

Breakdown Voltage Test Based on Artificial Neural Network

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Abstract— For electrical engineer everyone says transformer is the heart of the electrical machines. The transformers important part is oil as the cooling medium and generally use oil based oil. The causes of choosing petroleum based oil as transformer oil because it has a good dielectric strength and breakdown voltage cooling performance in the transformer oils. All other renewable energy sources are operated in transformer oil dielectric process. Because transformer cooling process is important in the high voltage transformer oil tests process and also measured the breakdown voltage using transformer oil kit. The existing system apply only one transformer oil test with different temperatures and find out dielectric strength of the transformer oil, measured breakdown voltage with help of PI, Fuzzy logic controller. In the proposed system paper deals with different oil are tested in single phase centre tapped earthed transformer with 230V and 50Hz supply. These oils are taken to undergo breakdown voltage test with various temperatures using Artificial Neural Network. This network was produce to achieve the target on breakdown voltage range with different oil in various temperatures.

Keywords: Power Transformer, Palm Oil, Coconut Oil, ANN Model

I. INTRODUCTION

In developing ecological burden has raising the interest to neat vitality. The electrical vitality has significant offer with different types in vitality. The age, transmission and dispersion frameworks are fundamental segments in an electrical vitality framework. Between the transmission and distribution system the transformer has used as interconnecting network. In this way, extraordinary consideration is constantly giving in transformers for guarantee continuous power supply. We take any transformer the important specification and it is commonly given by limestone oil card board and plain sheet. The protecting oil additionally goes about as coolant in transformer in this way exchanging the warmth delivered into environment. The protecting oil is described by same properties, for example, maximum breakdown voltage, maximum blaze point and minimum pour point with others. The mineral oil is a great extent utilized as protecting oil in transformer have a real impediment of decomposition in nature.

Throughout in previous years, the impressive intrigue has been produced for elective liquids in transformer, which is eco-accommodating and in the meantime has great warm by protecting properties. The exploration demonstrates in characteristic chemical compound (polished from creature items) and manufactured ester, which has been produced by analysts, has great appropriateness to go about as protecting oil instead of mineral oil. They appropriamaxition differs from sort to regular oil utilized the endless supply of utilization. In the another trial output propose that with the expansion of

directing nano particles to the basic liquids, its break down quality will upgraded.

From industries [1] suggested the cabbage oils will supplant mineral oils in circulation and power transformers gave these oils are blessed to receive enhancement in dependability and different factors previously giving these oils in to administration. They creators has built up a liquid from vegetables oils call it as TEMPTATION which has good characters to go about a protecting oil in transformer.[2] They introduced an audit paper on similar assessment of Solar flower oil, Palm oil, Rapeseed oil, Soybean oil and Olive oil. The creators displayed subjective correlation of vegetables oils as a physical, synthetic and good dielectric properties for oils just as their conduct when the liquid has been matured. Based on results, the creators recommended that solar flower oil, canola and soybean oil have truly good properties to go about as protecting oil.[3] They examined the impact of vegetables oils on life time of transformer utilizing quickened warm maturing testing. It is set up for different testing that helpful existence of craft paper can be reached out by vegetables oils.[4] L. Yang displayed correlation of nano ester based protecting liquids. Creators utilized sunflowers oil, soybeans oil, rapeseeds oils, rice grain oils, coconut oils and cotton seed oil for study. In this oils, diverse kinds of leading, half directing and non-directing nano particles was included with various fixations. The readied oil tests was ried for warm and electrical properties, for example, streak point, thickness and AC break down voltage. Creators' exhibited and the analyses that breakdown voltage of characteristic ester were improved contrasted with mineral oils at maximum temperatures (above 46°C). The expansion of nano particles brought about extensive variety of consistency (descending side) running from 4 to 25%. [5] Oil immersed transformer was designed and find the dielectric strength of the transformer oil. They find out only isopropyl alcohol dielectric materials values but cannot achieve desired target value. But in our proposed system produce better results when comparing the existing systems.

