Anubis 3D
Design for a New Dimension

Facts

Challenge

Bulding a lighter, yet more powerful vacuum gripper for a major American food producer's equipment supplier.

Solution

With EOS systems, it was quite easy to build a lighter and even more powerful tool that enables smarter packaging.

Results

- Efficient: 500g light gripper has four times the power
- Fast: new tool was ready to use in just one week
- Tweaked: less parts make assembly very easy
- Flexible: freedom of design enables optimized production processes

The bottom of the gripper cup showing the Swiss cheese pattern of channels leading to the vacuum hole at the top of the workpiece. Making these holes with conventional machining would have been impossible, but was easy to accomplish with additive manufacturing. (Source: Anubis 3D)

Lighter, yet more Powerful: Vacuum Grippers for Smarter Packaging

EOS

An innovative, industrial, 3D-printed end-of-arm enables Langen Group to lighten the load on their customer's robotic packaging line

Short profile

Anubis 3D is a division of Anubis Manufacturing Consultants Corporation. The company is based in Missis-sauga, Ontario, and specializes in custom digital manufactur-ing such as industrial 3D printing.

Further information

www.anubis3d.com

New robots for the pick-n-pack line were already on order when the major American food producer's equipment supplier, Langen Group, began designing the end-of-arm tool that would enable the robots to pick up wrapped, stacked crackers and place them into cardboard boxes. The engineers then ran into a challenge: the tool had to be extremely light. What seemed to be almost impossible turned out to be quite easy by relying on additive manufacturing. Anubis developed a clever solution for the Langen Group using EOS systems.

Challenge

To achieve maximum speed without upsetting the center of gravity of the robots, the tool – plus the weight of the product itself – couldn't weigh more than two kilograms. But the largest load of crackers on the line was 1.5 kilos for a ten-pack. That left only 500 grams with which to design the perfect tool. "Meeting these requirements would have been impossible with aluminum and sheet metal. To handle a heavier metal tool they would have had reorder larger robots, which would have been more expensive – and they were also under extreme time con-straints", says Anubis president Tharwat Fouad.

Furthermore, the tool needed to be quick-release, quick-connect, so operators could change from one size to another without bolts and nuts adding assembly time. "In all, there were two completely different configurations, different shapes and three box sizes consisting of two small boxes at one time and one large box," says Fouad. "They wanted a single tool that could handle it all, weigh no more than half a kilo, and they wanted it as soon as possible."

As in previous projects, Fouad and his team spent some time looking at the market, evaluating which manufacturing technology would best serve their customers. "We found that most of the manufacturers that bought into plastics-based additive manufac-turing did so for rapid proto-typing," says Fouad. "But our reasons were completely different. We envisioned a number of opportunities for functional, end-use components, and felt industrial 3D printing was the best technology for such applications."

A dual-box version of the completed vacuum assembly, shown attached to a robot. (source: Anubis 3D)

Solution

Once the decision to pursue additive manufacturing was made, Fouad performed a detailed analysis of the many different types of equipment available before deciding on a FORMIGA P 100 system from EOS. "Within a few days of delivery, EOS had us up and running. The system was quite easy to learn. EOS was there with us through it all, to the point where we became experts ourselves on the equipment. Now, several years later, we remain very happy with our decision."

"The biggest challenge to additive manufacturing acceptance", Fouad says, "is changing decades-old ways of thinking. The conversion from metal to plastic is possible, especially if it's done scientifically. You need to focus on part geometry, and throw out traditional concerns over part complexity. EOS technology has no such cons-traints."

Equally important to Fouad's vision of end-use products was

material selection – EOS powder-bed fusion technology utilizes engineering-grade polyamides, polystyrenes, thermoplastic elastomers, and polyaryletherketones, for example. "The system gives us the ability to build a virtually endless array of parts, using materials that are widely accepted in the industry," Fouad says. It uses a powerful laser paired with precision optics to quickly and accurately produce parts. The laser beam hereby fuses the powder material layer by layer to produce highly complex parts.

The benefits of EOS technology quickly became clear. One of Anubis' first successes was an end-of-arm tool for a blow molding application, which Fouad says inspired his team and opened their mind to what is possible with plastic additive manufacturing. They've since designed a number of similar tools for injection molding and bottle packaging customers, as well as various brackets and supports, helping Anubis earn a name for itself as an innovator in these and other industries. As a result, the company has since purchased two additional systems from EOS.

Results

In the case of the major American food manufacturer job for Langen Group, instead of a more traditional metal vacuum plate and shroud (which would have taken months to design and manufacture), Anubis designed a lighter, streamlined set of components that provided four times the gripping force of legacy vacuum grippers. It took only a week to additively manufacture, assemble and test the new tool.

The material used for the main vacuum part was nylon 12 (PA 2200 material from EOS), chosen for its flexibility, ability to sustain crash loads, and because it is certified as USP Class VI approved for food contact. The wall thickness of the vacuum cup was between 2 and 3.5 mm and varied from section to section. The parts were designed specifically for industrial 3D printing with the help of a software program that optimizes the design of structures organically, following the lines of the geometry and adjusting the thickness as needed for strength and/or flexibility. "The efficiency of the redesigned profile we produced with EOS technology enabled the gripper to suck so well you could actually hang on it with your own weight," says Fouad. "Our customer had never seen that level of performance before."

The vacuum grippers were delivered to Langen Group and installed on the newly arrived robots at the food producer's plant. "To design and produce tooling capable of picking what we wanted, while still staying within the payload constraints of the robot, would have been impossible before," says Langen Group Engineering Manager Robert Husnik. "Due to the freedom provided by plastics additive manufacturing, we can now do the impossible."

"I tell people that, unlike traditional manufacturing, complexity is free with additive manufacturing," Fouad says. "A designer can come up with all sorts of wild ideas and no one will complain. You can reduce part weight, maintain strength, and deliver nice looking products with greater functionality, in less time and at lower cost than ever before. It's a real manufacturing shift."

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