Advanced PWM Techniques for Enhancing Performance in Two-Level and Three-Level Inverters

keynote speaker
Prof. Dr. Yuttana Kumsuwan
Chiang Mai University

Multilevel inverters are extensively utilized in medium- and high-voltage applications, such as wind and solar power generation, power transmission, and motor drives. This popularity is attributed to their ability to reduce voltage stress on switching devices, lower high-frequency emissions, and improve output voltage quality. Among diverse multilevel topologies, three-level (3L) neutral-point-clamped inverter, T-type inverter, 3L embedded-switch inverter, and ten-switch 3L inverter are addressed in this discourse with challenges in terms of the neutral-point voltage balancing, reduced common-mode voltage, the DC-bus voltage utilization, any load with low/high power factor operations, and harmonic performance. Furthermore, an advanced pulse width modulation (PWM) algorithm to improve the performance of the inverters is also discussed in detail, such as conventional space vector PWM and virtual space vector PWM. The discourse also presents some applications involving grid-connected and AC drives. For low-power two-level inverter applications, the two-leg six-switch inverter, the three-leg six-switch inverter, and the four-leg eight-switch inverter are proposed for single- and two-phase loads with the advanced modulation control method. Finally, the new challenge topology, namely, the nine-switch inverter, is introduced in this talk with its application.

Yuttana Kumsuwan received his Ph.D. degree (Texas A&M University under the Royal Golden Jubilee Ph.D. Programme) in electrical engineering from Chiang Mai University, Chiang Mai, Thailand, in 2007. He joined Chiang Mai University in 2010, where he is currently a professor in the Department of Electrical Engineering, Faculty of Engineering. Dr. Kumsuwan has published more than 100 technical papers (conference and journal) and two books in the areas of power electronics, motor drives and renewable energy systems. Currently, the topic of his research is advanced modulation strategy for multilevel low/high power converters for any DC/AC loads.