II. EXPERIMENTAL SET UP

The 230 V ac supply is given to the autotransformer circuit and gradually increase voltage with certain range. From figure 1 the breakdown is occur in particular range the arc will be produced in oil filled bowl. From Figure2, to adjusting the auto transformer gradually with different oil and note down the breakdown voltage range with help of voltmeter. This breakdown voltage values are stored in MATLAB and achieve the target value with use of Neural Network model.

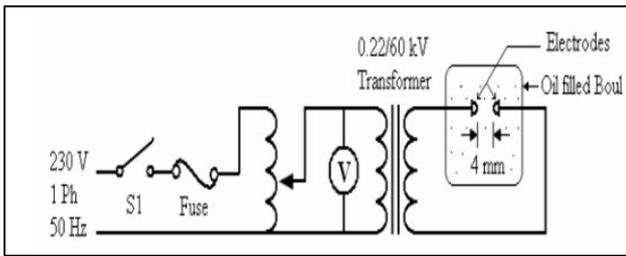


Fig. 1: Circuit Diagram for Oil Test



Fig. 2: Transformer Oil Test Kit

A. Sesame Oil at Room Temperature

The oil density depends upon the length of chemical acids. This is comparing minimum in sesame oil (16 and 18°C). Very density is a Properties matching to the cooling characters in transformer application, It are around 4.6(mg KOH/g /g oil) for sesame oil and and this comparative high due to the many impurities and dust constant .They According to the chemical property the sesame oil has an acceptable coverage to use as insulating materials.



Fig. 3: Sesame oil at room temperature

B. Sesame Oil after Heating

After heating to take sesame oil in the 500 ml glass beaker. The sesame oil colour will be changed into light reddish colour with this room temperature. At the time measure the breakdown voltage 14 KV for 18°C and 13 KV for 16°C with help of voltmeter.



Fig. 4: Sesame oil after heating

From Figure 4 have to heat the sesame oil with certain temperature range and the breakdown is occur when comparing to the other oils. This voltage range is saved in workspace in MATLAB for achieving the target.

After achieving the target values are stored in MATLAB files and apply those values in the network model produces a correct achievement of a transformer target value.

C. Palm Oil at Room Temperature:



Fig. 5: Plamoil at room temperature.

In figure 5. Take palm oil in the glass of the 500ml beaker. Before heating the palm oil colour is light yellowish colour and monitor the voltage value using voltmeter in the transformer oil test kit. The normal temperature of the palm oil is 27°C.

D. Palm Oil after Heating

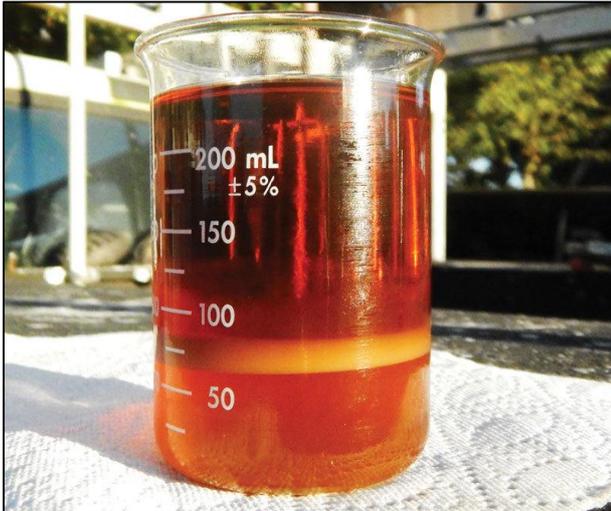


Fig. 6: Palm oil after heating

From Figure 6. After heating the palm oil the colour will be changed to reddish colour. At the same time breakdown voltages for 19 KV at 27 °C are marked by voltmeter, which is stored in MATLAB for achieving the target using ANN model. Comparing other oils breakdown voltage is occurring very quickly and using this oil for practical approaches easy handle.

E. Coconut Oil at Room Temperature



Fig. 7: Coconut oil at room temperature

From figure 7. Take coconut oil in the glass beaker at 32°C. By adjusting the auto transformer with certain range breakdown will be occur When comparing the other oils, the coconut oil are operated easily and breakdown to be reach in 12KV volts.

