LOAD EQUILISER TRANSFORMER

Mr. A.M. Bhandare, Chavan Ganesh Subhash, Divekar Madhura Nivrutti, Gandhi Shweta Vishwanath, Topannavar Kartik Mahaveer

Guide & Prof. (Electrical), Holy-wood Academy, Kolhapur, Sanjeevan Engineering and Technology Institute,Sanjeevan Knowledge City, Panhala, Tal. Panhala, Dist. Kolhapur

1 2 3 4 BE Electrical, Holy-wood Academy, Kolhapur, Sanjeevan Engineering and Technology Institute, Sanjeevan Knowledge City, Panhala, Tal. Panhala, Dist. Kolhapur

ABSTRACT: *Nowadays in India three phase unbalancing is a major problem. Unexpected power cut due to overloading, sudden rise in surge voltage etc. It may causes the heavy damage in the equipment's of households, costly equipment's in substation, industry. The faulty distribution system can lead some areas overloaded and some areas with less loaded. So to avoid these condition, controlling of the power and hence, controlling of the load is required in this areas. It leads to the load balancing technique and the load balancing is the process to prevent the system from the overloading condition. This project explains the details of load balancing and steps for the how to design and implement a load balancing in the power distribution.*

Keywords— Load Equalizing, 3phase 2 KVA Transformer, Load Distribution, Utilization Factor.

1. INTRODUCTION

Once the power transmission to sub-system is done the next thing is to distribute the power among all the consumers. The faulty distribution system can lead some areas overloaded and some areas with less loaded. So to avoid these condition, controlling of the power and hence, controlling of the load is required in this areas. It leads to the load balancing technique and the load balancing is the process to prevent the system from the overloading condition. To reduce this conditions Our project explains the details of load Equalizer Transformer and steps for the how to design and implement a load balancing in the power distribution.

Demand of electricity is increases continuously due to various reasons of human beings. An industry increases the load day by day. Majority of the load is inductive in nature. So they consume the reactive power which will affect the generation of plant. Then additional power is required to increases generation or increases KVA rating of the transformer. This solution is very costly because I^2R losses are increases. In this system we can't need to increases the KVA ratings of the transformer. so cost of the system reduces and I^2R losses will also reduces.

2. LITERATURE REVIEW:

A. General

In the three-phase power systems generated voltages are sinusoidal and equal in magnitude, with the individual phases 120◦ apart. However, the resulting power system voltages at the distribution end and the point of the utilization can be unbalanced for several reasons. The nature of the unbalance includes unequal voltage magnitudes at the fundamental system frequency (under-voltages & over-voltages), fundamental phase angle deviation, and unequal levels of

harmonic distortion between the three phases. A major cause of voltage unbalance is the odd distribution of single-phase loads, that can be continuously changing across the three-phase power system.

B. Literature Review

1. Initially Load balancing by using microcontroller this work is presented by Akshay Thalkari, Shrikant Biradar, Sanket Jadhav,Mrs. S.S. kumbhar Guide & HOD Of electrical department, Sou. S. D. Ghodawat cha. Trust, Sanjay Ghodawat Group of insti. Atigre Kolhapur, Maharashtra, India.(2017)

2. Three-Phase Automatic Load Balancing Applications A. Gouda*, A. Abul-Farag , H. Mostafa and Y. Gaber Smart Electrical Grids require nowadays a large interest in the electrical load distribution balancing problem

3. Three phase balancing in a LV distribution smart grids using electrical load flow variation:" L. F.B.M.". this work presented by karim Mansouri, Ben HAMED Mouna,Sbita Lassaad and Dhaouri Mehdi.

4. Implementation of ACO technique for load balancing through reconfigruration in electrical distribution system presented by Ravi Bau, Ritu Shenoy , N.Ramya , Soujanya in july 2014.

5. Feeder Load balancing using an expert system this work presented by Willy Mukwanga Siti

,Abdul-Ganiya Adisa jimoh , D.V.Nicolae in 2005 European.

2.1 BLOCK DIAGRAM

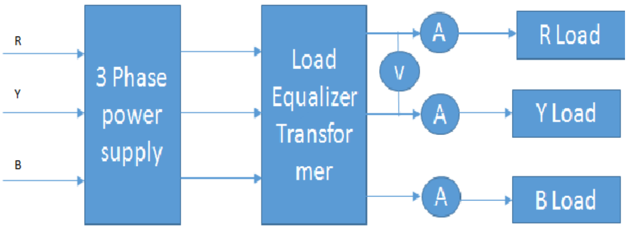
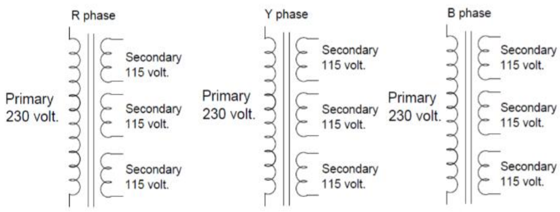


Fig.2.1.1 Block Diagram of LET.

3. METHEDOLOGY

3.1 Construction Transformer:



The three phase transformer is constructed. The primary winding of transformer is connected in delta connection. After the primary the secondary winding of the transformer is wound on the primary in the 1/3 part of the primary that means the secondary is in 3 parts on single phase primary winding having ½ turns in each 1/3 part of secondary winding of each core limb.

In each phase primary winding is having 3 layers of 67 turns. Therefore total primary turns is 201. And in secondary winding there are 6 layers of turns arranged in descending order in which the 1st layer is having 20 turns 2nd layer is having 19 turns 3rd layer contains 18 turns 4th layer contains 17 turns 5th layer contains 16 turns and last 6th layer contain 15 turns in these way the total secondary turns are 105 turns in each phase in these way the construction of coil or winding of transformer is done.

