(s) to provide a “tight” load
- Layer stripping device that, when retracted, allows the formed layer to be lowered onto the load hoist
- Pallet dispenser (not shown) that automatically feeds an empty pallet when needed
- Slip sheet / tie sheet feeders (optional, not shown)
- Load hoist to raise or lower the load to the proper stacking elevation

There are two major types of Conventional Palletizers: *Floor Level Infeed* and *High Level Infeed*.

**Floor Level Infeed Conventional Palletizers**

As the name implies, the conveyor leading to a Floor Level Infeed Conventional Palletizer is relatively low to the ground – about the same height as the discharge of the production equipment (See Fig. 3.). Because the infeed is low, this type of palletizer is often located near the production equipment. In this way, conveyors that feed product to the palletizer are less likely to block traffic flow or create “land-locked” areas that limit accessibility around equipment.

When Floor Level Infeed Palletizers are located adjacent to the production equipment, they are often dedicated to the output of a single production line.

Fig. 3. Typical Floor Level Infeed Conventional Palletizer
Palletizing Of Cases, Trays Or Bundles; Equipment Types and Operation

The advantages of Floor Level Infeed Conventional Palletizers are:

- When located near production equipment, the palletizer can be monitored by production personnel
- Alternately, the fork truck operator can monitor the palletizer due to the fact that the entire operation takes place low to the ground in view of the driver
- Components are accessible from the floor
- Jams can be cleared from the floor

The disadvantages of Floor Level Infeed Conventional Palletizers are:

- The space under the case delivery conveyors is not usable
- If located in production areas, valuable space is needed to maintain traffic aisles to accommodate the delivery of empty pallets and slip sheets and to permit access for full pallet removal

High Level Infeed Conventional Palletizers
High Level Infeed Conventional Palletizers receive cases at an elevation of 9 feet or greater, hence the reason for their name (See Fig. 4.) The high elevation of the infeed makes this type of palletizer ideal for locating away from the production equipment. In many cases these units cannot even be seen from the production area. This can represent a significant advantage since the cost of space in a non-production area is much cheaper than space built to house production equipment.

A platform and stairs is needed for the operator to access the case infeed and tier forming areas of the high level unit, which adds to the overall cost. A set of operator controls is mounted in the area of the platform. In many cases, a second control panel is located at the floor level although this panel may not contain all of the functions found on the upper unit. A ‘Rule-of-Thumb’ for these panels is “Be able to control what you can see.”

Fig. 4. Typical High Level Infeed Conventional Palletizer

The advantages of High Level Infeed Conventional Palletizers are:

- Unimpeded traffic flow since their infeed conveyors are routed overhead
- Multiple units can be grouped and share an common access platform
- When located remotely, fork truck traffic near the production area is minimized
- When located remotely, travel distances between the palletizer and product storage areas can be shortened, resulting in less time needed for truck transport.
The disadvantages of High Level Infeed Conventional Palletizers are:

- Cases must be elevated to the level of the infeed (inclined belt, case elevator, etc.)
- A stairs and platform are required for access
- More than one control panel is often required
- If located remotely from production, a conveyor is needed to provide a link to palletizing. Installed conveyor can be costly.
- When remotely located, case jams can go unnoticed
- A method to lower cases to the ground for hand stacking (case slide or gravity spiral) may be needed in the event of extended palletizer downtime

**Robotic Palletizers**

Robotic Palletizers are so named because they utilize a robot to accomplish the repetitive pick-and-place motion needed to retrieve and stack cases.

There are two major types of Robotic Palletizers: *Articulated* and *Gantry*.

**Articulated Robotic Palletizers**

Articulated Robotic Palletizers use an articulated-arm robot for handling material (*See Fig. 5.*). A single arm that contains at least three rotary joints generally characterizes articulated robots. This arrangement provides maximum flexibility while covering a relatively large volume of workspace. The unique nature of the arm allows the robot to reach above and below objects. Articulated robots can be either floor, pedestal, or ceiling mounted but are most often attached to the floor.

**Fig. 5. Articulated Robotic Palletizer**

In operation, cases are delivered to the robot by a conveying system. The robot can be used to pick single or multiple cases from the infeed and place them in the correct location on the pallet. Pallets can be automatically fed from a queue or can be picked from a stack by the robot when needed. The robot can also pick and place slip sheets or tie sheets as needed.

