Case Study

NON-CONTACT TRANSPORT
Delicately Handles Chocolate-Coated Cookies

“Handle with care” is a paramount demand for a variety of products. At the same time, sensitive objects such as cookies, plastics, paper, or electronic parts are not spared from efforts to increase cycle times and throughput levels. For applications that rule out the use of grippers or vacuum technology, the non-contact transport system NCT from AVENTICS takes on these difficult handling tasks. The new version of the NCT in polyether ether ketone (PEEK) even permits direct contact with food products. The best example: handling chocolate-coated cookies.

A Physical law for “Floating” Objects

When the NCT lifts objects without touching them, what may appear to be magic actually works according to a very real physical law. The Bernoulli principle states that the pressure in a flowing fluid decreases as the flow rate increases. The total energy of a steady flow remains constant for the entire flow path. This means that an increased flow speed is always accompanied by a decrease in pressure. Thus, a pressure differential is generated which modern systems use for non-contact handling of delicate parts.

According to this principle, the airflow below the NCT generates a vacuum that provides the lifting force between the lifting unit and the object. The continuous airflow and dynamic vacuum result in a small air pocket between the NCT and the object. Because there is no direct contact in this handling application, the workpiece appears to float. Unlike vacuum technology, the NCT does not leave any marks on the workpiece or suction off contaminants. This gentle handling technology is especially suited for sensitive parts. Various sizes (20, 30, 40, and 60 mm diameter) are available for different workpiece weights and sizes. The transport unit uses operating pressures between 1 and 7 bar (15 to 102 psi), and can lift objects weighing up to 1.0 kilograms (2.2 pounds). Multiple NCTs can be grouped together in assemblies to lift increased weights.

To extend its potential application areas, the NCT is now available in a PEEK variant. Polyether ether ketone is a semicrystalline high-performance plastic that is already well known in medical technology as a material for artificial intervertebral discs and kneecaps with particularly strong chemical stability. The non-contact lifting unit NCT in PEEK is therefore suitable for direct contact with foodstuffs and its hygienic design complies with EC and FDA guidelines. The PEEK version makes both in-place cleaning (CIP) and sterilization processes (SIP) possible at any time; even direct contact with silicon, indispensable in the semi-conductor industry, is permitted.

Compressed air (A) is fed in through a central or lateral M5 connection. The airflow (B) below the NCT generates a vacuum that provides the lifting force between the NCT and the object. The continuous airflow and dynamic vacuum result in a small air pocket between the NCT and the object, which thus appears to float.

The AVENTICS NCT (Non-Contact Transport) lifts objects delicately, yet without direct contact. Its special technology allows the transport unit to handle even the most delicate chocolate-coated cookies with both ease and care.

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Kinematic Robotics with NCT Peek

Automated handling systems are the primary domain of NCT, as shown by the example of Brähmig GmbH in Radeberg near Dresden, Germany, a company that has successfully used these components for several years. The manufacturer of special machines already used non-contact technology for difficult tasks such as handling wafers, charge air coolers and felt shoe soles. Brähmig’s now equips its own parallel kinematic robot BRÄHMIG DYNAMOTION with the NCT PK. After evaluation by a vision system, the NCT takes the completely unsorted goods arriving on the belt, picks them up, swivels them to the side and places them precisely into their packaging.

Sandro Claus, responsible for sales and marketing at Brähmig, cites the company’s demands on the NCT: “We need to make sure that the chocolate coating on the pastry is not damaged by pressure points or scratches. Vacuum was eliminated as an alternative, since we could not constantly exchange the filter elements, which is not required on the NCT.” Traditional vacuum systems used in this environment ingest contaminants and required frequent filter maintenance.

Fast, Precise, and efficient parts handling

“The DYNAMOTION achieves accelerations of 190 g and cycle times of 150 units per minute. However, cookies and especially chocolate-coated pastries require extremely gentle handling. Thus, precisely picking up and depositing 52 cookies per minute is a very high throughput in the food industry. Among other aspects, this speed is ultimately based on the quick switching of pneumatic valves at a defined point. In addition to CD04 series directional control valves, we use the AS3 maintenance unit with active carbon filters to provide the clean air required by the NCT-PK,” Sandro Claus explains.

The NCT-PK is mounted at the operating point of the kinematic robot. Brähmig conducted extensive testing with components in the sizes 20, 40, and 60 mm. After suctioning, the product is lifted 10 cm, moved 50 cm in a horizontal direction and placed back down from its 10 cm elevation.

Then the NCT switches off. “With our test pastries, we had the best results with the NCT40 in PEEK,” emphasizes Claus, quickly pointing to simple conversion options: “Depending on the pastry or the individual application, we can select the size of the NCT so that its distribution of force is optimally suited to the product.”

In its latest system, Brähmig uses three to four consecutive kinematic robots. The DYNAMOTION increases production efficiency through short cycle times coupled with consistently high precision. In fact, in some applications, such as handling chocolate-coated cookies, the kinematic robot with NCT-PK even enables the smooth automation of some complex manual tasks for the first time. The system is suited for all types of highly flexible loading and repositioning processes for small parts in a wide range of industry sectors.

The parallel kinematic robot BRÄHMIG DYNAMOTION is equipped with the NCT-PK. In a handling system for cookies, after evaluation by a vision system, the NCT takes the completely unsorted goods from the belt and positions them precisely in their packaging.

Brähmig selects the size of the AVENTICS NCT based on the individual application and specific demands. When handling chocolate-coated cookies, the NCT40 PEEK with a 40 millimeter diameter and 2.0 Newton lifting force can handle 52 cookies per minute.

For more information, visit www.aventics.com or email info.us@aventics.com

Photos: Brähmig GmbH