The reason of doing these type secondary winding is to avoid from loose winding turns and it will tightly mounted as well as the we get three parts of primary winding and having ½ turns with respect to primary winding. Therefore our secondary connection is established in these configuration.

3.2 Connections of Transformer winding:

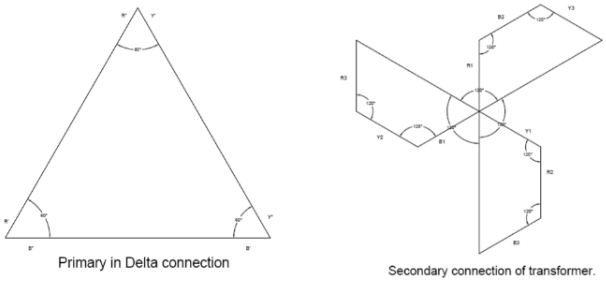


Fig. 3.2.1 Phasor Diagram of LET.

The above phasor diagram shows the connections of our load equalizer transformer as well as the phase angle of each winding. In our load equalizer transformer the primary is connected in delta connection and the secondary connection is as shown in above figure.

In the secondary winding connection the 1/3 part of each phase is connected in the configuration in which there are two windings are in same or in positive direction but the central winding is in opposite or in negative direction therefore in phasor diagram the direction of each middle winding is in opposite direction with respect to the direction of that phase the reason is to get the voltage at the secondary side is equal to the primary side voltage because in the secondary side each 1/3 part get ½ turns of primary turns. Therefore because of one winding is opposite direction the addition of two winding voltages is done.

Now each and every phase of the secondary is connected in 120◦ phase angle therefore the resultant of the each secondary phase is also in 120◦ phase angle therefore no any phase angle regulator is needed for our transformer.

12th International Conference on Recent Development in Engineering Science, Humanities and Management
The International Centre Goa, Panjim, Goa (India)
14th April 2019 www.conferenceworld.in ISBN: 978-93-87793-85-9

3.2.1 Connections of secondary winding:

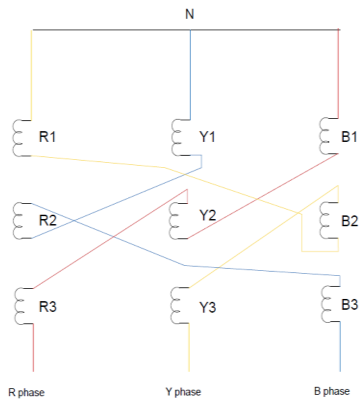


Fig. 3.2.1.1 Secondary winding connection of LET.

The secondary winding connections of load equiliser transformer is as shown in above fig. As per the phasor diagram the two windings are in same direction but one is in opposite we can see here in above figure of secondary connection all the middle connected windings as per the phase is connected in opposite direction.

Now one by one each phase is configuration is below.

A. R phase :

The R phase is configured from B1, Y2, and R3. The end terminal of B1 is connected to the end terminal of Y2, and the starting terminal of Y2 is connected to the starting terminal of R3 and end terminal of R3 is given out for load connecting terminal. Therefore these phase is considered as R phase.

B. Y phase :

The Y phase is configured from R1, B2, and Y3. The end terminal of R1 is connected to the end terminal of B2, and the starting terminal of B2 is connected to the starting terminal of Y3 and end terminal of Y3 is given out for load. connecting terminal. Therefore these phase is considered as Y phase.

C. B phase :

The B phase is configured from Y1, R2, and B3. The end terminal of Y1 is connected to the end terminal of R2, and the starting terminal of R2 is connected to the starting terminal of B3 and end terminal of B3 is given out for load connecting terminal. Therefore these phase is considered as B phase.

4. WORKING :

The working of our LOAD EQUILISER TRANSFORMER is when the load is given to the one phase these load is equally divided in the form of current in each phase. That means when we load is subjected to the R phase of secondary then the total load is divided in equal 3 parts and shred with R, Y, B all three phases.

Now consider the we should given a 15 amp load on R phase then these 15 amp load is divided in 3 parts and shared in all three phases that means R phase get 5amp, Y phase get 5amp, and B phase also get 5amp load current.

From the above configuration of secondary winding connection suppose if the 15amp load is subjected to the R phase then R3 winding get 5amp load, Y2 winding get 5amp load, and B1 winding get 5amp load.

If all three phases are loaded then as per the configuration of secondary winding connection the load is shared with each phase and total load should be balanced. In three phase load condition.

5. CONCLUSION :

Due to the load unbalancing phase unbalancing problems has occurs. It can be overcome by using load equalizer transformer. Now a days manually load shifting is done but to due to excessive overloading the winding of transformer is have to burn out due to excessive overloading current therefore to reduce these type of overloading fault conditions our three phase load equalizer transformer is useful and balance the overload condition also health of system.

ISBN: 978-93-87793-85-9

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BIOGRAPHIES :

:- Ganesh Subhash Chavan.
:-Sanjeevan engineering and technology institute, panhala, Kolhapur.
:- Student

:- Madhura Nivrutti Divekar.
:- Sanjeevan engineering and technology institute, panhala, Kolhapur.
:- Student

:- Shweta Vishwanath Gandhi.
:- Sanjeevan engineering and technology institute, panhala, Kolhapur.
:- Student

:- Kartik Mahaveer Topannavar.
:- Sanjeevan engineering and technology institute, panhala, Kolhapur.
:- Student

 ISBN: 978-93-87793-85-9

:- Mr. Arvind Madhukar Bhandare .
:- Sanjeevan engineering and technology institute, panhala, Kolhapur.
:- (Guid and Prof. of electrical dept.)