Typical pick rates for a robot of this type are 8 to 10 per minute. Remember that the motion needed for the arm to retrieve a slip sheet or pallet counts as a “pick”. The number of cases that can be picked in one motion is dependent on the orientation of the cases on the infeed conveyor, the capabilities and limitations of the pick arm and it’s tooling and the desired stack pattern. Each situation must be evaluated to determine the stacking speed for that particular application.
Automated pallet delivery and slip sheet insertion systems can increase picking speeds (by reducing the number of arm movements) but raise the cost and space requirements of the installed system.

The advantages of Articulated Robotic Palletizers are:

- Flexibility – they can palletize dissimilar cases from multiple sources
- Can be relatively easily relocated and reprogrammed for a new palletizing task
- Little or no manual intervention in normal operation
- Can form “rainbow” pallets (a single pallet that contains multiple products)
- Cases can be delivered at high or low elevations, or both, if needed

The disadvantages of Articulated Robotic Palletizers are:

- Require relatively large footprints
- Installation and start up are more involved due to the need to integrate multiple systems (infeed conveyor, pallet delivery, robot, take-away conveyor)
- Generally more expensive for the total system

Gantry Robotic Palletizers

The Gantry Robotic Palletizer employs a robotic arm that is capable of simultaneous linear motion in three dimensions. The palletizing operation occurs within the confines of a structural framework that supports the robot. (See Fig. 6).

In operation, the robot travels along the gantry frame to pre-programmed locations where the end effector picks up or places cases. The user can program the robot to travel to any location under the structure. The unit can execute a variety of picking or stacking patterns. Gantry robots are ideally employed where multiple production lines feed dissimilar products to a centralized palletizing area. They are also suited to produce ‘rainbow’ pallets – a mix of multiple products on the same pallet.

The gantry is relatively slow when compared to other palletizing methods, but has the advantage of being able to palletize many loads at the same time. Pick rates for this type of palletizer vary greatly due to the differences in travel distance from the pick point to the various stacking locations. It is reasonable to expect no more than 6 to 8 picks per minute.

Gantry Palletizers usually have a large footprint and are relatively expensive.
Palletizing Of Cases, Trays Or Bundles; Equipment Types and Operation

Though it can require a large volume of space in which to operate and cannot reach under objects, the gantry can often be found in palletizing applications. Initial versions proved to be relatively slow, but more efficient linear motors, lighter materials and faster computers have increased the speed of more recent units.

The advantages of Gantry Robotic Palletizers are:

- Flexibility – they can palletize dissimilar cases from multiple sources
- Little or no manual intervention in normal operation
- Can form “rainbow” pallets (a single pallet that contains multiple products)

The disadvantages of Gantry Robotic Palletizers are:

- Require relatively large footprints
- Installation and start up are more involved due to the need to integrate multiple systems (infeed conveyor, pallet delivery, robot, take-away conveyor)
- Generally more expensive for the total system

Robotic “Cells”

Palletizing robots operate in an environment known as a “cell” which includes not only the robot but also the product delivery and take-away systems. The Robot is typically only a single component of a much larger material handling system (See Fig. 7.).

Fig. 7. Typical Robotic Cell

The components of a Robotic Cell can be divided into two categories: Robotic and Non-Robotic.

The Robotic Components with which you must be concerned include:

- Tooling
- End Effectors
- Vacuum Source
- Grippers / Clamps
- Positioning
- Counting
- Safety
- Arm Acceleration Limits
- Tool-to-Case Interface
- Vacuum Cup Material
- Programming
- Maintenance Capability

Besides the robot, there are other components that are critical to the successful installation and operation of the robotic equipment. Without proper operation of these Non-Robotic components, the function of the robot is diminished and resources are not effectively spent.
Proper consideration must be given to the Non-Robotic Components of the total system, including:

- Case marking devices
- Case infeed conveyors
- Accumulation and surge devices
- Readers and sorters
- Vacuum systems
- Sensors
- Pallet dispensers and slip sheet/tie sheet dispensers
- Full load take-away conveyors
- Control Panels
- Teach Pendants
- Programming panels

Critical controls for these Non-Robotic systems often reside in the program for the robot itself.

