PERFORMANCE EVALUATION OF DISTRIBUTION TRANSFORMER (500KVA RATING) BY USING FMF TECHNIQUE

Rewati Raman Yadav
Assistant Prof. (HOD), Department of Electrical Engg, Government Engg College, Jagdalpur

Abstract

In today's globalization of world, power is the not the demand of industries but even essential /need of domestic houses. Distributed transformer is an electronic appliance, being employed to transforms the power from one circuit to another without changing its frequency. In today's competitive edges, distributed transformer companies/unit have paid the more attention in order to achieve the unified and some other goal of organization i.e. customer responses, qualities, good service, overall practices achievability index, etc. In last decade, it has been found that electricity board has suffered through intension in perceptive to evaluation the best distribution distributed transformer. Therefore, in present research, a distribution distributed transformer appraisement evaluation module (single layer index: measures); has been conceptualized from the resource of existing literature survey in purpose to evaluate the distributed transformer. A FMF technique is used in purpose to evaluate the distributed transformer. Finally, empirical study has been led in purpose to checking effectiveness of the said methodology for evaluation of appraisement index aligning distributed transformer evaluation practices

Keywords: Distributed transformer, FMF model, MCDM:

I. INTRODUCTION:

The distributed transformer is one of the simplest of electrical devices. Its basic design, materials, and principles have changed little over the last one hundred years, yet distributed transformer designs and materials continue to be improved. Distributed transformers are essential in high voltage power transmission providing an economical means of transmitting power over large distances. The simplicity, reliability, and economy of conversion of voltages by distributed transformer s were the principal factor in the selection of alternating current power transmission in the "War of Currents" in the late 1880's. In electronic circuitry, new methods of circuit design have replaced some of the applications of distributed transformers, but electronic technology has also developed new distributed transformer designs and applications.

Distributed transformer s come in a range of sizes from a thumbnail-sized coupling distributed transformer hidden inside a stage microphone to gig watt units used to interconnect large portions of national power grids, all operating with the same basic principles and with many similarities in their parts.

Distributed transformer s alone cannot do the following:

- Convert DC to AC or vice versa
- Change the voltage or current of DC
- Change the AC supply frequency.

Presented, the state-of-the-art in maintenance strategies offers new opportunities which are structured in at least three basic approaches for making decisions related to maintenance. These opportunities are: (1) condition-based maintenance (CBM); 2) reliability centred maintenance (RCM); and (3) optimization techniques (asset management/Risk Management) [1].

presented an interesting work that shows the experience in Germany regarding the application of the RCM-strategy [2] .
Determined both condition and importance criteria, the strategy allows for determining which equipment has to be maintained first. It is worth mentioning the existence of a commercially available tool that works using this strategy [3]. Most of the authors who have written about this subject give positive opinions with regard to the implementation of the RCM strategy through condition and importance indices. Nevertheless, there are also some skeptical works [4].
Presented a neuro-fuzzy system for student modeling. the proposed system performed classification of students based on qualitative observations of their characteristics [5] .
Proposed adaptive neuro fuzzy inference system (ANFIS) using genetic algorithm (GA) to assess student's academic performance [6] .
presented a neural network-based fuzzy modeling approach to assess student knowledge. Authors used fuzzy logic to handle the subjective judgments of human tutors with respect to student observable behavior and knowledge, here Student knowledge is decomposed into pieces and assessed by combining fuzzy evidences, each one contributing to some degree to the final assessment [7] .

A party that supplies goods or services. A supplier may be distinguished from a contractor or subcontractor, who commonly adds specialized input to deliverables. Also called vendor. Multiple-criteria decision making (MCDM) is a sub-discipline and full-grown branch of operations research that is concerned with designing mathematical and computational tools to support the subjective evaluation of a finite number of decision alternatives under a finite number of performance criterions/indices by a single decision maker or by an expert group. Described that MCDM explores knowledge from many fields, including mathematics, behavioral science, decision theory, economics, computer technology, software engineering and information systems [9].

II. FMF METHOD:

$A = \{A_1, A_2, ..., A_m\}$ be the set of alternatives, and $C = \{C_1, C_2, ..., C_n\}$ be the set of criteria-attributes. Let $\approx{w}_{kj} = (w_{j1}, w_{j2}, w_{j3})$ be the attribute weight given by the decision maker e_k, where $\approx{w}_{kj}$ is also a triangular fuzzy number.

