JEEE-U (Journal of Electrical and Electronic Engineering-UMSIDA)
Vol 5 No 1 (2021): April, 89-102
Electrical Engineering

Detection of Stator Winding Short Circuit Faults Through Magnetic Fields In Induction Motors

Deteksi Gangguan Hubung Singkat Belitan Stator Melalui Medan Magnet Di Motor Induksi

Bima Rachmat Ah Ro Ufun — Hang Tuah University Surabaya
Iradiratu Diah Prahmana Karyatanti — Hang Tuah University Surabaya
Belly Yan Dewantara — Hang Tuah University, Surabaya

In applications in the industrial world, the use of induction motors has been widely used in operation because induction motors have many advantages, although they have many advantages, induction motors themselves also have disadvantages, namely having high starting currents. In many cases the damage to the induction motor, the damage to the stator due to a short circuit, is a frequent failure, this damage can cause considerable losses because the motor can stop operation So this research will discuss about the detection of short circuit faults in the stator winding through leaky flux using a flux sensor that is placed outside the motor and placed radially and using the Fast Fourier Transform (FFT) method. Damage to the short circuit is done by reconstructing the stator winding of the induction motor. There are two variations of short circuit damage, namely short circuit winding 1 to winding 3 and short circuit winding 2 to winding 10 on an induction motor. The short circuit data is then processed using the Fast Fourier Transform method which produces data in the form of voltage to frequency. The results of the percentage of success of short circuit fault detection seen from the loaders have an average percentage of 50%, at no load conditions can detect short circuit faults by 100%. In conditions of short circuit interruption 1-3 has a success percentage of 30% and short circuit fault 2-10 by 70%. The existence of this system is expected to be able to anticipate any damage that can cause considerable and fatal losses.

References

1. C. Jiang, S. Li and T. G. Habetler, "A review of condition monitoring of induction motors based on stray flux," 2017 IEEE Energy Conversion Congress and Exposition (ECCE), Cincinnati, OH, 2017, pp. 5424-5430
2. N. R. Alham, D. A. Asfani, I. M. Y. Negara and B. Y. Dewantara, "Analysis of load and unbalance voltage on air gap eccentricity in detection of three phase induction motor," 2018 International Conference on Information and Communications Technology (ICOIACT), Yogyakarta, 2018, pp. 566-571.
3. Liu, Zheng, et al. "Non-invasive winding fault detection for induction machines based on stray flux magnetic sensors." 2016 IEEE Power and Energy Society General Meeting (PESGM). IEEE, 2016.
4. J. Penman, H. G. Sedding, B. A. Lloyd and W. T. Fink, "Detection and location of interturn short circuit in the stator windings of operating motors," in IEEE Transactions on Energy Conversion, vol. 9, no. 4, pp. 652-658, Dec. 1994.
5. R. Romary, R. Pusca, J. P. Lecointe and J. F. Brudny, "Electrical machines fault diagnosis by stray flux analysis," 2013 IEEE Workshop on Electrical Machines Design, Control and Diagnosis (WEMDCD), Paris, 2013, pp. 247-256.
6. A. Hermawan, et al. “Deteksi Kegagalan Isolasi Pada Belitan Stator Motor Induksi Bebasis Fast Fourier Transform,” 2019 CITEE, Yogyakarta, 2019.