Robot vendors are experts at adapting their products to packaging applications. It is likely that the robot to be used in your particular application has already been employed in such a fashion by the vendor in another installation. The case handling system will probably be a custom design. For these reasons, it is assumed that the robot will be the most reliable component of the total system.

**Hybrid Palletizers**

Attempts to combine the speed of Conventional Palletizers with the flexibility of Manual or Robotic Palletizers have resulted in Hybrid Palletizers. Hybrids borrow concepts found on conventional and robotic units and employ them to palletize more than one load at a time, usually from two to five. Thus, one Hybrid Palletizer can handle the output of several production lines of different products. The combination of features found on hybrid units is limited only by customer needs and the willingness of equipment manufacturers to meet those needs.

Because Hybrid Palletizers are capable of handling multiple pallets, they often require a relatively large space for operation, though less than the aggregate space needed by multiple single-product palletizers. Because of this space requirement, and the fact that these types of palletizers serve several production lines, they are often located away from the production area.

Some concepts employed in Hybrid Palletizers:

- Shuttle Cars
- Rotary Tables
- Robotic Arms
Shuttle Car Hybrid Palletizers
Shuttle Car Hybrid Palletizers combine the layer forming section found on conventional palletizers with two or more shuttle cars that ride on a set of tracks or a chain conveyor (See Fig. 8.).

In operation, the layer forming section is fed from more than one case delivery conveyor. Each conveyor can carry a different product. When enough cases to form a complete layer are waiting in queue on a given delivery conveyor, a metering system allows them to flow into the layer forming section of the palletizer. A method of identifying the case, such as a bar code reader, tells the layer former which case is in the system so the appropriate layer pattern is formed.

A counting system, operated by photo eyes or the bar code reader, insures that the proper number of cases is fed to the forming section to form a complete layer. To keep the layer forming section operating efficiently, it is important that enough cases are available in the queue to form a complete layer before forming is attempted. Generally, the case delivery conveyor with the longest queue length of waiting cases is chosen to feed the former. This minimizes the length of infeed surge conveyor needed to operate the system.

When a complete layer is formed in the layer forming section, it is stripped onto the pallet in the same way a conventional palletizer works. Since the pallet is riding on a shuttle car, it can be moved into or out of the loading position as needed. Once clear, a different pallet, also riding on it’s own car, is moved into the loading position and the loading process is repeated.

Empty pallets are fed onto each shuttle car from a pallet dispenser as needed. Slip sheets and tie sheets are placed as needed by conventional sheet feeders. The location of the shuttle car is carefully controlled by linear positioning equipment so that pallets, sheets and cases are accurately positioned and tight loads are formed.

When a given pallet contains a completely formed load, the shuttle car moves to an unload point where the full pallet is driven off of the car and onto a transport conveyor. This conveyor can transport the load to an automatic stretch wrapper or to a surge location where a fork truck can remove it from the system.

This type of palletizer may cost more than a single, dedicated unit, but the cost is generally lower than the cost to purchase, install, operate and maintain individual units for each product.
Rotary Table Hybrid Palletizers
Rotary Table Hybrid Palletizers operate in a manner similar to Shuttle Car Hybrid Palletizers. (See Fig. 9.). The main difference is that a rotating table replaces the shuttle cars as the means of pallet transport.

![Fig. 9. Rotary Table Hybrid Palletizer](image)

The discharge of the Rotary Table Hybrid Palletizer is often directly connected to an automatic stretch wrapper by way of a pallet conveyor. Alternately, full pallets can be discharged to a station where they can be picked up by fork truck for further handling.

Robotic Arm Hybrid Palletizers
Robotic Arm Hybrid Palletizers combine the features of a robot arm for picking and stacking with a shuttle car for pallet handling and transport (See Fig. 10.). This type of unit offers the ability to palletize multiple products simultaneously in a central location.

![Fig. 10. Robotic Arm Hybrid Palletizer with Shuttle Car](image)

In the case of the unit pictured above, the robot selects cases from the bank of infeed conveyors shown on the left. Loads are formed on pallet loading conveyors, shown arrayed near the robot that are held stationary during the forming process. A shuttle car is used to deliver empty pallets to the loading conveyors and to transport full pallet loads away from the stacking area when a load has been completed. Slip sheets and tie sheets are placed by the robot as needed.

