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Theoretical Analysis of Reactor

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Abstract: ***The aim of this paper is theoretical analysis of air core series reactor . For transmission and distribution system it's necessary to regulate the reactive power flowing through a network, limit the tangency current and filter the harmonics . nowdays various reactors are used in industries as well as substation but due to less saturation and less losses air core series reactor are found to be more beneficial.***
Keywords: Reactors, Types of Reactors

I. INTRODUCTION

Reactor is electromechanical device, used for reducing short circuit current , to control harmonics to a suitable value . It works on the working principle of inductance i.e. it is a combination of inductor and some mechanical linkages. The categories of reactors supported upon the subsequent issues

1) Association of reactors within the system.
2) Constructional primarily based.
3) .Application primarily based.

A. Association Of Reactors In System

1) Shunt Reactors: High voltage transmission lines Associate in Nursing cables have an inherent capacitance, inflicting a electrical phenomenon charging current and, thus, electrical phenomenon power is generated. In gently loaded lines or cables this electrical phenomenon current can rise the voltage at the top of the road. By the employment of shunt reactors, the electrical phenomenon load are going to be salaried and therefore the voltage rise at the top of the road are going to be restricted. below traditional operation of an influence system this is actually determined by the connected resistance unit and inductive hundreds. High voltage transmission lines Associate in Nursingd cables but have an inherent capacitance, inflicting a electrical phenomenon charging current. so electrical phenomenon VArs network measure generated. In gently loaded lines or cables this electrical phenomenon current can increase the voltage at the top of the road. By the employment of shunt reactors the electrical phenomenon VARS are going to be salaried and therefore the voltage increase at the top of the road are going to be restricted. The potency of the ability system are going to be magnified by permitting the transmission of additional active energy. Air-core dry-type shunt reactors network measure commonly connected to the tertiary winding(e.g. at 20kV) of the high voltage electrical device (e.g. four hundred kV/110 kilovolt transformers) (a). For system voltages up to 115kV, air-core dry-type shunt reactors also can be directly connected to the system

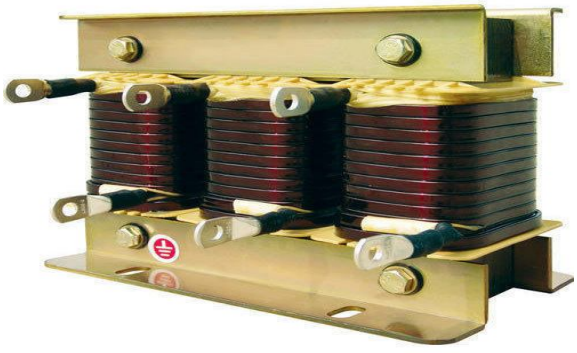

Fig: Shunt Reactors

The shunt reactors network measure commonly connected to the tertiary winding of the high voltage electrical device (e.g. 400kV system) however also can be directly connected to lower voltage systems (e.g. 110kV).

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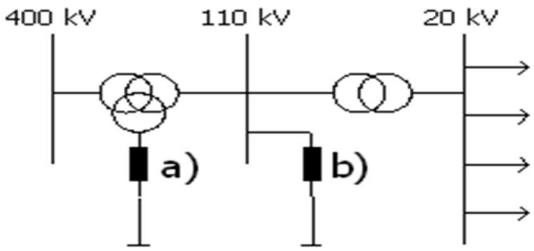

Fig: Location Of Shunt Reactors

2) *Series Reactor:* Series reactors network measure used extensively in transmission and distribution networks to make sure that fault ratings don't seem to be exceeded . as an example, once generation capability is expanded or once feeders network measure else to a station, the ensuing fault current could exceed the rating of existing equipement . The series reactor can end in a dip associated with the electrical resistance to the reactor in most casesv this voltage drops is little compared to the traditional system voltage fluctuations and no further action is needed . Once the network becomes larger, generally the short-circuit current on a cable can exceed the short-circuit current rating of the instrumentality. Upgrading of system voltage, upgrading of kit rating or using high-impedance transformers network measure much more dearly-won than putting in liquid immersed series reactors within the line. The liquid-immersed style also can considerably save house within the station. The electrical condenser inpouring limiting reactors network measure employed in series with the electrical condenser bank to regulate the inpouring current and if designed befittingly, to suppress system harmonics. Neutral facet and 6 June 1944 for line facet in Star configuration. inpouring protection supported on the system style, the out there SC MVA at the electrical condenser bank and whether or not it's one bank or a part of a multi-capacitor bank

a) Advantages

i) Can not saturate below fault condition

ii) Have low losses

iii) Have a protracted life

iv) Virtually maintenance free

Fig: Series Reactor

B. Constructional Primarily Based

1) *Iron Core Reactors:* The reactors consisting of iron core network measure referred to as iron core reactors. A coil is placed within a typical electrical device tank and oil is crammed for cooling and insulation functions

These reactors are referred to as oil immersed type reactors and might be used for any voltage level.

