



## COLUMN

Cover product:

### **Block Pulse Drive Brushless Motor – BL825 from 1982**

Author: Shinji Suzuki

From around the end of the 1970s, there was a gradual shift in the industrial world towards brushless DC motors. This was due to the occurrence of problems caused by the shortfalls of DC motors such as brush wear, noise caused by brush sparks, commutator wear and so on. In response, motor manufacturers actively engaged in research relating to the conversion to brushless. Amidst this, Sanyo Denki was one of the first to act by prototyping a large brushless motor, the BL820. This was a period of making requests to users to trial the BL820, extracting problem areas and studying countermeasures.

At the time we had been mass producing the U series (Super U) as brush-type motors for industry. U series motors were equipped with encoders as sensors for speed and position control. Amidst the shift towards brushless motors, a discussion arose regarding development of a brushless motor as an alternative to the U series.

However, there were various challenges to overcome before such a development could begin. First, there were restrictions on the design concept to reduce the size of the large BL820. It was also necessary to achieve compatibility with the U series. In addition, each of our customers at the time was proactively engaged in robot development and, in the same way as the U series, the new series was also required to have brakes.

Regarding configuration, in contrast to the U series motors having an armature on the rotating side, brushless motors required the armature to be on the fixed side, therefore making it necessary to adopt a commutation sensor (CS) equipped with an electronic circuit. As the CS is installed near the armature, there was concern that the electronic circuit would be damaged due to temperature elevation, however fortunately, the temperature tolerance range of the Hall element used as the CS was higher than that of the encoder component, therefore dispelling this concern.

The motor itself was lacking in aesthetic appeal due to being longer by the amount of the CS, having up to 4 cables (motor main

body, brake, CS, encoder) protruding from its side, not to mention requiring an oil-proof connector for installation on robots. This issue became apparent in the schematic drawing phase, therefore revisions were made over and over, however we were unable to find any good solutions and postponed countermeasures such as integrating the CS and encoder for the next model.

At the time, the rotary machine design section at our Kawaguchi Works had not yet begun using computers. Drawings were made by hand and property calculations were made on calculators.

The BL system development departments were divided into motor main body and CS, encoder and servo amp, with all areas being taken care of at the Kawaguchi plant, therefore achieving efficient development.

I used to take care of the design of individual motors to meet customer requests, however I really felt the importance of collaboration between the concerned departments when I became involved in the development and design of the BL825 series, which was a combination of various elements.

Leveraging the advantages of a brushless motor, the BL825 series became widely used in robots, semi-conductors and other industrial machinery, contributing to the high-speed, high-precision and size reduction of equipment. Moreover, the BL825 series also played an important role within Sanyo Denki as the foundation for the current small AC servo motor series.

#### **Shinji Suzuki**

1966: Joined Sanyo Denki – Assigned to the Kawaguchi Works Design Section

1984: Section Chief 1 of the 2nd Device Division, Design Section

1986: Deputy Manager of the 2nd Device Division and Section Chief 1 of the 2nd Device Division, Design Section

1987: Deputy Head of the 1st Operations Division, 2nd Design Department

1993: Head of the 1st Operations Division, 2nd Design Department

1995: Principal Engineer of the Servo System Division, 1st Design Department

1996: Principal Engineer of the Servo System Division, 4th Design Department

1997: Principal Engineer of the Servo System Division

1999: Lead Researcher of the Servo System Division

2002: Retired