F. Coconut Oil after Heating



Fig. 8: Coconut oil after heating

Coconut oil from figure 8. Says that after heating the coconut oil colour is changed and the breakdown voltage is measured with use of voltmeter. This voltmeter values stored in the MATLAB workspace for achieving the breakdown target. This oil consumers having light cost while comparing other kind of oils.

III. PROPOSED METHODOLOGY

Artificial Neural Network from figure 9. model is used to achieve the breakdown voltage for different oil with various temperatures. Using these breakdown voltage values stores in MATLAB workspace and apply the neural network toolbox model to train the network. After train the network model to achieve the target for breakdown range in different oils. For example here take 10 samples for training and remaining samples for testing and validating the breakdown voltages. This same oils test was done by using PID controller and Fuzzy logic control cannot achieve the accurate target values. This problem can be achieved by using Artificial Neural Network model.

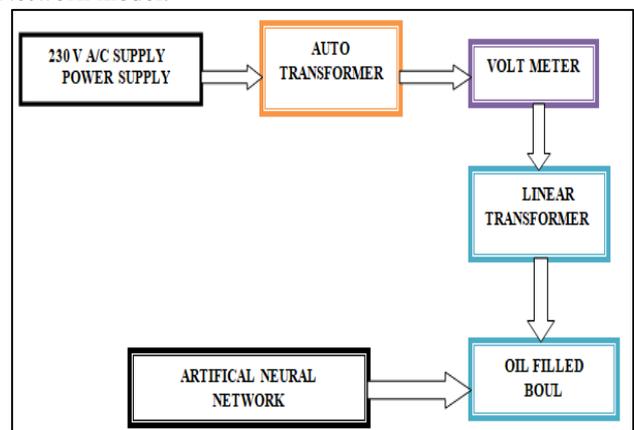


Fig. 9: Proposed system Block diagram

IV. RESULTS & DISCUSSION

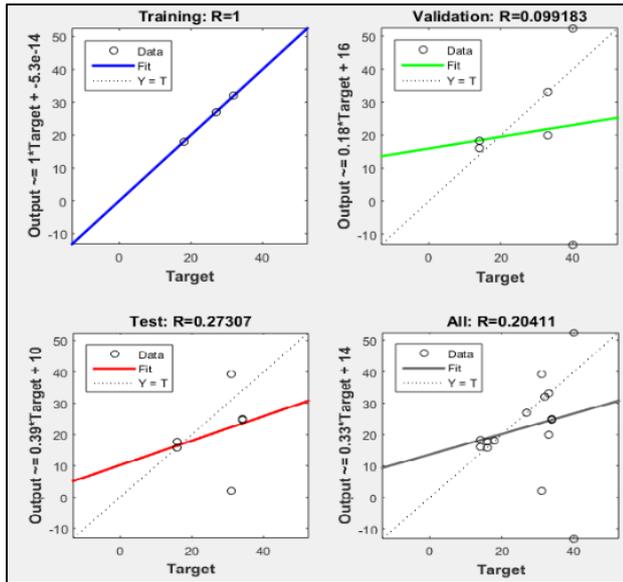


Fig. 10: Simulation result for breakdown voltage range using ANN model.

From simulation figure 10. Shows that breakdown voltages with various oil with use of ANN model. These results achieve the target for breakdown voltage in the form of various colours. The ANN model produces better results when comparing the other controller model. Here we use different oil from various temperatures and network achieves the target data values.

V. CONCLUSIONS

Transformer oil test is the normal process for practical approaches. This test usually mentioned breakdown voltages for different temperatures. Auto transformer increase the voltage value gradually at certain range the break down will occur. At the time some spark will be produced inside the transformer oil kit. Here the major problem is cannot predict the breakdown voltages in particular oils. So the PID and fuzzy logic controller cannot predict the break down voltage range this problem can be overcome by ANN model.

In this paper we took different oil for various temperatures to find out the breakdown voltage range. These voltages are stored in MATLAB workspace and different samples in various temperatures to train the ANN model. This ANN model produce break down voltage in different temperature for a final target.

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