Fault Detection In Induction Machine By Analysis Of Stator Current In Transient Condition By Continuous Wavelet Transform

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ABSTRACT

Using of wavelet transform for monitoring and diagnosis of fault in induction motors is increasing because analyzing of the stator is possible in transient conditions by these methods. This method can be used for local analysis in the domain time - frequency or dimension time scale. In this paper, the detection of hanging load fault in a stator current signal is presented using the Morse wavelet in the structure of the continuous wavelet transform. In the proposed algorithm, firstly, the stator current signal is measured by the sensors, then by analogue-to-digital converter of the relevant signal is sampled , using the MATLAB software by wavelet transform,The sampling signal is processed. Experimental and practical results indicate that the method selects the fault with high accuracy and reliability without the need of complex calculation in a short time, which makes it possible to use it in operation. In this paper, the ability to select a wavelet compared to the Bump wavelet is investigated and ultimately the accuracy and ability of the selected wavelet are discussed.

Keywords: Fault detection,Continuous wavelet transform, Induction motor, Wavelet transform, Transient state , Hanging load fault, Signal processing.

1. INTRODUCTION

Three-phase induction motors have the most applications among electric machines in the industry, and consumes between 40% and 50% of their production in industrial societies [1]. Most of the equipment comes with the motor plays a key role in the industry [2,3].Due to the importance of continuous engine operation in the industry and its wear and tear due to continuous operation and various stresses, and the need for permanent maintenance and care in this device, timely detection of them is the great technical and economic importance for the industry. Troubleshooting is direction to increase efficiency, raising the quality and quantity of production, preventing accidents caused by the failure of large motors in industrial environments, preventing additional costs and lowering maintenance costs. At first all faults in the motor are not clearly identified, and long-term perceptions can cause many losses and, on the other hand, some motor faults, even when opening the engine, are not visible. For example, the break of rotor bars, if not timely diagnosed and resolved, will damage rotor and stator eventuates to motor failure. Over the past two decades, extensive research has been carried out to create new monitoring techniques for induction motors based on vibration signal oscillation analysis, current , etc . In this regard, in this article we have tried to provide a suitable method for identifying these faults. faults generated in the motor are detected in the specified frequencies for each fault in the stator current signal [4]. To determine the amplitude and frequency of the generated components (which have relatively high bandwidth), each fault requires the strong signal processing can determine their domain and frequency with proper accuracy [5]. The frequencies in the signal, according to the diagnostic motor, are given to the frequency , each fault produces [4]. Due to the wide range of frequencies created for processing various faults, signal wavelet transform is used in this paper. By using a wavelet, the ability to calculate low frequencies in the motor is up to the mechanical vibration frequencies of the motor. The superiority of this method compared to the previous methods is the high accuracy in the characteristics of the computed frequency components of the signal and the identification and better diagnosis of fault. This method can also be used to investigate the transient state behavior of the motor. Research and research on fault diagnosis is based on two basic logics: 1. fault detection (fault occurrence) 2 - fault diagnosis (fault type) The most well-known method for detecting faults is the current signal analysis method, which is based on the monitoring and processing of the stator current to identify the bundles around the base phase of the phase current . However, the problem of identifying the fault is a difficult task because the behavior of the motor system is a nonlinear behavior.

Usually, in the signal analysis method, the effect of the motor current from FFT is used to obtain current frequency content. Over the past decades, pattern recognition methods such as neural network methods have been widely used in fault detection [6]. In this paper, due to the nature of the stator current signal, which is a