

GRASPING THE CHANCE TO MINE THE MOON

Taguchi Industrial Company makes attachments for hydraulic excavators, but is now branching out to **DEVELOP EQUIPMENT FOR THE MOON**

Hydraulic excavators have uses beyond digging. By swapping their buckets for other attachments, they can be used to crush, grapple, hammer, cut and demolish. These components are so diverse that major manufacturers of construction machinery generally outsource their production to specialist companies.

Taguchi Industrial Company was a relative latecomer to excavator attachments, but it has quickly become a market leader. Through its culture of nurturing creativity and ambition, it now stands apart as an innovator. In this vein, its engineers have taken up the challenge of developing equipment for use in space.

"We're open to any technological and business ideas, as long as they have the potential to contribute to the company's growth," says Yuichi Taguchi, chief executive and technical officer of Taguchi Industrial Company.

FROM WELDING TO ROBOTS

The spirit of challenging norms stems from Taguchi's understanding of the importance of introducing

novel ideas to inspire his engineers.

Established as a family-run welding company in 1957 in Okayama, western Japan, Taguchi Industrial Company developed its first attachment in 1985 — the Grasper grapple for hydraulic excavators. The Grasper series became the fastest selling product on the market. In 1993, the company released its second brand, the Guzzilla series, which is designed to crush and cut the steel frames and rebars of concrete buildings. Today, the company employs 200 staff and sells 500 different attachments for excavators and other construction machines.

The Guzzilla series, however, has suffered years of sluggish sales. "We wrestled with how best to promote the Guzzilla series," Taguchi recalls.

THESE ACHIEVEMENTS INSPIRED TAGUCHI INDUSTRIAL COMPANY TO BECOME EVEN MORE AMBITIOUS

Taguchi hit on the idea of creating a video game that features Super Guzzilla, a robot character based on a wheel loader. It released the game as an app for smartphones in 2014. The

following year, it developed a real-life version of Super Guzzilla in which a player enters the cockpit of a 3.5-metre-high robot and operates it. The company developed the robot to showcase its technological expertise and exhibited it at an event in Tokyo. "We also wanted students to remember our name," adds Taguchi.

This venture gave Taguchi Industrial Company an unexpected opportunity to grow. A creative designer from a major advertising agency was at the event and happened to ride Super Guzzilla. He was so impressed that he recommended that Taguchi Industrial Company apply to work on a project with the Japan Aerospace Exploration Agency (JAXA).

AIMING FOR THE MOON

Under the Japanese government's science and technology innovation strategy, JAXA is aiming to become an innovation hub through collaborating with various

companies, research institutes and universities whose technologies could be applied to space exploration.

In 2015, Taguchi Industrial Company was selected to be among 29 project leaders. Its mission was to reduce the weight of construction machinery for exploring the Moon as much as possible. A 1 kilogram cut in weight will save JAXA about 100 million yen in transportation costs from the Earth to the Moon.

The project team chose to lighten the weight of a stick and a boom of a hydraulic excavator. They selected two materials for comparison: a lightweight metal and carbon-fibre-reinforced plastic, a very strong but lightweight composite often used in airplanes and automobiles.

The work was led by Yasuhiro Okada, the company's top engineer, who went to JAXA in a two-year joint appointment. Okada designed the moldings, but recalls the struggle to ensure the attachments were strong enough. The strength calculation using finite-element method software could not be confirmed until tests had been performed on a prototype.



The real-life version of Super Guzzilla.



Excavator equipped with a lightweight Taguchi attachment.



A Guzzilla attachment equipped with an electromagnet.

In collaboration with other partners, including Toray Carbon Magic, Okada succeeded. About eight months into the project, Okada developed a stick made of a light metal, which was about half the weight of the original steel stick. Two months later, he succeeded in reducing the weight of the carbon-fibre-reinforced plastic stick by two thirds. Both sticks displayed better hanging

capability and productivity than the original sticks.

These achievements inspired Taguchi Industrial Company to become even more ambitious. The company has recently started another project with JAXA to develop lightweight construction machines whose attachments can be controlled remotely from Earth. It is a three-year project, but Taguchi aims to continue the

development on its own and create a remote controlled electric demolition robot within four years. Although many technological difficulties lie before them, such as the remote control of hydraulic cylinders, Taguchi is excited about the robot's potential. "The lunar landscape resembles a disaster area in terms of being a tough environment," he says. "The robot could thus be useful

in relief work for disasters on Earth."

"We are always looking to develop niche technologies," Taguchi says. "The development process is inevitably painful, but it's also a lot of fun." ■

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