

MAJ Enterprises Presents from Cognex

Smooth Pizza Picking with a Robot



After the installation of robotics and Cognex VisionPro® vision software, Panidea is able to quickly and easily adapt to consumer demand. The Italian producers need to package three different shapes of pizza that are all randomly placed on the same conveyor belt. In order to do so, they implemented a system featuring a robotic picker, guided by Cognex vision. As the different pizzas move along the conveyor belt, Cognex vision identifies and communicates the location of each pizza to the robot. This system is capable of packaging sixty to eighty pizzas per minute while maintaining proper shape and without

losing any toppings.

While an expert pizzaiolo might prepare a pizza in a few minutes, an industrial pizza machine must turn out hundreds of pizzas in the same time frame. No one would claim that frozen pizza tastes quite the same as that prepared fresh in a brick oven, but frozen pizza can bring a lot of satisfaction to those who want the taste of Italy and don't have an authentic pizzeria nearby.

For an industrial pizza producer, making the pizza is only the first part of the problem. The pizza must then be frozen, sorted, wrapped and packaged in accordance with regulations for freshness and hygiene, and must not lose its attractiveness during this process. For example, if the pizza starts out round, it should still be round when it arrives in the consumer's kitchen. If cheese has been sprinkled on top of the pizza, it should still be there when the customer opens the package, and not be left behind on the factory floor.

Last year, Italian pizza producer needed to design an automated packaging system for frozen pizzas. Pizzas coming from a freezer were to be loaded into a flowpack machine before going to a cartoning machine. The major challenge was to handle three different shapes of pizzas: triangular, circular and oval. Furthermore, the customer wanted a fully flexible and scalable system, where new products could be introduced as the capacity increased over time.

A specific challenge with pizzas is that they don't always collate neatly on the line and may not be perfectly uniform in shape. The pizzas also must be handled delicately with the robot's gripper. Items on top of the pizza mustn't be lost in the trip from the line to the package. Looking at these requirements, it was concluded that this combination of total flexibility and high capacity could only be achieved through the use of a Model RB340 FlexPicker robot from ABB, Inc. used in conjunction with ABB's PickMaster software for vision guidance.

The FlexPicker is a parallel, kinematics robot that is said to offer a great combination of speed and flexibility. With picking rates exceeding 120 items/min, the robot can pick and place products one-by-one. Since all the motors and gears are fixed on the base of the robot, the mass of the moving arms is limited to a few kilograms. This means that accelerations above 10 gravity can be achieved.

The FlexPicker has a hygienic design, and the fact that the robot is top-mounted means it doesn't restrict access to the robot line, a feature that is greatly appreciated by both operators and maintenance personnel.

The PickMaster vision software gives the robots "eyes." The pizzas are arranged randomly on a conveyor belt, and the robots need to know their location to pick them up. Incorporating a vision system from Cognex the PickMaster PC-based software package makes the programming of multiple (up to eight) robots, cameras and conveyor belts an easy task—even for an inexperienced robot programmer. The loading system contains two FlexPicker robots, each with a camera and PickMaster software. Should Panidea wish to upgrade the capacity of the system, the layout has room for a third robot at the end of the line.

The key to the success of this pizza-loading system, which is the first of its kind in Italy, is the gripper design. Although single grippers are simpler and cheaper than multiple grippers, the high capacity and product variation makes the gripping technology very important. In this project, two types of grippers are used: a finger-like gripper and a faster, vacuum gripper. Each robot has a capacity of 60 to 80 pizzas/min, depending on the type of gripper being used. If a third robot is added to the line, the maximum capacity of the system will be 240 pizzas/min.

The cameras and the Cognex vision system locate the pizzas and feed the positions to the robot controller. The products don't have to be guided or prearranged, as they would need to be with conventional automation systems. Instead, they can be fed on an ordinary, flat conveyor belt for all product variants; the FlexPicker robots and vision system take care of the rest. The result is a cleaner robot-based system with fewer mechanical peripherals. The flexibility provided by this approach is very valuable to the customer, since it allows the optimal mix of products to be produced, depending on consumer demand. In addition, only the grippers need to be changed to accommodate different batches, so downtime and loss of production are minimal. Also the ability to add another robot is a valuable option to accommodate future growth in the demand for the pizzas. Since the system packages open food, it is mainly designed in stainless steel to meet washdown standards—an important requirement in food production.

According to personnel at Panidea, the FlexPicker system installation went very smoothly and took only two weeks. The reliability has been very good, they say, since the installation in March 2004. According to Panidea engineers, this is probably the only way to automate this application with such a great combination of flexibility and speed. The only equally flexible alternative to the FlexPickers would have been a much more costly solution using manual labor.

The pizza-picking installation is an excellent example of how standard robots and application software result in a short payback for a food producer. Panidea says it is already planning to continue the expansion of the concept.

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