Fault Tolerant Control of Induction Motor

Abstract – One of the main scientific problem undertaken by various research centers and centers associated with the industry, including the automotive industry, is the topic connected to the safety of users of electric drives as well as executive machines. One of the most popular electrical machines used in both industry and automotive industry is squirrel cage induction motor. Those machines are generally controlled using more or less advanced and complicated algorithms. For their correct operation, information about inaccessible or difficult-to-measure state variables are necessary. Those state variables can be estimated using signals from electrical and / or mechanical sensors. The electric machine itself, the power electronics systems and the measuring sensors can be damaged. Each type of the fault gives rise to the uncontrolled phenomena in electrical drive, which negatively affect his job. In the worst case, defects can endanger the lives of the drive users. Therefore, it is necessary to use, wherever security is the priority, complex control systems with a higher degree of security, so-called Fault Tolerant Control (FTC) systems. The paper presents the methods of detection and compensation of selected faults in an electric drive with an induction motor, controlled using vector methods. Both the diagnostics of the induction motor itself and the measuring systems will be described. Attention will be focused on algorithmic methods, that are easy to practical implementation as well as on methods, that use artificial neural networks. The results of simulation and experimental research will be presented.

Index Terms – Induction motor, FTC, state observer, speed sensor, fault detection, fault compensation, fault detector, algorithmic detector, neural network detector, DFOC, DTC-SVM, vector control