Empty pallets are accurately located on the pallet loading conveyors by a pallet positioning system so that the robot is able to accurately put the cases in the correct place. Full loads are delivered to a discharge area by the shuttle car for transport to a stretch wrapper or pick up by a fork truck.

**Palletizing Speed**

When selecting a palletizing system, it is important to have an understanding of the speed – the number of cases per minute – that the equipment will be capable of handling. After all,
you want to insure that the equipment is up to the task, but you don’t want to pay for excess capacity that you won’t need. This sounds like a simple task but it is often easier said than done.

We have all seen claims in vendor literature that tout the speed of a particular palletizer. “Up to 30 Cases a Minute” for example. But what do these claims really mean? It is doubtful that you will be able to palletize at that rate for any and all cases regardless of size, weight or stacking requirements. For a performance claim to have any validity, the vendor MUST have an opportunity to evaluate your particular situation. Only after gaining a complete understanding of ALL the requirements of the proposed palletizing system can a vendor quote speed capabilities with a level of confidence that you can believe.

It is curious to note that a given circumstance may have little impact on the speed of one palletizing system but create a major problem for another type of palletizer. Take case weight, for example. A heavy container delivered at a relatively high case rate may present no difficulties for a Conventional Palletizer, but may be nearly impossible for a Manual Palletizer to handle.

It is important to carefully compare your palletizing needs to the capabilities and limitations of each palletizing method you wish to consider. Many of the factors that can affect palletizer speed are discussed below.

**Case Length and Pallet Layer Pattern**
Case length can have a major impact on palletizing speed because it directly impacts the number of cases that can be placed in a layer (See Fig. 11.).

![Fig. 11. Effect of Case Length on Cases per Layer](image)

The configuration on the left has a longer case length which results in fewer cases per layer than the configuration in the center, while the one on the right has the shortest case length and the most cases per layer.

This simple fact will affect speed in a *Conventional Palletizer* in which the layer forming operation must stop while the layer is stripped and the hoist moves. Layer configurations with fewer cases will require more interruptions of the forming operation due to stripping and hoist movement, thereby reducing the overall speed of the palletizer. Conversely, layer
configurations with more cases will require fewer interruptions and result in a faster palletizing speed in cases per minute.

With all that said, note that in some high-speed Conventional Palletizer designs, the forming, stripping and hoisting motions occur simultaneously and there is no interruption to the overall operation. Indeed, this feature is the very reason why these units ARE designated as high speed. As you can imagine, the cost of a high-speed unit is significantly greater than the standard design – up to five times as much.

With a Robotic Palletizer, case length has the potential to affect speed for reasons similar to those listed above, but this isn’t always necessarily true. Instead of time lost due to interruptions caused by hoist movement and layer stripping, the robot loses time with each movement of its articulated arm. The more movements needed to form a layer, and the greater the distance between pick and drop points, the more time lost and the slower the overall case rate. For this reason, the pattern into which the cases are formed on a layer is as important as case length. For example, robots often pick more than one case at a time from the case infeed conveyor. If the pattern dictates that some of the cases in a given pick need to be turned, it will take longer to complete the pick (to turn cases) than if none of the cases need to be turned and the robot can simply set the entire pick down into position.

Note that case length will have little impact on the speed of a Manual Palletizer unless the case is so long that it is bulky for the stacker to handle.

Cases per Layer and Layers per Pallet
The number of cases in a layer and the number of layers per pallet in a finished pallet load can affect palletizing speed.

In a Conventional Palletizer, the hoist must operate to move the load each time a layer is formed. Depending on the design of the palletizer, this movement can interrupt the palletizing operation. Additionally, each time a finished pallet is moved from the palletizer and an empty pallet is moved in to take it’s place, the palletizing operation can be interrupted, again, depending on palletizer design.

For these reasons, in a Conventional Palletizer of such design there will be fewer interruptions with layer configurations that contain more cases and with pallet configurations that contain more layers. Fewer interruptions that interfere with the overall operation will result in a faster palletizing rate in cases per minute.

