Research Description

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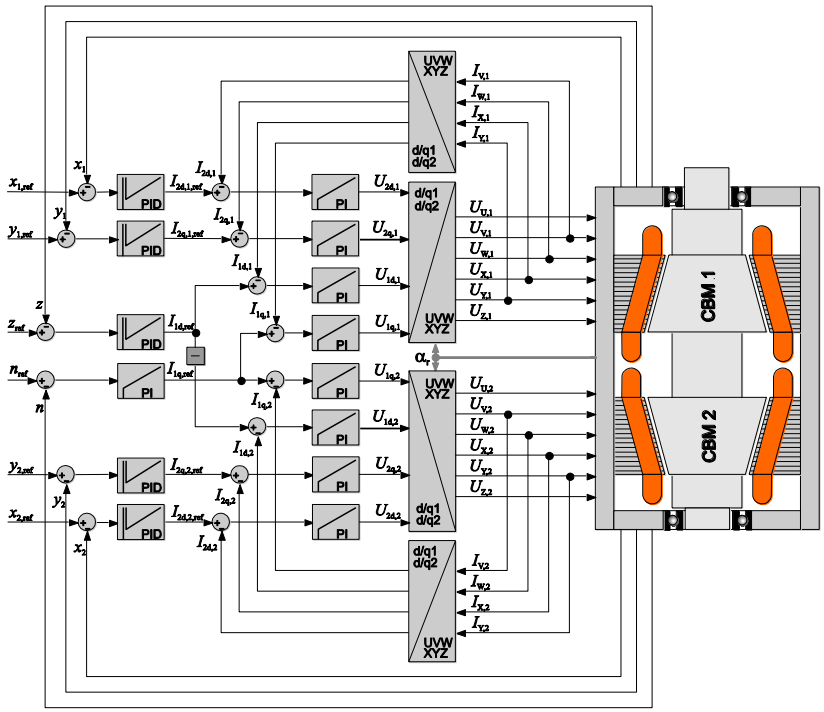
Control of high speed bearingless permanent magnet synchronous motors.

Magnetic levitation is a smart solution to tackle the wear of the mechanical bearing due to inverter feeding and high speed operation. It also enables the motor to work in hazardous, very clean atmosphere or in vacuum. The use of magnetic bearings is a classical industrial solution for magnetic levitation. It usually requires additional rotor length to insert the magnetic bearings. In high speed drive, low Eigen-frequencies of long rotors can lead to instability problems and is unwanted. To solve the problem, some motors are using the same motor slot to provide magnetic forces through an additional winding. These motors are (incorrectly) referred to as bearingless motors. The integrated magnetic bearing can be realized with different winding topologies.

The aim of this research is to use the synergy of two three phase winding system to generate the required force and torque of the motor keeping the field symmetry of distributed winding. A special high speed PMSM with a double half pitched three phase winding is investigated for this purpose. Symmetrical component system control is required to control separately both torque and forces. Alternative to classical PID controllers are also investigated to improve control behavior.



Symmetrical component PID based control of a double conical integrated bearing with double half pitched distributed windings: