

## **Abstract**

Permanent magnet (PM) machines exhibit high torque density and high efficiency, and are widely used for many applications. Multi-3-phase PM machines consist of two or more sets of 3-phase windings. They have many advantages, such as high fault tolerance capability, improved torque density, reduced torque ripple, reduced DC link pulsating and DC link capacitor requirement etc., and consequently, are widely used for more electric aircrafts, electric ship propulsion, wind power generation, and electric vehicles etc.

This plenary presentation will systematically overview various multi-3-phase PM machine topologies and control strategies, as well as their merits and demerits, including

- (1) Multi-3-phase PM machine topologies with different slot/pole number combinations and stator winding coil pitches;
- (2) Spatial and time displacements of multi-sets of windings and currents;
- (3) Electromagnetic performance of various multi-3-phase PM machines with surface-mounted and interior PM rotors;
- (4) Vector and direct torque control strategies;
- (5) PWM strategies;
- (6) Reduction techniques of current harmonics and torque ripples;
- (7) DC link pulsating analysis;
- (8) Fault-tolerant control strategies;
- (9) Examples of various applications, including aerospace, wind power generation and electric vehicles.