As stated above, these interruptions may not exist in high-speed Conventional Palletizer designs because they have been eliminated from the operation. Of course, these palletizers are usually accompanied by a higher price tag, but may the best option if high speed is needed.
Palletizing Of Cases, Trays Or Bundles;  
Equipment Types and Operation

In a Robotic Palletizer design, the cases per layer and layers per pallet will affect the speed of the operation if the robot is required to make more arm movements. For example, the fewer the layers in a pallet, the more times a new pallet must be retrieved. Some robotic palletizer designs use the robots arm to pick a new pallet from the empty pallet stack. While the arm is retrieving a new pallet, no case palletizing can occur which affects overall palletizing speed in cases per minute. A way to mitigate this problem is to provide a system that automatically delivers and positions the pallet without using the robot.

Case Weight
The weight of a case can also affect palletizing speed. In a Conventional Palletizer, cases are moved by a belt conveyor or roller conveyor. The friction generated between the conveying surface and the case determines how smoothly the case will handle. If there is not enough friction, the case may hesitate or not move at all, both of which can result in a jam.

Many palletizer designs use bump bars or turning wheels to rotate the case into the proper orientation for forming. This turning motion relies on the friction between the conveying surface and the case to work correctly. A lightweight case may result in reduced friction and unreliable case handling. Lightweight cases can also be subject to bouncing during transport, which can lead to instability and jams, thereby reducing operating speed.

Case weight can also affect the operation of a Robotic Palletizer. When picking cases with a vacuum end effector, the adhesion between the vacuum cup and the case surface must not be broken or the case may fall. The most critical part of the move is after the cases have been picked vertically and the arm begins it’s horizontal motion. With a heavy case, this motion must begin slowly and end slowly to maintain adhesion and control of the case. Therefore, the heavier the case, the longer it will take the robot to make a particular movement.

Of course, the heavier the case, the more adverse will be the effect on the speed of the stackers in a Manual Palletizer.

Slip Sheets/Tie Sheets
In most Conventional Palletizer designs, the placement of a slip sheet on the empty pallet will have no effect on speed in cases per minute. The sheet is usually placed on the empty pallet after it has been positioned in place for receiving cases and is done simultaneously with the next layer being formed. The same is true of tie sheets, which are usually placed on top of a given layer after it has been stripped while the next layer is being formed.

Check the design features of the particular palletizer you are considering to make sure that sheet placement does not interfere with layer forming or stripping.

In the case of a Robotic Palletizer, the placement of slip sheets and tie sheets is often accomplished by the robotic arm. This action takes time to complete and interrupts the placement of cases, thereby slowing the overall speed of the palletizer in cases per minute.
In some robotic designs, however, the pallet is fed from an automatic pallet dispenser and delivered to the robot by a separate pallet handling conveyor. In this instance, the slip sheet can be placed by a sheet dispensing mechanism before it gets to the robot, thereby saving the need for the articulated arm to perform this movement. However, if tie sheets are required, a movement of the robot's arm may still be needed to accomplish this task.

The Relationship Between Production Speed, Case Surge Capacity and Palletizing Speed
As a manufacturer, you know what your production systems are capable of making and the rate at which cases will need to be palletized. The question is, “What should the speed capability of the Palletizing System be in cases per minute?”

The factors to consider in determining the speed requirements of the palletizing system are:

- What is the maximum rate at which cases will be delivered to palletizing from all sources?

The maximum case rate is the total of all of the streams that have the potential to be palletized by the palletizer. When figuring the total count, don’t forget to include multiple production sources, hand pack stations and repack operations. It is this total number with which we are concerned.

Circumstances such as equipment failures, jams, programming malfunctions, operator breaks, etc., dictate that production systems will operate at an efficiency less than their capability. For example, a system capable of producing 1,000 cases per hour may actually consistently produce only 800 cases per hour over an extended period of time – an efficiency of 80%. Some people may be tempted to use this lower figure in determining the speed requirement of a palletizer. However, in a given time interval, there will be situations when the system WILL produce at a rate of 1,000 cases per hour and it may do so for extended periods of time. For this reason, the palletizer must be designed to handle cases at the higher rate. If not, the palletizer will tend to become a bottleneck and reduce overall system efficiency and throughput.

