COLUMN

Cover Product:

Automation Unit of “Hot-Topping”

Manufactured from 1955-1970

Perhaps you have heard of a product known as the automation unit of hot-topping. This unit was one of our company’s principal products from 1950-60, accounting for more than half of our earnings. It was a device that used a servo motor and provided ground-breaking reduction of iron and steel loss when used in ironworks or steelworks.

One process in iron and steel manufacturing involves injecting molten iron or steel into a mold. When the molten metal cools and hardens, it contracts, and unless steps are taken, cracks or air bubbles form. In order to prevent this from occurring, and to create an even surface, an amount of molten metal equal to the amount of contraction must be poured in and heated. This process of heating the top of the iron or steel is called “hot-topping”. Methods of hot-topping that involved inserting rice husks or chemical heating agents were used, but rationalization for this work was needed as it was complex and high cost. This happened to be the postwar age of global industrial modernization, so even in Japan, there was a sudden, rising anticipation of automatic controls.

In October 1953, the Shin Riken Kogyo (now Daido Steel), a manufacturer of special steel, made a research request to the Electrotechnical Laboratory of the then Ministry of International Trade and Industry. The request was to research a way to automatically controlling the hot-topping process through electrical heating by using carbon electrode arc. Part of arc heating process required automation for the lifting and lowering of the electrodes, and therefore Sanyo Denki received a request for technical cooperation.

At the time, Sanyo Denki had already started testing a 2-phase servo motor, which our company would successfully develop into a product line-up of five models by 1955. (See COLUMN in Technical Report 28.) Sanyo Denki used the 25 W output motor from that line-up and the magnetic amplifier control technology developed as a product for a voltage control device used in marine communication power sources to test a device that detected arc voltage and automatically controlled the electrode lifting and lowering mechanism.

Working together with the Electrotechnical Laboratory, the prototype was brought to the Shin Riken Kogyo factory and tests were performed for about three months. It was observed that the device was highly effective, resulting in a uniform steel surface and reduction in loss. In December 1954, Sanyo Denki obtained a large order for 76 of the lifting and lowering mechanisms, 18 control units, and a complete operation monitor.

Feeling that this was a potential hit, Sanyo Denki took out a one page advertisement (Photo 1) in the iron and steel industry magazine “Iron and Steel” published by the Iron and Steel Institute of Japan and started promoting the product to other companies. As a result, the product made huge waves in the iron and steel industry, which faced many of the same problems, and this product soon stood out as a core product for Sanyo Denki. Deliveries spread all around Japan, starting from Mitsubishi Steel in Nagasaki before spreading to more than 50 companies, including Yawata Iron & Steel in Yawata and Fuji Iron & Steel in Hirohata (both of which are now part of Nippon Steel), Japan Steel Works in Muroran, Kobe Steel in Amagasaki, Sumitomo Metal Industries in Wakayama, and Hitachi Metals. With more customers, the product specifications also became more varied. Sanyo Denki manufactured everything from a 2-inch carbon electrode type, to a 6-inch type large lifting and lowering mechanism that could support 200 kilograms to several dozen tons of iron and steel, to a product with three of these large mechanisms for flat steel ingot.

By 1970, about 15 years later, Sanyo Denki would deliver more than 700 automation units of hot-topping. From the 1970s, the manufacturing methods for iron and steel would begin to change, and therefore the role of this product would also come to an end. However, as the first of the system products from Sanyo Denki, and as a ground-breaking example of using early servo motors, the automation unit of hot-topping is a product that greatly contributed to our company’s success and to the development of later products.

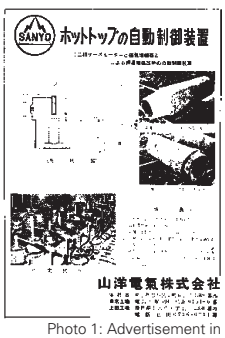

Photo 1: Advertisement in “Iron and Steel” magazine

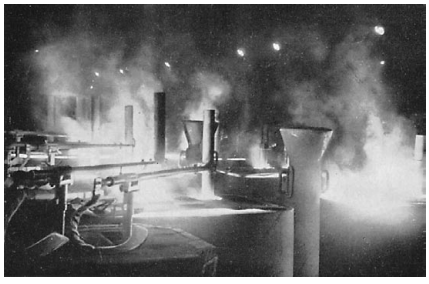

Photo 2: Using hot-topping