Molding Ideas

Shinko Sellbic Co.'s development of a unique waste-free and ultracompact injection molding machine is testament to the sustained *monodzukuri* brilliance of the company's president, Takeuchi Hiroshi. **Tamura Mariko** reports.

I got off at Hatanodai Station on the Tokyu Ikegami Line that runs through the central part of Tokyo's Shinagawa ward. As I walked down a cul-de-sac that was accessed via an alleyway off the main shopping street, the head office and plant of Shinko Sellbic Co. suddenly came into view, exuding the unmistakable smell of machine oil. This unassuming backstreet factory that connects two two-storey wooden buildings is the birthplace of the new ultracompact injection molding machine.

"Molding production technology is an essential factor in volume production of uniform quality," says Shinko Sellbic president, Takeuchi Hiroshi. Takeuchi has created many novel products related to molding, in addition to designing and manufacturing molds.

Shinko Sellbic was founded in 1987. Its predecessor, Shinko Kanagata Seisakusho (metallic mold manufacturing), was founded by Takeuchi Hiroshi and his father. Despite the company's early successes, the sudden rise in the value of the yen that followed in the wake of the Plaza Accord of 1985 brought with it a radical change in circumstances. While many backstreet factories were forced to close or relocate overseas, Takeuchi decided to undertake an initiative that would see the company reborn, or in Takeuchi's words, "to progress from being a subcontractor to a company that developed its own products in Japan." Through his dynamic spirit of challenge, Takeuchi has developed a succession of unique products. He successfully converted the factory into a hotbed of ideas that takes the initiative in expanding the market, enabling his true abilities to come to the fore.

According to Takeuchi, "Ultracompact injection molding machines were possible after seventeen years of research. Molds are the distillation of considerable wisdom. A product is finally able to be completed as a result of a series of inventive efforts that have been constantly directed at breaking through the status quo."

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Takeuchi Hiroshi, president of Shinko Sellbic Co.

The first product that Takeuchi developed as a fully fledged company product was the Unit Mold, which was designed and developed in 1987. Molds are indispensable for making components of the same form in large numbers. One mold is needed for one type of component. In other words, a mold in which the profile and frame are integrated is created for each component type, which needs to be replaced each time with the plastic molding machine. This process takes considerable time and effort. To circumvent this problem, Takeuchi invented the Unit Mold, in which the profile and frame are separated for the molded products, enabling only the core section to be replaced easily. This innovation greatly reduced the time needed for replacement. It was the first successful attempt to make the molds more compact.

The next essential step in the development was to make the screw flat. The screw, which is an iron rod with a spiral blade, extrudes the materials from the molding machine. In a radically new design, the screw was made into the form of a plate and the length was minimized. In addition, a compact decelerator with a large rate of deceleration was used to make the servo motor even more compact. In this way, every part of the molding machine was made fully compact, enabling even a small component to be attached individually.

Then, the company developed the Hot Runner in 1998. Eliminating the generation of waste material has been achieved by ensuring that all the material in the mold is used. For example, the use of material in the void section of the mold has been eliminated, and resin is used only in the sections where it is needed. There is usually a channel that leads to the mold, and hardened resin that remains in this section used to be discarded. However, by attaching the Hot Runner that heats the channel, no waste material is generated. In this way, it has become possible to form

small components each measuring several millimeters square, with the minimum amount of energy and injected resin. Production has doubled while the necessary space has been halved.

The benefits that flow from the design of this device defy imagination. They range across the conservation of resources, energy, space and the cost of logistics. In addition, maintenance work on the machines is now possible using delivery services.

These unique development initiatives by Takeuchi have culminated in a desktop ultracompact injection molding machine that is unrivaled anywhere in the world.

Takeuchi has also attempted to develop a counter to keep track of how many times a mold has been pressed. Some press molds with quick strokes make ten shots per minute, and it is not always possible to count the number of shots visually. To avoid this problem, Takeuchi invented a mechanism to count the strokes automatically, consisting of a sensor that reacts each time the convex portion of the mold approaches the concave portion.

TAMURA MARIKO

The ultracompact plastic injection molding machine designed by Shinko Sellbic Co.; inset, an essential feature in the reduced size of the machine, the plate-like screw (right)

The Ideas Studio

Today, products that the company has developed in-house account for nearly eighty percent of Shinko Sellbic's sales. Takeuchi believes the secret of the success of his development work is to work on three or four ideas at the same time. He says, "Have several mental compartments ready in your head for different ideas, and take ideas from one compartment, say, for five minutes. If you cannot think of any new ideas within that time, close the compartment for the time being, open another compartment, and work on the ideas in that compartment for five minutes. Repeat the process continuously."

Takeuchi, who wishes to continue with the development of in-house products, says, "I did not have any money for advertising when the company was just founded, so I publicized my ideas in various research papers. This led to exchanges with the people in the same industry, entrepreneurs, university professors and students and other people from various walks of life. The technical exchanges became more profound and the people gathered spontaneously to exchange information. The result was the Ideas Studio. The number of members increased and there are now about sixty people." It is not possible for Takeuchi to come up with all the ideas himself. One of his assets is the network of people that supplement his individual limitations.

The greatest feature of the Ideas Studio is that it is a free and open group. Takeuchi and other members are always exchanging ideas concerning new product development. It is a "cross-capability" group rather than a cross-industrial group, which purely pursues *monodzukuri* [a certain Japanese way of making things] to help society and make a contribution to the world.

Takeuchi has never spared any effort in the development of new products, combining Shinko Sellbic's spirit of innovation, evidenced by the acquisition of over 100 patents, with other technologies and expertise. He recently proposed and announced a new production method called the P Process to manufacture products without molds. Under this method, melted plastic resin is wrapped around a stick like candy and allowed to harden. It is then machined to create the prototype. This eliminates the need to manufacture molds and molding machines, and saves 90% or more materials that used to be scraped off as waste. Viewed from the broader perspective, the method facilitates environmentally friendly monodzukuri. Takeuchi described the idea as "one that started out by refuting the work process in which we were engaged, aiming at product manufacturing that does not require molds or molding machines."

The problems associated with having a large machine have been solved by the succession of ideas that break free of the conventional framework of thought, accepting the notion that any type of molding machine is possible as long as uniform products can be mass produced. The end result is this revolutionary new device.

Takeuchi predicts that the future of molding operations in Japan lies in the ability to make compact components of a wide variety in small quantities, for use in products such as mobile phones and portable digital music players. He says, "Contrary to the conventional method of mass production, one way to achieve success is to devise a method for injecting a small amount of resin into the mold with a small amount of energy."

Takeuchi also points out that the conventional mainstream molding technologies and businesses for mass-production have been transferred from Japan to China and other Asian nations.

Takeuchi has devoted immeasurable effort over the past seventeen years to monodzukuri in Japan. There is a great deal to look forward to with the future evolution of the ultracompact injection molding machine.

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