VACCON
VACUUM PRODUCTS

Designed for Dirt No Filters Never Lose Suction

Let Them Move Cake!

Colorado based commercial baker needs to pick-and-place 10 inch sponge cakes.

Abstract

A leading commercial baker in Colorado develops an end-of-line pick and place system to speed up production, reduce product loss, and enhance product quality. The solution illustrates the application of "vacuum flow" and how "vacuum flow" should be differentiated from "vacuum" in pick & place technology.

Conventional vacuum and vacuum cup technology damages delicate, "crumbly" products like cake.

Introduction

As a leading commercial bakery in Colorado, the client produces cakes and other baked goods for a wide range of customers in the western United States. The project goal was to develop a new pick & place machine for inserting 10-inch round cakes and slip-sheets into corrugated shipping cartons. The new machine would need to place 8 to 12 cakes with slip-sheets into a carton at a rate of two or more cakes per second. The placement of the cakes and slip-sheets would have to be "downward" or on the Z-axis.

According to the Production Manager at the bakery, "We knew that our production bottleneck was at the point where we were transferring the cakes from the line and into the cartons. The process was slow; we had to deal with a lot of job dissatisfaction that comes from doing this kind of repetitive motion activity, and we saw an opportunity to address these things while improving our product."

Technical Issues

Cake is technically a very challenging material to handle with vacuum. Cake is porous, relatively heavy, crumbles easily, has variable density, and is basically "floppy" stuff. Trying to use vacuum and vacuum cups as handling mechanisms will fail because the cake will break easily or have its surface marred by vacuum cups. Since, in this application, the cakes and their slip sheets would be inserted downwards into cartons, solutions employing grasping or lifting technologies would not be practical because of the "tight" dimensions of the shipping carton's interior. The solution would have to be vacuum, but employed in a way that would accommodate the physical characteristics of cake.

As Ellen Ferri, President of Vaccon Company, Inc., describes the situation: "There are literally millions of vacuum cups out there, and thousands of pumps and blowers. With any of them, it isn't a question of will vacuum technology work, but how will you apply vacuum technology." In this application the solution would lie in the use of vacuum flow as distinct from vacuum level. Vacuum flow is free air induced by the vacuum pump. When that air is constricted it creates vacuum, the level of which is measured by the amount of constriction. If the flow of free air is completely blocked, the vacuum level is highest. Since — in this case — the cake is delicate and porous, a flow is crucial to creating a vacuum level high enough to hold the cake, but low enough to keep it from damaging the surface.

Solution

The pick & place system developed for this application needed to address the physical characteristics of cake, the placement of the product into cartons

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To accommodate the physical characteristics of cake, a round, rigid cup with mesh screening and composed of Ultra High Molecular Weight (UHMW) plastic was developed. This allows a greater surface area for suction, creating a vacuum head able to spread the vacuum tension over the entire top surface area of the cake without marring or dimpling.

via the Z-axis, and the issue of how to accommodate the volume of free cake crumbs present around the production line that would clog the average vacuum blower. Using a typical vacuum pump and vacuum cup configuration would be unacceptable, as the cakes would be damaged (see picture).

To accommodate the physical characteristics of the product, a round, rigid cup with mesh screening measuring 6" in diameter and composed of Ultra High Molecular Weight plastic (UHMW) was developed. The screening allows a greater surface area for suction, creating a vacuum head able to spread the vacuum tension over the entire top surface area of the cake without marring or dimpling.

A continuous vacuum flow is delivered by Vaccon CDF 750H Adjustable Air Amplifiers with added control solenoid valves for instant on/off release. This is not a hard vacuum that must be released but a continuous flow or "pressure" which is controlled via solenoid valves. The CDF Air Amplifiers' straight-through design allows the debris — in this case, cake crumbs — to pass through without clogging, providing maintenance-free operation. The CDF is energy-efficient, unlike regenerative blowers that must run continuously.

Incorporating the solenoid valve for the instant on/off control allowed the CDF to only be on when air was needed. The CDF is non-heat-generating, compact and lightweight, and easily installed. The Vaccon-developed vacuum head and vacuum blowers are mounted on an arm that moves the cakes from the end of the production line over the shipping carton and lowers them on the Z-axis into the carton. The same process is applied to the slip sheets between the cakes.

Rigid cup being used to lift a cake. Note the loose pieces of cake. These would quickly clog the typical vacuum blower or pump, but will not affect a Vaccon pump.

Results

The new vacuum flow based system developed by Vaccon increased production throughput to 3 seconds per cake (and associated slip sheet) inserted into a shipping carton and eliminated the need for worker involvement.

Summary

The successful development of a pick & place system for cake needed to address the product's physical characteristics, the reduced manpower requirements, and increased throughput. This was achieved by the application of vacuum flow technology as opposed to typical vacuum pick and place technology.

About Vaccon Company, Inc.

Vaccon Company Inc. is the leading U.S. manufacturer of air powered venturi vacuum pumps, supplying the manufacturing, food, and process industries with reliable vacuum products characterized by efficient operation, rugged construction, and low cost.

Vaccon innovations include pump designs that place the vacuum port and exhaust path inline, making a straight-through venturi vacuum pump. These compact pumps are excellent for extremely "dirty" and dusty environments such as food processing, packaging, foundries, and bagging operations, by not clogging, losing suction, or requiring a vacuum filter. Vaccon's expanded vacuum pump product line also includes other unique devices such as Material Conveying Vacuum Pumps, Variable Vacuum Pumps, Air Amplifiers and Manifolds.

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