Construction of Weighted Decision-Making Matrix:

Let $\tilde{\tilde{V}} = \left[\tilde{\tilde{v}}_{ij}\right]_{m\times n}$ be the weighted matrix, then:

$$\tilde{\tilde{v}}_{ij} = \tilde{\tilde{x}}_{ij} \otimes \tilde{\tilde{w}}_j \quad (1)$$

Above equation presented the submission of all considered beneficial Jth criterion g=1,2…n. under the A_i. Therefore this equation is valid merely for beneficial criterions associated by their alternative $A_{i_1}, A_{i_{21}}, A_{i_{31}}, A_{i_{41}} ....A_{i_n}$

$$y_j^* = \sum_{i \in \Omega_G^+} s_i\, x_{ij}^* \Big/ \sum_{i \in \Omega_G^-} \otimes\, s_i\, x_{ij}^*, \quad (2)$$

III. PROCEDURAL STEPS

Step 1: Performance evaluation of distribution transformer (500kva rating) index and its rating data is given in Table 1 and 2, respectively.
Step 2: Construct weighted normalized decision matrix by normalization formula [1] and then used using [Equa. 1]; to construct weighted normalized matrix, shown in Table 3.
Step 3: Rank of the alternatives has been computed by using [Equa. 2]; higher value high ranking revealed in [Table. 4].

IV. CONCLUSION

In present reporting, a distributed transformer evaluation module (single layer practices index: measures); has been conceptualized from the resource of existing literature survey in purpose to evaluate the distributed transformer companies under similar practices. In this context, objective information has been tackled by the application of non-fuzzy set theory. Therefore, a FMF model (*valid for beneficial and non-beneficial measure*) has been effectively explored in purpose to evaluate the distributed transformers alternative; the result has been depicted in [Fig 1 and 2]. Finally, an empirical study has carried out in order to exhibit the feasibility, effectiveness and validity of the proposed methodology.

REFERENCES:

[1] Velásquez, J. 'Guidelines for the implementation of condition monitoring systems in power distributed transformer s', in: Advanced Research Workshop on Distributed transformer s Baiona, Spain, 2007, pp. 265–270.

[2] Orlowska, K. 'Life cycle management of circuit-breakers by application of reliability centred maintenance', Cigre-Report, 2000. , pp.13-103,

[3] Wang Z., Tang, L., Frimpong G. , Tong Lee P. ,Approaching decisions, Special report ABB review, 2003, pp.43–48.

[4] IEEE/PES task force on impact of maintenance strategy on reliability, Impact of maintenance strategy on reliability, 1999.

[5] Sevarac, Z., Neuro fuzzy reasoner for student modeling, IEEE International Conference on Advanced Learning Technologies, 2006, pp. 740–744.

[6] Taylan, O., Karagozoglu B., An adaptive neuro-fuzzy model for prediction of student's academic performance, Computers & Industrial Engineering , 57, 3, (2009) 732–741.

[7] Stathacopoulou, R., Grigoriadou, M., Magoulas, G. D., and Mitropoulos, D., 'A neuro-fuzzy approach in student modeling'. In Proceedings of the 9th International Conference on User Modeling (UM2003), June 22–26, 2003, University of Pittsburgh, Johnstown, USA. Lecture notes in computer science (LNCS), pp. 337–341). Heidelberg: Springer-Verlag.

[8] Lootsma, F. A. (1999) ''Multi-criteria decision analysis via ratio and difference judgment'', *Kluwer Academic Publishers*

[9 Zadeh, L. A. (1975) 'The concept of a linguistic variable and its application to approximate reasoning', *Part1, 2 and 3, Inform. Sci.*, 8, 1975, pp. 199-249; (1976), 9, pp. 43-58.

[10] Zadeh L. A. (1965) ''Fuzzy sets'', *Information and Control*, 8, pp. 338-353.

[11] Leekwijck, V and Kerre (1999) 'Defuzzification: criteria and classification', *Journal of Fuzzy Sets and Systems*, 108, pp. 159-178.

TABLE: 1

Distributed transformer (500kva rating) evaluation detail

Goal (C)	Initiatives	
Evaluation of Distributed transformer Production Industry	$\eta_{full\ load}$	+
	Maximum efficiency	+
	Copper loss	-
	Silicon steel contain	+
	Power factor utili**ty**	+
	Secondary voltage utility	+

TABLE 2:

Crisp data against Distributed transformer (500kva rating) evaluation detail

A_i	$\eta_{full\ load}$	**Maximum Efficiency**	**Copper Loss**	**Silicon Steel Contain**	**Primary Line Voltage Supply**	**Secondary LINE Voltage Utility**
A_1	50	49	4.5	4.4	11	439
A_2	49	48	4.5	4.6	11	438
A_3	50	47	4.6	4.6	11	438
A_4	49	47	4.9	4.6	11	438
A_5	49	48	4.8	4.5	11	439
A_6	48	45	4.9	4.4	11	437
A_7	50	59	4.5	4.6	11	438
A_8	49	47	4.5	4.6	11	439
A_9	49	48	4.6	4.6	11	438
A_{10}	50	49.50	4.9	4.7	11	439

TABLE 3:

