

MIYAIRI, Shota as “Pioneering Research on Power Electronics”



Prof. Shota Miyairi (1917–1999)

1 . Personal History

- 1917. 4 born in Nagano prefecture
- 1942. 9 graduated from Nagoya Higher Technical School
in mechanical engineering
- 1945. 9 graduated from the Tokyo Institute of Technology
in electrical engineering
- 1945. 9 Associate Professor at Nagao Technical College
- 1947. 9 Professor at the above college
- 1951. 3 Associate Professor at the University of Shinshu
- 1958. 4 Associate Professor at the Tokyo Institute of Technology
- 1960. 7 Professor at the above institute
- 1978. 4 retired from the above institute, with Professor Emeritus conferred
- 1978. 4 Professor and the Director of the Research Institute of Motor Applications at Tokyo
Denki University
- 1990. 2 received the Order of the Rising Sun, Gold Rays with Neck Ribbon
- 1999. 2 passed away

2 . Achievements in Research

2.1 Research on induction motors

He submitted his doctor thesis entitled “Theory and Graphical Discussion on Single-phase Induction Motors” to Prof. Yoshikazu Omoto (later, Professor Emeritus) at the Tokyo Institute of Technology

- 1957. 12 received his Doctor of Engineering from the Tokyo Institute of Technology
- 1962. 5 received the IEE of Japan (IEEJ) Distinguished Paper Award for his paper entitled
“The Method of Setting Up the Equivalent Circuits of Electrical Machinery by Means
of the Variable Phase Shifter.”

2.2 Pioneering research on power electronics, and the resultant technical papers

For the first time in Japan, he obtained silicon-controlled rectifiers (SCRs, referred to as “Thyristors” later) from the US, which was developed by General Electric in December 1957. Then, he started conducting research on power electronics, leading to the following achievement:

- Commutator-less motors and its analytical methods⁽¹⁾⁻⁽³⁾
- Power amplifiers and ac-to-dc power converters⁽⁵⁾
- Cycloconverters and power-modulation techniques⁽⁶⁾⁻⁽¹²⁾
- Improvements of power factor, harmonic distortion, and three-phase imbalance⁽¹³⁾⁻⁽¹⁴⁾

In addition, he conducted research on analytical methods on hysteresis motors⁽¹⁵⁾.

3 . Representative text books published

1963. 5 “Introduction to energy conversion, Parts I and II,” which received the IEE of Japan (IEEJ) Book of the Year Award in May 1966.

1967. 10 “Modern electrical machine for university teaching.”

1974. 3 “Power electronics,” that received the IEEJ Book of the Year Award in May 1976.

1976. 3 “Energy conversion between electricity and mechanics.”

4. Major activities in the IEEJ and Recognition from the IEEE

1969. 5 to 1971. 5 IEEJ Director in Editorial and Publishing Affairs

1977. 5 to 1978. 5 IEEJ Vice President

1981. 5 to 1982. 5 The 68th IEEJ President

1982. 5 to 1983. 5 IEEJ future planning committee chair

1980. 1 IEEE Fellow

5. Selected published papers (main coauthors)

- (1) “Research on the Commutatorless Motor with SCR” (Tsunehiro), Journal of IEEJ, vol.82, no.890, pp.1741-1750, 1962.11
- (2) “The Analysis of a Commutatorless Motor as a DC Motor and its Characteristics” (Tsunehiro), Journal of IEEJ, vol.85, no.924, pp.1585-1594, 1965.9
- (3) “The Operation of the Damper Winding in a DC Commutatorless Motor” (Tsunehiro), Journal of IEEJ, vol.87, no.947, pp.665-674, 1967.8
- (4) “SCR Power Amplifier and the theory of its Circuit Constants Design” (Fukao), Journal of IEEJ, vol.87-8, no.942, pp.603-612, 1967.3
- (5) “Bidirectional AC/DC Power Converter and its Operation” (Fukao), Journal of IEEJ, vol.88, no.960, pp.1675-1684, 1968.9
- (6) “Firing Method and Waveform Analysis of Cycloconverter” (Takahashi), Journal of IEEJ, vol.90, no.4, pp.647-656, 1970.4
- (7) “Analysis of Commercial Power Modulator,” (Takahashi), IEEJ Transactions, vol.92B, no.5, pp.297-306, 1972.5
- (8) “Relation between the Output Voltage Waveform of the PWM Inverter and its Gate Control Signals” (Takahashi), IEEJ Transactions, vol.95B, no.2, pp.73-80, 1975.2
- (9) “Equivalence in Harmonics Between Cycloconverters and Bridge Converters (Akagi and Fukao), IEEE Transactions on Industry Applications, vol. IA-5, no.1, pp.92-99, Jan./Feb. 1979
- (10) “Power Factor Improvement of a Non-Sinusoidal A.C. Current by Thyristor Switching Filter” (Fukao), IEEJ Transactions, vol.92B, no.6, pp.342-349, 1972.6
- (11) “Principle and Fundamental Characteristics of Thyristor Negative-Sequence Current Source for Balancing Three Phase Currents,” (Fukao), IEEJ Transactions, vol.97B, no.4, pp.207-214, 1977.4
- (12) “An Analysis of the Hysteresis Motor Taking Account of Eddy Current Effect” (Kataoka), Journal of IEEJ, vol.86-6, no.93, pp.996-1005, 1966.4

(presented by Tadashi Fukao and Hirofumi Akagi on May 8, 2021)