Hasse, K.; Walczyna, A.; Czarnecki, R.: Input filter stability of drives fed from voltage inverters controlled by direct flux and torque control methods; IEE Proc.-Electr. Power Appl., Vol. 143, No. 5, Sept. 1996, page 396-402 (Abstract)

Problems of stability of input filers of drives controlled by direct torque and flux control methods are studied. Two direct methods for AC drive control, Depenbrock´s (DSC) and Takahashi´s, are based on two-level hysteresis control of torque and flux. The objective of the paper is to show that in the case of inverter drives controlled by these methods and fed from a DC source through an LC input filter instabilities of this filter can often occur. The case is different from studies published by Lipoi and Krause (1969) and Ahmed et al. (1986) as it includes closed loops for torque and flux control. These fast nonlinear control loops mean that during input filter voltage and current oscillations the main state variables (flux and torque) do not oscillate.

The basic difficulty in the analysis of stability of mulidimensional variable-structure systems is the complexity of available methods. In the paper a state-averaging model of a drive controlled by two-level hysteresis controllers is proposed. Application of this model significantly simplifies the stability analysis. The analysis has been done by plotting the migration of eigenvalues of the linearised state matrix. A new strategy of active damping of input filter oscillations is proposed and its influence on the drive behaviour during transients is shown. Theoretical considerations are supported by results of simulation of the 2.6MW inverter-fed drive.