Robotic End-of Arm Tooling Considerations for Palletizing Lines

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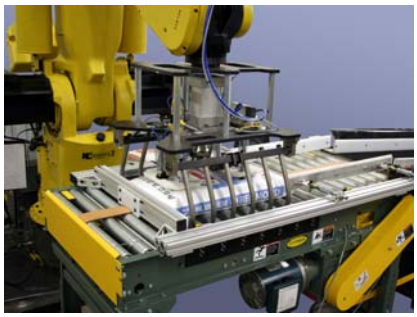
If you have more than one product per line – costly changeover tooling is not always necessary

Palletizing lines are as varied as the product that is shipped on the pallets. Many times palletizing lines are set up to handle various products that are similar in shape or size such as corrugated cases, bags, containers, etc. If an industrial robot is used for palletizing then there are three options for the robot's End-of-Arm Tooling (EOAT); dedicated tooling for each shape or size product, tooling designed to handle the entire range of products for that specific line, or a combination of the above. Clearly, from a cost standpoint if one EOAT can accommodate the entire range of product for the line, this is the best solution. Several design considerations and tooling options are available for designing the EOAT to accommodate the entire range of product.

Bag Palletizing



Bag palletizing lines are suited for EOAT that can supply enough vacuum to pick from the top of the bag (as presented) or mechanical gripping EOAT that reach around and slightly under to mechanically lift the bag. The vacuum method is typically feasible for bags that are very robust and where the product maintains the shape of the bag well. Mechanical gripping can lift a variety of bag types. A proven design for this concept is to have two sets of fingers or tines that pick the bag from a roller conveyor. The tines reach down between the rollers so they can lift the bag from the bottom and sides. They are not as dependent upon the product inside the bag because the EOAT can be designed to have the tines travel past the envelope of the bag to deform the bag if necessary to get a secure grip. This same concept of "over travel" can be used to secure bags of various sizes to make the line more flexible.

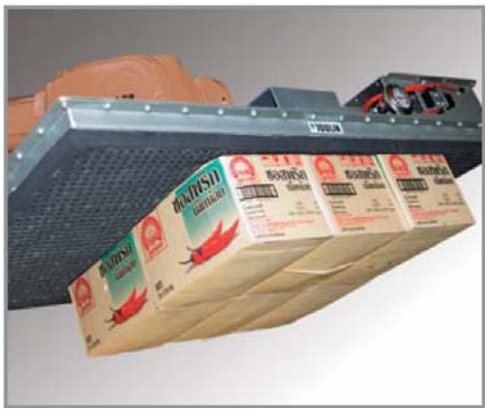
Case Palletizing

Case palletizing lines typically utilize EOAT with mechanical grippers, vacuum cups, or vacuum grippers. Mechanical grippers often will have a stationary plate and a moving plate to secure the case from the sides with a friction grip. The stationary plate is typically made of high strength steel so it can be thin enough to allow palletizing the cases in a tight pattern. The contact area will have a machined knurl or a rubber material adhered to it to give it better grip. The moving plate can be designed to have enough stroke so the mechanical grip can secure cases with different widths. Care

should be taken when designing a mechanical case gripper to ensure the robot can reach the various positions necessary to place the cases on the pallet in the desired pattern. The robot will have to operate in a wider envelope to reach all of the palletizing positions.

Gripping Solutions

Vacuum cup EOAT for case palletizing utilize vacuum cups along with a centralized or decentralized vacuum source. Zoning of the vacuum system may also be necessary to grip cases with varying size. Pre-design testing is almost always needed to ensure the sizing of the vacuum system. Since the cases are porous there will always be a certain amount a vacuum leakage between the vacuum cups and the case. Therefore, through the testing you can determine the amount of vacuum flow and style of vacuum cup needed to overcome the leakage and maintain a firm grip on the case. Zoning the vacuum cups enables the robot to apply vacuum to cups in various zones to grip different case sizes. The number of different size cases the EOAT can handle is dependent upon the number of zones and the minimum vacuum cup diameter that can be used to still maintain a firm grip on all of the case patterns.



Mechanical gripping and vacuum cup EOAT are good for securing a single case or a row of cases but are not the best choice for palletizing the entire pallet layer of cases. Mechanical grippers would need to apply forces that would damage the cases for an entire layer. Vacuum cup zoning would become cumbersome with the amount of zoning necessary to secure the various layer patterns. Also, compressed air usage increases as more zones are required. Vacuum gripper EOAT offers an excellent solution for layer palletizing of cases. High flow vacuum at relatively low vacuum levels is pulled through a vacuum chamber that has an array of orifices on a plate. The plate has a closed cell foam pad adhered to it with the same array of holes that interfaces with the cases and decreases the leakage. A series of mechanical valves can be used in conjunction with each orifice to close off those that are not directly covered by the cases. The vacuum gripper EOAT uses vacuum blowers to generate the high flow vacuum. Since the profile of the vacuum gripper EOAT that interfaces with the cases is a flat surface, it does not matter what size or pattern the cases have as long as the vacuum gripper envelope covers the cases.

All of the EOAT design concepts discussed above for palletizing applications would utilize electrical sensors, RFID, or vision systems to locate and identify the product or position of the EOAT relative to a key reference. They can also be equipped with options to secure pallets and tier sheets adding value to the function of the robot cell.

Conclusion
The key to an efficient robotic palletizing line is to limit the number of tooling changeovers and downtime when you change product. If one EOAT can handle most of the product for a given line then that portion of the changeover is eliminated. However, it can still be cost effective to have one or two dedicated EOAT to keep a specific product on a given line. Tooling specific to only one product can be designed to be less sophisticated and less expensive.

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>SAS< is a leading supplier of modular EOAT components, end effectors & robotic gripper systems – capable of servicing any part and any robot. >SAS< manufactures in the USA "*get a grip!",* and distributes "nip it!" Nile sprue nipper line, and "GRIP IT!" Asian chucking/gripper line. >SAS< is ISO 9001:2000 Quality Certified. Specialists in Robotic End-of-Arm tooling & Custom Gripper systems, Sprue Nippers, CNC degating & Insert Mold tooling for packaging, palletizing, plastics, and general material handling. Sales, service & support to: USA, Canada, Mexico, Europe.

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