NOVEL FCMA METHOD FOR INRUSH CURRENT MITIGATION

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ABSTRACT:

The idea of the project is to overcome the inrush current problemwe face in the transformer, we have come up with thesolutionto replace the resistor in the transformer with reactor. The reactor or choke is an inductor it is utilized to obstruct the low recurrence of A.C in an electrical circuit. Usually in every transformer they use resistor to control the inrush current generated. Butitdoesn't have much efficiency, so we still have inrush current voltage drop problem everywhere. Now by replacing the resistors with a reactor, the efficiency of blocking the inrush current or starting current increased. So the efficiency of thetransformeralsoincreased.

KEYWORDS: Transformer-Inrush current-Voltage drop-Efficiency.

1. INTRODUCTION

The project is used in transformer to reduce the inrush current attained in it. The reactor is an inductor. It is used to block thelow level frequencies of the alternating current. This helps us to increase the life span of the transformer. By using this we canreduce the voltage drop produce across the transformer. It is a new improvised system. Reduction of inrush current in Transformer is a project to enhance the performance of Transformer. The heat dissipated in the transformer while this process wi**l** alsoless compared to the existing one.

2. EXSISTING SYSTEM

In transmission of power supply the transformer plays a major role in our daily life. The existing transformeraregoodintransmission of the power. In the existing systemthe inrush current reduced by the resistors but the resistors might not be efficient allthetime. As a result of this high 3 voltage drop occurs which directly affects the transformer and its respective loads.

3. PROPOSED SYSTEM

In existing systemwhen the power fromthe source while entering through the transformer inrush current will be attained. This inrush current can be minimized by using the resistor. By using this resistor inrush current can be reduced minimally.This leadsto the heat dissipation will be in larger amount. The efficiency and the life span of the transformer also will be reduced. In proposed systemwhen the power fromthe source before directly entering into the transformer it goes into the control contactorandpo wer contactor. The timer or relay are connected with contactors. This will work normally close and normally open vice versa within given sort of time. Fromthe control contactor the current goes into the FCMA (FluxCompensated Magnetic Amplifier) as itis an inductive load it blocks the inrush current fromthe source. After few seconds of time will the help of the timer powercontactorgets energized and then the control contactor will be de-energized. So now the current flows travel through the power contactortothe transformer then to the load.

4. CONTROL CIRCUITRY BLOCK DIAGRAM

MAIN BLOCK DIAGRAM

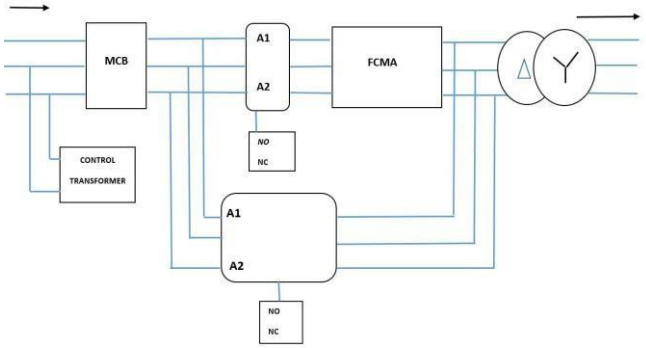

Fig.1

The above block diagramexplains the overall working of the propose system. Where the control andpowercontactors areconnected to the timer or relay switches. The input fromthe source is connected to MCB and its output to the contactors.Thecontrolcontactor to FCMA Reactor to the transformer. The power contactors input from MCB and its output to the transformer. Fromtransformerto the respective load.

OPERATION

The operation of this project begin by turning the power source ON. Once after the MCB turned ON, the MCB allows thepowerto travel to the control contactors since its timer is normally closed. The power fromthe control contactorgoes intothereactor(FCMA-FluxCompensated Magnetic Amplifier). After few seconds before de-energizing the control contactor the power contactorwi**l** be energized as its timer will be normally close. Then the control contactor will be de-energized. So that the power will be travelled through the power contactor to the transformer and its respective loads.