Figure one shows the physical characteristics of typical Iron-Core and Air-Core reactors used in harmonic filters. Iron core reactors sometimes incorporates a copper winding wound around Associate in Nursing iron core that has Associate in Nursing air gap. the quantity of winding turns, space of the air gap, and length of the gap, confirm the reactors inductance. thanks to the high permeableness of iron, the force field is confined to the core, and therefore the inductance of the reactor is accomplished with a coffee variety of turns. The iron-core could also be place at either line or ground potential. At line potential, the core would be supported on post insulators and therefore the voltage gradient between the core and therefore the winding would be tokenish. once the iron-core is at ground potential, the winding-to-core insulation should be rated for the road potential.

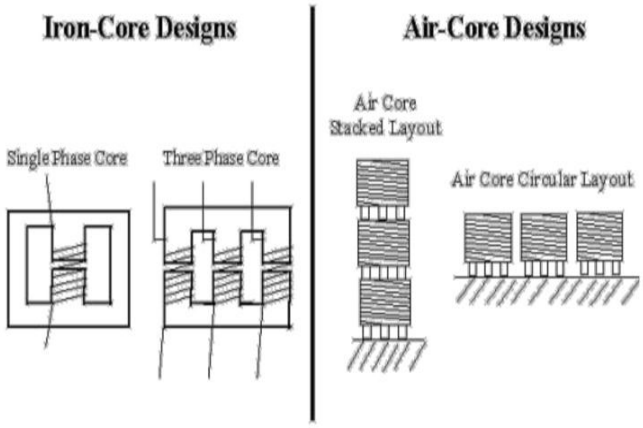

FIG: Distinction between air core & iron core reactor

a) *Advantages:* These reactors give bigger protection against short-circuit currents, have high thermal capability, appropriate for each indoor and out of doors services and might be used at any voltage level.

b) *Disadvantages:* They are pricey, complicated and tough to repair.

Fig: Iron Core Reactor

2) *Air core Reactors*

The reactors during which no iron core is employed ar known as air core reactors. These reactors ar solely dried-up to 33kv. These reactors ar larger in size.

a) *Advantages*

i) These ar easy, have constant current and electrical phenomenon and have bigger mechanical strength.

ii) Lower inductance

iii) No core loss

iv) No magnetic saturation

b) *Disadvantages*

Not appropriate for outside services, take a lot of house thanks to their massive size, tough to produce cooling and might solely be dried-up to 33kv.

Types Of Air Core Reactors

i) Dry sort Air core or Open sort or unprotected sort reactors.

ii) Oil immersed air core reactors.

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Fig: Air Core Dry Type Reactor

Fig: Oil Immersed Reactor

C. Application Based

The application fields for the employment of reactors ar varied, like within the neutral grounding systems, as tangency (current) limiting reactors, as smoothing reactors, for harmonic filtering, as shunt reactors for compensating electrical phenomenon power, as line entice reactors, and so on. the most reason to fifteen use reactors in power systems is to cut back or eliminate the consequences of fault currents, to separate high frequency carrier signals for management functions, to compensate electrical phenomenon power and to boost, power quality.

Inductive reactors ar principally used as follows:

1) Series reactors ar series connected to the transmission / distribution line or to the feeder so as to limit the short-circuit power on the load facet of the reactor. It limits the short-circuit current to A level which might be handled by the elements like breakers, switches or fuses.

2) Neutral grounding reactors ar used for low-impedance grounding of the neutral purpose of threephase networks . These reactors limit the fault current within the event of a phase-to-ground short-circuit.

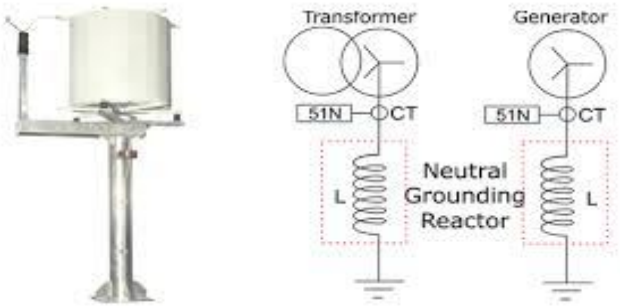

Fig: Neutral Grounding Reactors

The harmonic currents have to be compelled to be eliminated by filters. These harmonic filters, consisting of reactors and capacitors, ar typically put in near to the supply of harmonics . they supply a coffee electrical phenomenon path for the harmonic currents. this is often done by series association of a filter reactor with a capacitance bank, forming a filter circuit tuned to the harmonic frequency, that must be eliminated. If many harmonic frequencies got to be eliminated, variety of filters with totally different resonance frequencies are going to be connected to the bus system, as an example the third, fifth and seventh harmonic of the basic frequency. The filter reactor is also equipped with faucets for inductance adjustment if there's a demand of fine –tuning of the filters. So as to optimize and to manage the electrical phenomenon of the transmission path, load flow reactors ar connected serial to the high voltage conductor. the employment of load flow reactors in power grids is one the foremost efficient solutions, to confirm the desired load equalization inside the grid system underneath traditional continuous load conditions.

