ABSTRACT

Industrial prime mover segments play a crucial role in converting raw materials into finished goods. In this regard, diverse process control from raw material to completed product is vital to all industries. As industry technology continues to progress, computer-aided control systems emerge, causing loads to become nonlinear. An inverter drive architecture, which maximises energy conservation, is used to precisely manage industrial processes. Electric drives use 55-60% of a company's total energy. Nonlinearity affects industrial drives because of semiconductor technology. In addition, the input power quality becomes a crucial element. With expanded power electronic devices in industry and power system network connectivity, power quality also plays a crucial role in the performance of drives. As power quality continues to deteriorate, industrial equipment such as drives is susceptible to temporary or permanent failure. In addition, the electric drive operating efficiency continues to decline as a result of numerous defects caused by power quality issues in the industry.

The research titled "Certain Investigation on Fault Tolerant Artificial Intelligent Prediction Analysis in Electrical Drives" aims to build an AI-based blended electrical drive system that may boost system stability and protect it from temporary or permanent failure. A literature study finds the defect-causing parameter, which is utilised to train and learn principles utilising AI machine learning. This trained algorithm dataset can anticipate fault events during operation; more study is needed. Temperature, derating, vibrations, and power semiconductor temperature impact drive performance. Implementing the trained algorithm dataset will result in the most accurate prediction of abnormal system and monitoring behaviour. If a new computational method is devised in this respect, it can detect the erroneous timing before it occurs, giving operating people a tiny edge in optimal drive operation and preventing emergency failure or stopping of the machine or production process. To advance the suggested approach, a field test of the above-mentioned solution is necessary.

In order to proceed with this study, it is required that the fault index parameters for the artificial intelligence fault prediction approach be determined. In order to ascertain this information, a PQube metre is used to monitor a variety of power quality metrics, including voltage, current, frequency, and total harmonic distortion (THD), in a total of eight different locations across the textile industry. On the basis of data gathered from field tests, the information that has been gathered is analysed in order to look for distinctive parametric behaviour from any of the parameters that have been discussed previously. In this study, individual drive specifications ranging from 0.25 kW to 75 kW will be analysed, and convincing evidence pertaining to the parameter identification of fault indices will be presented. Analyses were performed on the same pattern of behaviour under additional fault scenarios utilising the fault indices parameter. On the basis of the investigation described above, the defect identification parameter dataset that will be used by the artificial intelligence training model will be created. Following the acquisition of the dataset, novel machine learning strategies were conceived of by drawing inspiration from the data's context. It is possible to complete training in machine learning, which is then utilised to simulate the prediction of fault occurrence at the drive input section of the textile industry. On the basis of the accuracy of their predictions, the limitations of their approach were analysed, and an alternative and original method of prediction was presented for the same application.

After researching artificial prediction methods, it was revealed that an inverter's internal drive section may solve the constraint. Based on the drive's intrinsic response to input side voltage variations, MATLAB is used to classify the false proof dataset. Variations in input side voltage cause this response. The machine learning model is then evaluated to see if it can accurately anticipate drive input problems in the textile industry. An AI algorithm for forecasting drive faults was tested for accuracy and results, and a remedy was offered to prevent end-user and manufacturer capital losses. By adopting the said AI technology, both end customers and manufacturers can remotely monitor system performance, which can collect drive segment data and self-learn through a designed algorithm, consequently improving system reliability and performance. Deep learning on real-time datasets can also improve the system's reliability.