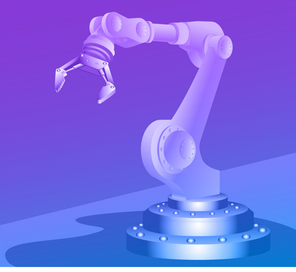
THE STRENGTH AND VERSATILITY OF ROBOTIC GRIPPERS



BY CARLOS M. GONZÁLEZ

As manufacturing facilities began to ramp up production after the initial shutdowns due to the COVID-19 pandemic, several of them focused on improving their supply chains. In particular, companies started to explore advances in robotic systems.

The pandemic impacted several aspects of manufacturing, from access to materials and reliable transportation goods to a diminishing workforce and social distance requirements.

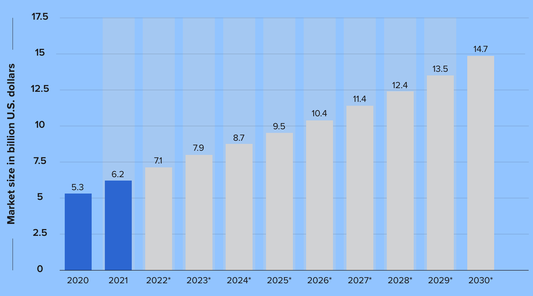
The use of robots within manufacturing sites and warehouses rose dramatically in response. Robots became a vital tool to combat labor shortages and public safety requirements and improve supply chain processes through automation.

With the investment in robotic systems, the robotic grippers industry has also received an increased focus. The robotic gripper market is expected to register 9.8 percent of the compound annual growth rate between 2022 and 2028, driven mainly by increased use in material handling operations.

Today, robotic grippers are powerful enough and agile enough to move, lift, hold, and grasp heavy objects and precise enough to handle delicate items such as electronics and consumer goods carefully.

Let's explore four types of grippers that are becoming popular within reinvigorated manufacturing sites and used in various industries such as automotive, textile, electronics, and food and beverage.

SIZE OF THE WAREHOUSE ROBOTICS MARKET WORLDWIDE FROM 2020 TO 2030 (IN BILLION U.S. DOLLARS)



Source:
NMSC @Statista 2022

Additional Information:
Worldwide; NMSC; 2020 and 2021

POPULAR GRIPPER TYPES

ELECTRIC VACUUM GRIPPER

Vacuum grippers are extremely popular in factories worldwide due to their handling of a wide range of products. They use the difference between the atmospheric pressure and a vacuum to lift and move objects. They can package and palletize uneven parts made of different materials, including sheet metal, cardboard, plastic, and glass, allowing for flexibility down the assembly line. The increase in online shopping in recent years has attracted logistic companies to acquire vacuum grippers.

In February 2022, OnRobot released the VGP20 vacuum gripper. The gripper is one of the most-powerful electric vacuum grippers on the market, able to lift a payload of 44 pounds. The VGP20 can be used on items typically lifted by pneumatic grippers, including large bags of food, consumer packages, and cardboard boxes. The gripper does not use compressed air to operate as the suction cups are all-electric, and the airflow control is monitored by built-in software, adjusting the grip for delicate to hard and heavy items.

Image Credit: OnRobot

ELECTROMAGNETIC ROBOT GRIP

Magnetic grippers differ from other grippers by relying on permanent magnets or electromagnets to actuate. Other grippers use either hydraulics or compressed air to generate movement and lift parts. The electromagnetic grippers also do not contain joints or digits to grab objects. They rely on magnetic surfaces to handle different materials. This makes electromagnetic robot grippers extremely helpful when handling small workpieces.

SCHUNK's EMH electromagnetic gripper is an electrically activated end-effector that uses 24V electro-permanent magnets. The electronics are housed inside the gripper and are actuated via a digital input/output control. This eliminates the need for external control electronics to reduce the overall footprint and cost. The EMH has a high power density able to lift different payloads, and the magnets only use power when switching from inactive to active, cutting down on power consumption.

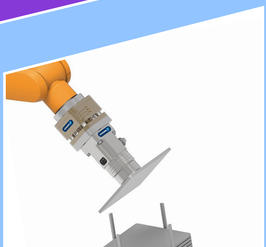


Image Credit: SCHUNK

ADHESIVE GRIPPER

Some items are too delicate and uneven to be handled by electric or mechanical grippers. For those in the food industry, grippers designed to pick up a tomato or an egg require grippers that are dexterous, strong, and delicate all at the same time. Adhesive grippers accomplish this by using material that creates a "sticky" surface. The gecko-like adhesive is built into the gripper and, via microscopic flaps, creates a Van der Waals force. This weak intermolecular force results from small differences in the positions of electrons on the outsides of molecules to grasp objects.

The farmHand robotic gripper designed by Biomimetics and Dextrous Manipulation Lab uses gecko-like adhesives within its multi-jointed fingers to grasp different items, including eggs, grapes, plates, liquid, and even a basketball. The bonus of using Van der Waals force is that they do not leave any sticky residue behind, leaving the products clean for use.

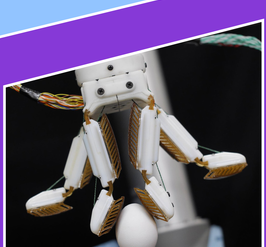


Image Credit: Biomimetics and Dextrous Manipulation Lab

SOFT TOUCH GRIPPER

Mimicking the touch of a human hand is a challenge for roboticists. Many robotic systems use a combination of machine vision and AI software to detect different object types and their orientations. Based on what they see, the gripper can attempt to grab the item with the appropriate amount of force.

In an attempt to replicate the intricacies of the human hand, the National University of Singapore (NUS) Department of Biomedical Engineering and the NUS Advanced Robotics Centre have developed two grippers that use soft and flexible 3D-printed fingers. The fingers are on a reconfigurable base and are air-driven. Paired with a robotic arm and computer vision module, the gripper is equipped with an adjustable locking mechanism that can tune its stiffness depending on the object being grasped. The GourmetGrip and UnisoGrip can be used for food packaging, item sorting, and assembly lines.

Image Credit: NUS

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