II. CONCLUSIONS

During this paper we tend to studied concerning the switchyard reactor . there ar differing types of reactors used these days . the applying of reactor depends upon the circumstances arising within the station power plants and industries .

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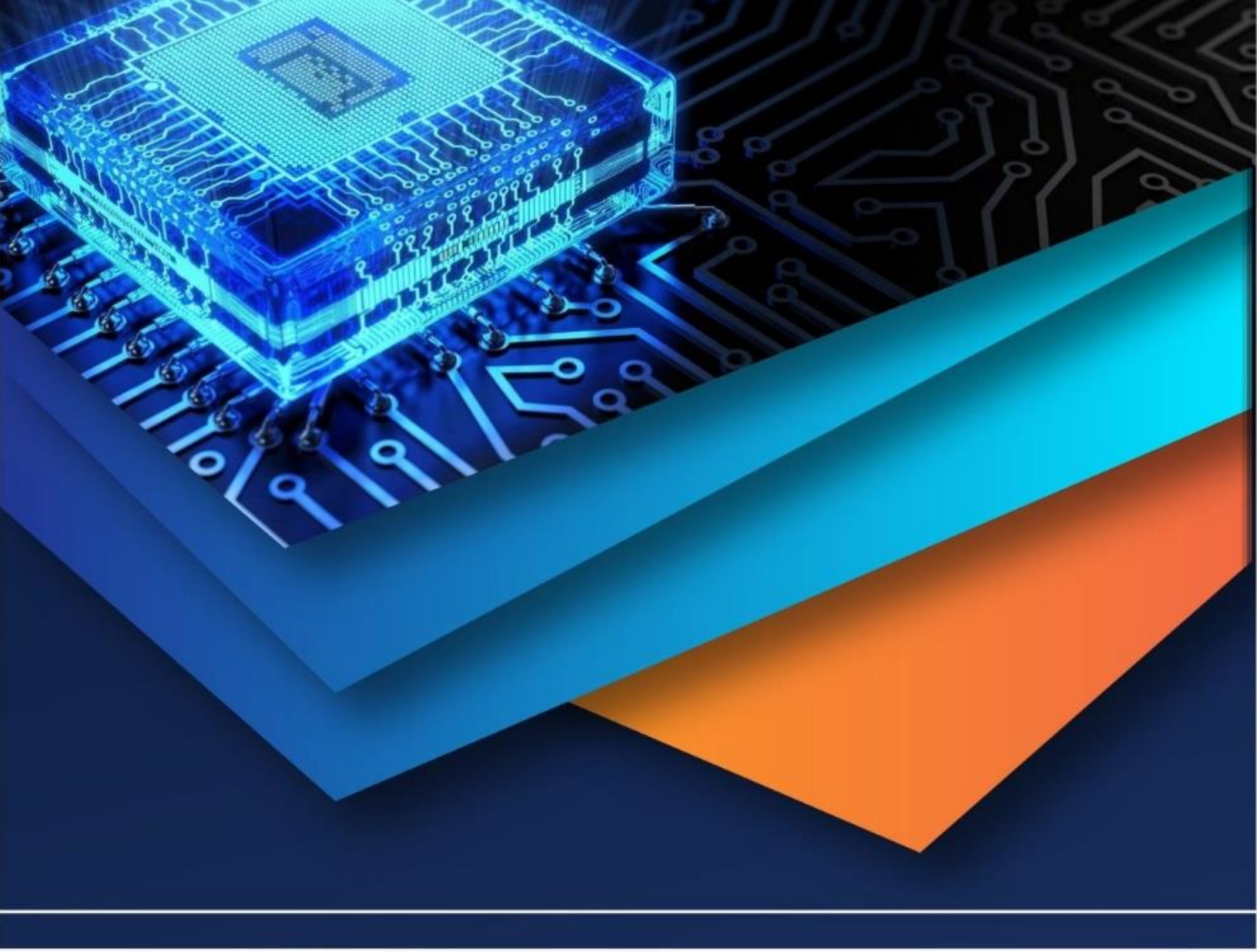

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