PMBLDC MOTOR CONTROL METHOD
STATIONARY REGULATOR CONTROL

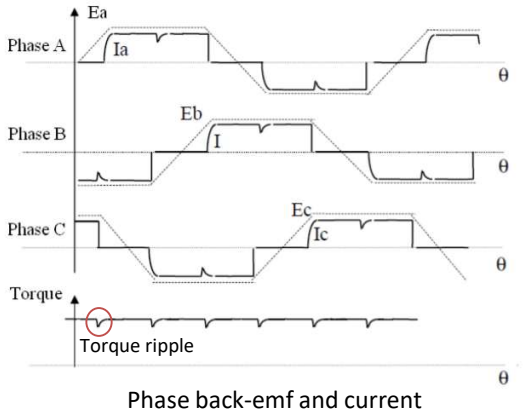
Permanent Magnet Brushless DC (PMBLDC) motor has been used extensively to achieve better energy efficiency and control performance. PMBLDC motors are electronically controlled via various control techniques.

There are two motor control approaches:

1. Stationary Regulator Control, operates on the actual phase currents
   - Square Wave Control
   - Sine Wave (Halbach) Control
2. Synchronous Regulator Control, operates on the rotatory direct and quadrature axis (d-q axis)
   - Field-oriented control (FOC)
   - Direct Torque Control (DTC)

Square Wave and Sine Wave Control

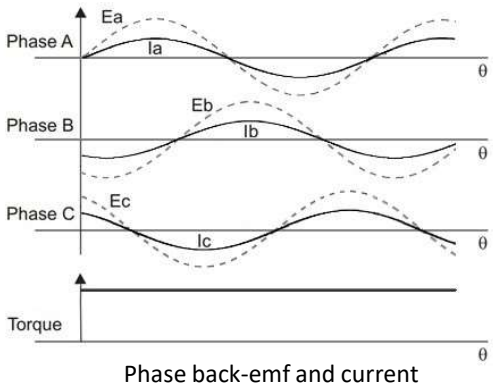
Square Wave Control



Phase back-emf and current

- Preferred control method for motors with trapezoid back-emf
- Generally, hall sensors are used to sense position
- The switching happens based on the zero-crossing of back-emf

Sine Wave Control



Phase back-emf and current

- Preferred control method for motors with sinusoidal back-emf
- Generally, encoders are used to sense the position
- Continuous switching depending on absolute position

Two Stationary Regulator Control Methods Comparison

Motor Control Method	Square Wave Control	Sine Wave Control
No. of Active Phases	2	3
Switching Loss	Low	High
System Efficiency	Low	High
Torque Ripple	High	Low
Vibration	High	Low
EMI/EMC Noise	High	Low
Dynamic Response	Good	Poor
Preferred Position Sensor	Hall Sensor	Encoder
Cost	Low	High

61 Science Park Road #01-19 The Galen
Singapore Science Park II Singapore 117525
research@magnequench.com
www.mqitechnology.com

neo Magnequench