CONTACTOR

In this project we are two types of contactors. They are control contactor and power contactor. It is a lever which is controlled electrically for toggling the electric circuit. The contactor is operated using a power source. We have used 22- Amps control contactor and 65-Amps power contactor. It is used to allow the flow of current to the reactor.

Fig 2. Power contactor

Fig 3. Control contactor

TIMER RELAY

A Timer Relay is a control circuit that combines an electromechanical output relay and a timer. The contacts will open and close before and after a time interval that you choose. Time Relay are started or set off by one of the two techniques. Whenan incoming voltage supply is connected, the device will either start or prepare to start when a trigger sign is registered. Applyingatriggersign is utilized to start the unit after the information voltage has been applied.

Fig.4 TIMER RELAY

Timer Relays separate the first circuit and second circuit when one involves in contact with source. The Timer Relay key hastwo operations common, open and close:
Common=It is the moving piece of the key
OPEN = This key and common is come in contact when transfer loop is open or ON
CLOSE =This key and common is come in contact when the transfer loop is CLOSE.

TRANSFORMER

For this project any kind of transformer was suitable, so we use 60kVA Isolation Transformer in this project. An isolation transformer is a transformer used to transfer electrical power from an AC mains to certain devices or instrumentswhilealsoisolating the powered equipment fromthe mains, usually for safety reasons. Isolation transformers give galvanic separation;noconductive way is available among source and burden. This detachment or isolation transformer is utilized to secure against electric stun,to stifle electrical commotion in touchy gadgets, or to move power between two circuits which should not beassociated.Atransformer sold for disengagement is frequently worked with unique protection among essential and optional, and isdeterminedtowithstanda high voltage between windings. Isolation transformers cutoff the transmission of the Direct Current componentinsignals fromone circuit to the other, but allow AC components in signals to pass. Transformers that have a ratio of 1:1 between the primary and secondary windings are often used to protect secondary circuits and individuals fromelectricalshocks betweenenergizedconductors and earth ground. Reasonably planned Isolation transformers block obstruction brought about by ground loops. Detachment transformers or Isolation transformers with electrostatic s afeguards are utilized for power supplies for delicate gearlikePCs,clinical gadgets, or research facility instruments.

Fig.5 60 kVA ISOLATION TRANSFORMER

REACTOR

A Reactor is also known as choke. It is used an inductive load. Flux Compensated Magnetic Amplifier is a type of modulated inductive impedance. If the FCMA connected to the transformer, it reduces the inrush current to a low value.

The voltage drop will occur after the occurrence of inrush current in the transformer. The FCMA is always linear in unsaturated zone. Thus the sinusoidal values such as inrush current and voltage are without harmonics. So that theseelements canbeneglected when we consider about the harmonics effect. The motor torque and load torque is used to adjust the minimumvalue of inrush current value.

Features of FCMA Reactor:

1. Suitable for extreme weather conditions- EPOXY caste unit.
2. No electronic component.
3. Staring a Transformer with the limited kVA.
4. No external or internal cooling system required.
5. Harmonic free.
6. Less maintenance.
7. Run indoor and outdoor models in line or in phase model is available.

Fig.6 FCMA REACTOR

ADVANTAGES

1. It reduces the voltage drop produced.
2. Heat produced is comparatively less.
3. Life span of the core and coil be increased.
4. Inrush current can be blocked comparatively.

DISADVANTAGES

1. It produces heat during the process.
2. Building cost is comparatively high.

4. RESULT

As we compared to the existing systemour proposed idea will give increased life span to the transformers. The efficiency of the transformer can be increased upto 20% more than the existing type method. So that only this method willgivethebetterperformance and the larger life span to the transformers using this type of reduction method.

5. CONCLUSION

As we all know that transformer plays a vital role to the commercial and day to day life. By our method we can able assure yo u to protect the transformer and its respective loads for the various productive future. This more efficient way for minimization ofthe inrush current by comparing to the existing system.

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