Research & Reviews in Polymer

Vol 9 Iss1

Applications of ANFIS to Estimate the Degree of Polymerization Using Transformer Dissolve Gas Analysis and Oil Characteristics

Kharisma Utomo Mulyodinoto , Suwarno, Rahman Azis Prasojo and Abu-Siada A*

PLN (Persero), Jl. Trunojoyo Blok M I/135 Kebayoran Baru, 12160, Jakarta, Indonesia
School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia
Electrical and Computer Engineering Department, Curtin University, Australia
E-mail: A.AbuSiada@curtin.edu.au

ABSTRACT

Power transformers are vital links inside distribution and transmission networks which play important position to maintain sustainability and continuity of the electricity grids. Reliable and powerful situation diagnostic and monitoring strategies need to be hired to keep away from unplanned outages of the equipment. Early analysis and detection of unique dissolved gases in transformer oil has end up the fastest technique in detecting incipient faults inside the power transformer. Dissolved Gas Analysis (DGA) uses several specific concentrations of gases that are obtained due to insulating paper degradation and oil decomposition.

In Power transformers, Polymerization degree is a reliable parameter that can determine health conditions and operational life of the paper insulation. Measuring this parameter is a difficult procedure due to the difficulty in obtaining paper samples from hot spot places of working transformers. Dissolved gas analysis (DGA) and Insulation oil characteristics of power transformers have become powerful tools to overcome this restriction, because these experiments are performed on regular basis by utilities in Indonesia, unlike degree of polymerization measurements and furfural. This research offers a singular Adaptive Neuro Fuzzy Inference system (ANFIS) approach to evaluate the paper degree of polymerization based oil traits on and dissolved gas evaluation.

In this research, data of DGA, oil insulation characteristics and furan compounds of 200 150/20 kV and 42 500/150 kV operating transformers are taken from Power transformers. Several studies in transformer prognosis primarily based on synthetic intelligence had been carried out particularly in predicting the lifestyles of operational transformers by using acidity range facts and interfacial anxiety (IFT). The degree of polymerization from furan data of each investigated transformer is calculated and analyzed by using the corresponding DGA data and oil insulation characteristics. The results obtained show that acidity number, interfacial tension, carbon oxides compounds and colour of the oil are analytically correlated with the degree of polymerization of the insulation paper. Parameters that noticeably correlated with the degree of polymerization are used as input parameters to the proposed ANFIS version to estimate the degree of polymerization cost. The outcomes of the developed ANFIS model screen show normal accuracy more than 86% for the two investigated transformers' information. The proposed ANFIS model accuracy can be increased by tuning the model using future

This work is partly presented at 9th International Conference on Biopolymers and Polymer Sciences, November 19-20, 2018 Bucharest, Romania

obtained results.

Keywords: Power transformers; Degree of polymerization; Oil insulation characteristics; DGA; Fulfural compound; ANFIS

This work is partly presented at 9th International Conference on Biopolymers and Polymer Sciences, November 19-20, 2018 Bucharest, Romania