KUKA ROBOTICS CORPORATION

WHITE PAPER

BAG PALLETIZING: A DESIGN GUIDE

22500 KEY DRIVE
CLINTON TOWNSHIP, MI 48036
866.USE.KUKA

info@kukarobotics.com
www.kukarobotics.com

Revision 1.1

Bag Palletizing: A Design Guide

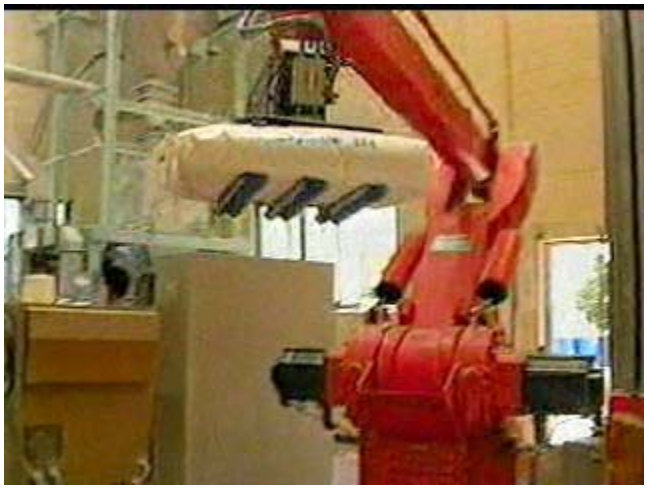
When designing your bag palletizing operations you need to ask yourself two vitally important questions. First, what type of bag am I palletizing? Is the bag smooth, porous, flat, round? Second, how is the product in the bag packed? Is it loose or firm? There are many differences between case palletizing and bag palletizing but these two elements will affect the cost and efficiency of your palletizing operation. Your answers will define the type of end-of-arm tooling (EOAT) that you should use and how the EOAT you choose will ultimately affect the throughput of your system.

Once you have defined what type of bag and product you plan to palletize you have a choice of basically four basic types of EOAT: vacuum, clam shell, fork gripper and bag gripper. Each has its niche and its drawbacks so analyzing your options plays an important role in your palletizing cycle times.

Bag Palletizing Tooling Options

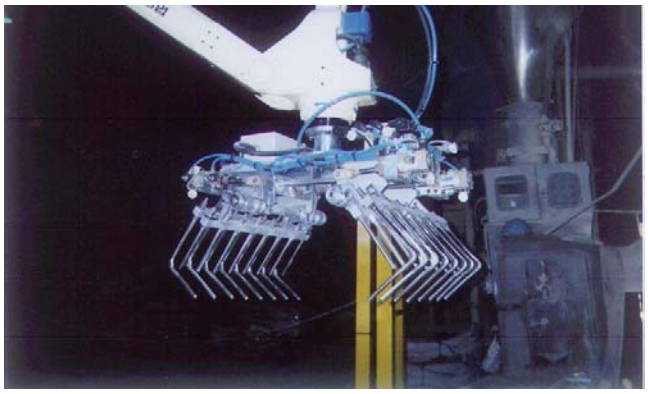
Using a **vacuum tool** is the least expensive method available. Vacuum cups come in a variety of styles and sizes and work best with products in non-porous bags with flat surfaces (such as plastic). This method also works best with products that are tightly packed. Tightly packed products, as opposed to fluid product, will allow the bag to maintain its shape which in turn allows the vacuum to maintain its contact with the surface of the bag. This method allows you to hold from one surface, typically from the top, and will also allow you to independently place products on a pallet. A robot fitted with two or more vacuum cups can drop or place the products independent of each other. While vacuum is an easy-to-configure solution that gives you the flexibility to handle a wide range of products and shapes, it cannot handle porous bags or operate in “dirty” environment where dust can clog the tool. Also, to be considered is the amount of air or suction required to pick up the bag. If shop air is insufficient for the weight of your bag you may require a vacuum generator increasing the cost of the EOAT.

A **clam shell** mechanical gripper is more expensive than vacuum but less expensive than the fork or bag gripper methods that follow. This tool consists of two mechanisms that clamp to the sides of the bag. This method is ideal for packages that are tightly packed and have a curved shape. Bags of sugar or flour are excellent candidates for clam shell grippers. Both vacuum and clam shell methods have the added advantage of not requiring modifications to the standard pick up conveyors, unlike the fork or bag grippers. The clam shell approach, while very supportive of barrel shaped bags, does require more maintenance due to the added moving parts. Additionally, due the design of the clam shell, fork and bag gripper mechanics, these methods can not independently place or drop products as described previously in the vacuum description.



The **fork gripper** EOAT is the most flexible of the four tools and is designed for product that requires pick up from the bottom. It is designed to hold the bag from the bottom, working best for bags that do not have a sufficiently flat surface for pick up from the top and/or the product in the bag is very loose or fluid. This is also useful for bags that allow air to flow through them such as cotton or burlap. The fork gripper can pick up nearly every type of packaging. However this flexibility carries a cost in that the EOAT is very heavy due to an abundance of moving parts. These additional parts also increase the weight and maintenance issues for the machine. When considering this method consideration must be taken to the conveyor used as modifications might be required in order for the palletizer to reach under the bag.

The **bag gripper** is a hybrid of the clam shell and the fork gripper. It holds the bag from the sides but also utilizes tines that extend under the bag. This allows the gripper to hold between three to four surfaces of the bag. This method holds the bag more securely than the clam shell and vacuum approach and is quicker and lighter in weight than the fork gripper approach. While this method has the added advantage of holding the bag more securely while in motion than the clam shell of vacuum methods it does require a specially designed conveyor to allow its “fingers” to pick and it requires more room in which to operate.



Other Considerations

Once you have evaluated your EOAT options there are several other considerations to keep in mind in order to fully optimize your palletizing cell including:

- To increase cell productivity the product on the in in-feed conveyor needs to be close to the build pallet without interfering with the robot or the EOAT.
- Software should remain simple and easy to use.
- Bag palletizing, with its unique shapes and consistencies, does not lend itself well to column stacking. Interlocking pallet patterns will produce a more stable pallet.
- When building a pallet, cases tend to be placed on the pallet where as bags tend to be dropped. This is due to gripper design and allows the bags to from/mold in place creating greater pallet density. Additionally, because robots work in more fluid motions cycle times are increased by this stacking method.

Palletizing cell design requires careful consideration of product shape, size, packaging and consistency. Evaluating these components, software requirements and manufacturing layout during your design phase will increase your overall palletizing efficiency.

For more information including technical details, how-tos, and specifications, click here (or cut and paste the url below into your browser) to receive our comprehensive Robotic Guide on CD, Free!

http://www.kukaregistration.com/packagingtoolkit.htm