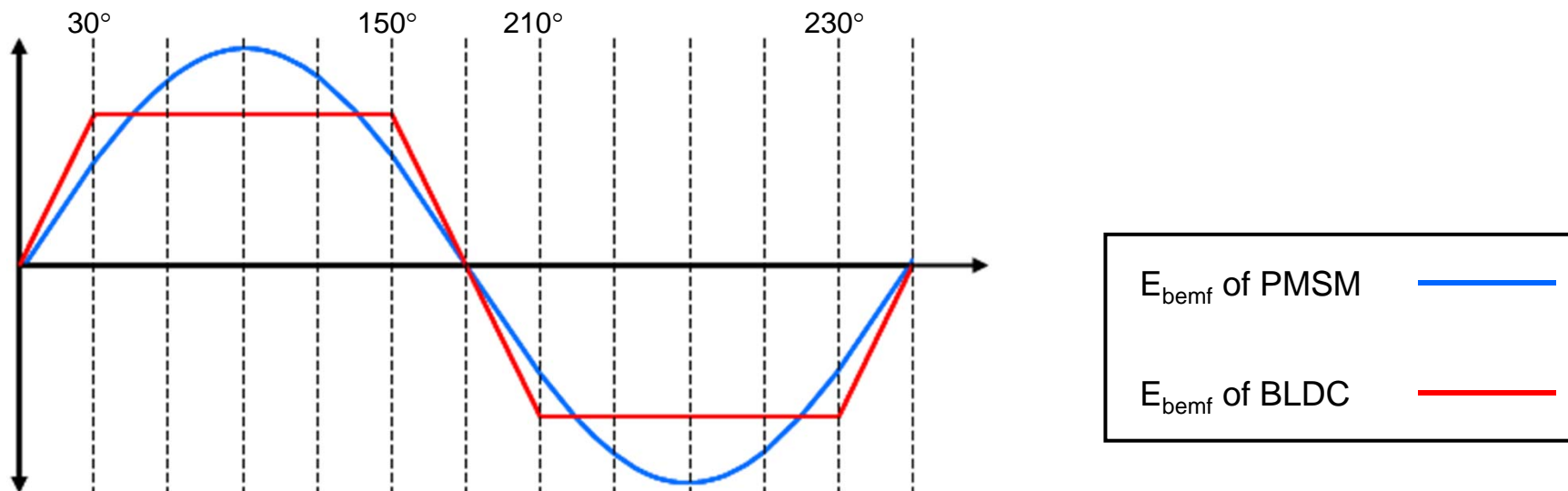


# The Difference between PMSM & BLDC Motor

- The Torque is a function of current and Back EMF -  $E_{\text{bemf}}$ 
  - $E_{\text{bemf}}$  is a function of how the stator has been wound
- **PMSM:** stator with distributed windings will have a sinusoidal  $E_{\text{bemf}}$ 
  - In order to achieve constant torque we inject a sinusoidal current
- **BLDC:** stator with concentrated windings will have a trapezoidal  $E_{\text{bemf}}$ 
  - In order to achieve constant torque we inject a square wave current



## Which Synchronous? BLDC vs. PMSM

- **BLDC Motors**
  - Easier to control (6 Step) and only dc currents required
  - Torque ripple at commutations
  - Lower cost but poor performance
  - Needs Hall sensors
    - sensorless is possible
- **PMSM Motors**
  - Very commonly used in servo drives with integrated shaft encoder
    - Sensorless is possible for speed control
  - More complex control (needs 3 phase sinusoidal PWM)
  - No torque ripple at commutation
  - Higher efficiency, higher Torque
  - Higher cost but high performance