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SVM-BASED STATOR FAULT DIAGNOSIS FOR INDUCTION MOTORS USING *DQ*0 VOLTAGE COMPONENTS

Chalermchat Manop[1], Vijit Kinnares[1] and Suphot Chunwiphat[2]

[1]School of Electrical Engineering
Faculty of Engineering
King Mongkut's Institute of Technology Ladkrabang
Ladkrabang, Bangkok 10520, Thailand
{ kmchaler; kkwijit }@kmitl.ac.th

[2]Department of Electronics Engineering Technology
College of Industrial Technology
King Mongkut's University of Technology North Bangkok
Bangsue, Bangkok 10800, Thailand
spcp@kmutnb.ac.th

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Abstract. *This paper presents a new technique for diagnosis of stator winding shorted turns in three phase induction motors using support vector machine (SVM) as a classifier in conjunction with a voltage signature analysis as feature extraction. The proposed dq0 voltage components related to three phase voltages are obtained by using Park's transformation. Unlike general dq0 quantity, the required dq components are considered from only harmonics in a certain range resulted from the stator shorted turn fault whilst the required zero component is determined from the fundamental voltage excitation only. The procedure for finding the harmonic spectrum associated with the stator fault employs a FFT technique together with digital signal processing in order to enlarge such harmonics to be easily detected. The data of d, q and zero components will be used as the input features for a SVM classification and diagnosis. In order to confirm that the dq0 voltage components could be used as quantity for identifying the stator fault, patterns of dq0 voltage components in three-dimension are plotted. The obtained trajectories are obviously different depending on the severity of the shorted turn fault. In training and testing with a multiclass-SVM classification, the good accuracy is obtained under various load conditions for both healthy and stator fault conditions. The SVM classification performance of the proposed method has high accuracy greater than 98% comparable to other feature extraction processes such as a motor current signature method (MCSA) but the number of training data and features for the proposed technique are less.*
Keywords: Support vector machine, Condition monitoring, Stator failure, *dq*0 voltage components, Park's transformation

1. **Introduction.** An induction motor has been developed continually and is now a first choice in many industrial applications. The induction motor has several advantages over other electrical machines in terms of high efficiency, low maintenance, very high reliability, simple construction, reasonably small size, ruggedness, etc. Motor failure statistics reveal that the two most important factors are bearing failure about 40%-50% and stator failure about 30%-40% [1]. The main causes of stator failure problem are a combination of various stresses including thermal, electrical, mechanical and environmental [2]. With these causes, insulation failure often occurs and leads to shorted turns. In many industrial applications, in order to avoid unexpected failure such as reduced output, product