Weighted normalized matrix

A_i	$\eta_{full\ load}$	**Maximum Efficiency**	**Copper Loss**	**Silicon Steel Contain**	**Primary Line Voltage Supply**	**Secondary LINE Voltage Utility**
	O_1	**O_2**	**O_3**	**O_4**	**O_5**	**O_6**
A_1	0.0641	0.0318	0.0305	0.0618	0.0632	0.0633
A_2	0.0629	0.0311	0.0305	0.0618	0.0632	0.0633
A_3	0.0641	0.0305	0.0311	0.0618	0.0632	0.0633
A_4	0.0629	0.0305	0.0332	0.0618	0.0632	0.0633
A_5	0.0629	0.0311	0.0325	0.0618	0.0632	0.0633
A_6	0.0616	0.0292	0.0332	0.0618	0.0632	0.0633
A_7	0.0641	0.0382	0.0305	0.0618	0.0632	0.0633
A_8	0.0629	0.0305	0.0305	0.0618	0.0632	0.0633
A_9	0.0629	0.0311	0.0311	0.0618	0.0632	0.0633
A_{10}	0.0641	0.0321	0.0332	0.0618	0.0632	0.0633

TABLE 4:

Ranking orders of distributed transformer (500kva rating) evaluation detail

A_i	**FMF**	**Ranking orders**
A_1	0.00432815	2
A_2	0.00415502	3
A_3	0.00406124	6
A_4	0.00373634	9
A_5	0.00389533	8
A_6	0.00350434	10
A_7	0.00521144	1
A_8	0.00406846	4
A_9	0.00406469	5
A_{10}	0.00401539	7

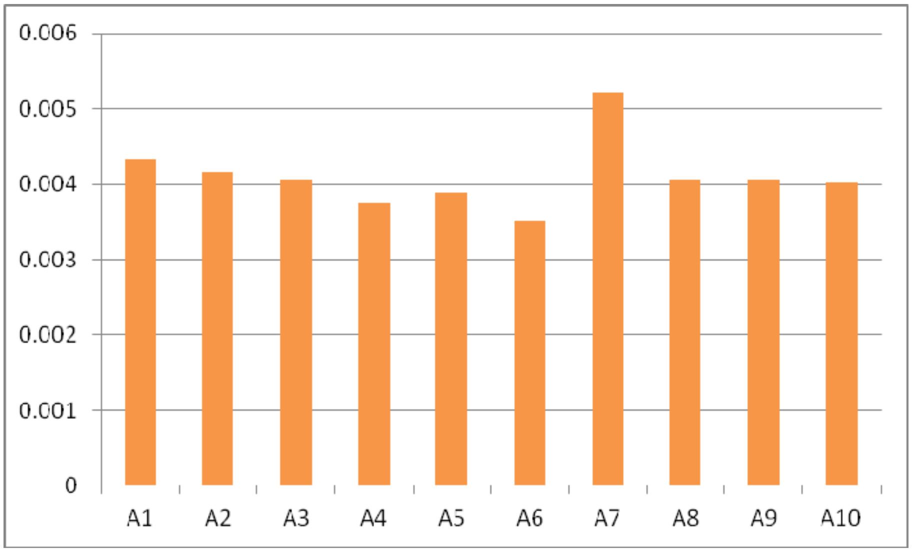

Fig: 1 Ranking orders of distributed transformer (500kva rating) by bar chart

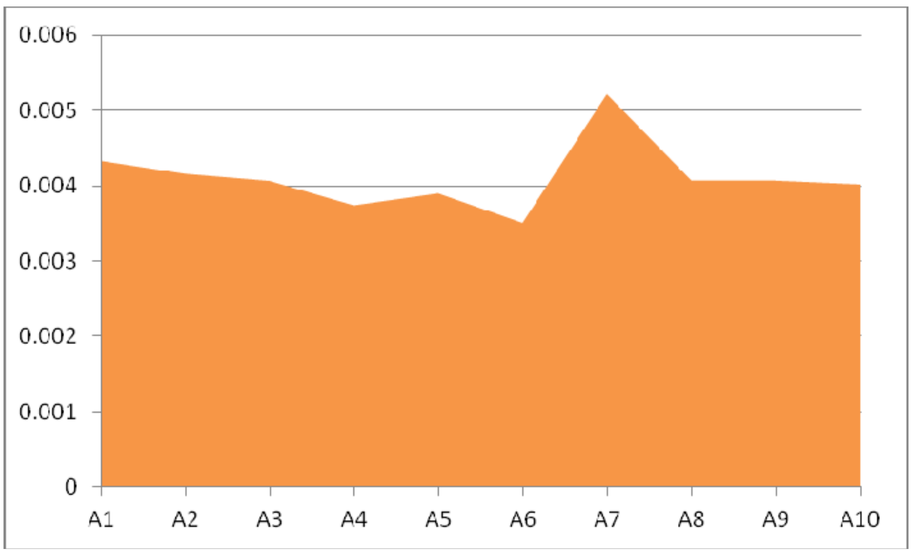

Fig: 2 Ranking orders of distributed transformer (500kva rating) by liner chart