- What is the case surge capacity between production sources and palletizing?

Palletizers that are close-coupled to production may not have any case surge capacity between the two. Cases may leave the production area from, say, a case sealer and travel only a few feet before entering a palletizer. If the palletizer were to stop, (due to jammed pallets or cases, overloads, no slip sheets, etc.), the production equipment would be immediately affected and would shut down.

For palletizing systems that are not close-coupled to production, there will be space for case surge between the production source and the palletizer that will provide a buffer between the two. It is important to understand the capacity of this buffer when selecting a palletizer.
Palletizing Of Cases, Trays Or Bundles;  
Equipment Types and Operation

Since many instances of palletizer downtime last less than five minutes, the buffer capacity will ideally be capable of storing at least that equivalent amount in cases. This way, the production equipment is likely to continue to run through most failures of the palletizer.

Of course, when operating again, the palletizer and conveying system must be capable of running faster than the production equipment to reduce the queue of cases that built up in the surge area during the failure (See Rules-Of-Thumb below). Note that if an automatic stretch wrapping system is fed by the palletizer, you must account for similar downtime events such as film change-out and maintenance.

- Is the palletizer shared by multiple production sources?

When multiple production sources share the services of a common palletizer, it is necessary to have case surge capacity between all the production sources and palletizing. The reason for this is that as the palletizer is handling cases from one source, the cases from other source must have a place to accumulate.

A properly designed case delivery system will take this into account. While it is not practical to have unlimited surge capacity, it is necessary to have at least enough surge to prevent a production source from shutting down because it’s cases have no place to go.

- The Rules-Of-Thumb regarding Palletizer speed requirements in cases per minute:

If the palletizer is direct coupled to a production line – i.e.: there is no surge capacity between production and palletizing - and the palletizer is dedicated to a single production source, the minimum speed of the palletizer must match the maximum output of the production equipment operating at 100% efficiency in cases per minute. Since there is no case surge capacity, there is no need for the palletizer to have a higher case rate than production. Buying excess palletizing capacity would waste capital.

If the palletizer is located remotely from the production line, with case surge capacity between the two, and if the palletizer is dedicated to a single production source, the minimum speed of the palletizer should be 5% to 10% faster in cases per minute than the maximum output of the production equipment operating at 100% efficiency. This will provide palletizing capacity that can economically meet the needs of the production system and still be able to reduce the queue of cases that builds up in the surge area during a palletizer failure.

If the palletizer is located remotely from the production line, with case surge capacity between the two, and if the palletizer is used to serve multiple production sources, the minimum speed of the palletizer should be 10% to 20% faster in cases per minute than the maximum output of the combined production equipment, each operating at 100%
Palletizing Of Cases, Trays Or Bundles;  
Equipment Types and Operation

efficiency. This will provide palletizing capacity that can economically meet the needs of all production systems and still be able to reduce the queue of cases that builds up in each surge area during a palletizer failure.

Cases vs Trays/Bundles

When handling trays or bundles, especially those that have been over-wrapped with a plastic film, remember that they may present the palletizer with different handling characteristics than those that exist with traditional corrugated cases.

These differences can manifest themselves in the following ways:

- The conveying surface of over-wrapped packages generally has a higher coefficient of friction than corrugated. They may tend to “stick” in areas where corrugated will “slip” which can cause them to handle differently in critical places such as the case turning device or the layer stripping area.

  You may also experience difficulty in conveying systems where there is case-to-case contact, especially in accumulation areas. The higher level of friction may cause cases to bind during conveying which can cause skewing and jams, especially in turns.

- The top surface of trays and bundles is not always as smooth and regular as corrugated cases. The operation of vacuum-assisted case handling equipment, as found in end-of-arm tooling for a robotic palletizer, can be adversely affected by this. Suction cups may not be able to develop the holding force necessary to completely lift the case. If lifting force can be generated, the speed of lateral arm movements may be limited due to lack of adherence.

- Round or irregular-shaped items that are over-wrapped may have protruding surfaces on the exterior sides of the package that would otherwise be covered by a corrugated case. These surfaces may tend to snag on components of the palletizer and/or its conveying system. Additionally, the surfaces can snag on each other when the packages come into contact with one another.