A Control Strategy for an Induction Motor Used for Vehicular Traction and/or Positioning Systems with Variable Speeds

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Abstract— The paper presents a control strategy employed to control an induction motor (IM) used in vehicular traction applications with variable speed. This strategy is based on the Direct-Flux Vector Control (DFVC) method. In such applications, deep flux weakening is required, and the maximum torque production must be obtained under current and voltage constraints. Information on the mathematical model and control scheme for DFVC is provided. The reference frame is given by the stator flux, all the calculations being made with respect to this frame. The proposed control scheme is also implementing a limitation of the maximum values of current and voltage, according to specific control laws - MTPV (Maximum Torque per Volt) and MTPA (Maximum Torque per Ampere). Experimental results are presented for a small power IM, accelerating in idle running, with an inertial load and for the steady state respectively. They are showing the efficiency of the proposed solution and a robust operation in flux-weakening conditions. The controller is belonging to the dSPACE family , being able to provide very fast floating point results. The proposed strategy can be used for controlling other types of motors, as the Interior Permanent-Magnet (IPM), Synchronous Reluctance (SyR) and wound rotor synchronous motors, considering the modifications imposed by the magnetic model (load angle, flux orientation a.s.o.).