

Electrical Substation Maintenance and Protection

Under Grid North-2, DPDC

**A thesis submitted in partial fulfillment of the requirement for the Award of
Degree of Bachelor of Science in Electrical & Electronic Engineering**

Submitted By

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January 2019




ঢাকা পাওয়ার ডিস্ট্রিবিউশন কোম্পানী লিমিটেড
DHAKA POWER DISTRIBUTION COMPANY LIMITED
(An Enterprise of the Government of the People's Republic of Bangladesh)
ISO 9001: 2008 Certified

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Participation Certificate

This is to certify that Mr. Md. Nura Alam, ID No: 151-33-2302, Student of Electrical and Electronic Engineering Department, Daffodil International University has successfully completed a two months long internship program entitled "Electrical Substation Maintenance and Protection" under my office.

I surely hope that the knowledge that he has gathered from this program will help him a great deal in his future career. I wish him every Success.


03/12/18
Md. Abdul Wahed Halim
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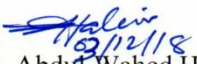
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I surely hope that the knowledge that he has gathered from this program will help him a great deal in his future career. I wish him every Success.


Md. Abdul Wahed Halim
Executive Engineer
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ব্যবস্থাপনা পরিচালক-এর দপ্তর
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তারিখ: ০৬/৮/২০১৮

01 August, 2018

Managing Director
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Biddud Bhaban, Abdul Goni Miah Road,
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| Necessary Actions | | | | | |
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| ED (T) Eng. | ED (T) Ops. | ED (Fin.) | ED (A.J. & HR) | ED (T/CT) (CT & Proc.) | CE (Dev.) |
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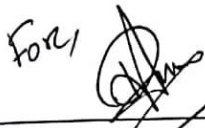
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SE, Gird (North)
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Pls termination

Declaration

We hereby declare that this internship report is an outcome of our own work and effort. Any information from other sources has been acknowledged in the reference section. We further declare that the work reported in this internship has not been submitted, either in part or in full, anywhere else for any other degree or publication.

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Dedicated to Our Parents

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The Authors
January 2019
Dhaka, Bangladesh

The table of our training schedule in Dhaka Power Distribution Company (DPDC) is given below:

| Date | Division | Time | Mentor |
|--------------------------|--|--------------|---------------------------|
| 01.09.2018 (Saturday) | Moghbar 132/33 Kv Grid Sub-station. | 10am to 05pm | Engr. JonyBarua |
| 06.09.2018 (Thursday) | Moghbar local 33/11 Kv Grid Sub-station. | 10am to 05pm | Engr. JonyBarua |
| 08.09.2018 (Saturday) | Tejgaon 33/11KV Sub-station. | 10am to 05pm | Engr. JonyBarua |
| 13.09.2018 (Thursday) | Asad-gate 33/11KV Sub-station. | 10am to 05pm | Engr. Md. Sazzad Hossain |
| 15.09.2018 (Saturday) | Green road 33/11KV Sub-station. | 10am to 05pm | Engr. Md. Sazzad Hossain |
| 20.09.2018 (Thursday) | Lalmatia 33/11KV Sub-station. | 10am to 05pm | Engr. Md. Sazzad Hossain |
| 22.09.2018 (Saturday) | Taltola 33/11kv sub-station | 10am to 05pm | Engr. Md. Mahbubur Rahman |
| 27.09.2018 (Thursday) | Khilgaon(Gulbag) 33/11KV Sub-station. | 10am to 05pm | Engr. Md. Mahbubur Rahman |
| 29.09.2018 (Saturday) | Ullon 33/11KV Sub-station. | 10am to 05pm | Engr. Md. Shahanur Rashid |
| 04.10.2018 (Thursday) | Madartek 132/33KV Sub-station. | 10am to 05pm | Engr. Md. Shahanur Rashid |
| 06.10.2018 (Saturday) | Madartek(local) 33/11KV Sub-station. | 10am to 05pm | Engr. Md. Shahanur Rashid |
| 11.10.2018 (Thursday) | Ullon 33KV GIS Switching-station. | 10am to 05pm | Engr. Md. Shahanur Rashid |

| | | | |
|--------------------------|--------------------------------|--------------|---------------------------|
| 13.10.2018 (Saturday) | Goran 33/11KV Sub- station. | 10am to 05pm | Engr. Md. Shahanur Rashid |
|--------------------------|--------------------------------|--------------|---------------------------|

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Executive Summary

The power segment of Bangladesh have confronted various issues portrayed by absence of supply limit, visit control cuts, unsuitable nature of supply and poor money related and operational execution of the division substances. There have been various changes in the power division in Bangladesh since the autonomy. A large portion of these changes neglected to acquire the ideal result the power segment. Among the three fundamental parts of the power framework, late change exercises were fixated on age and transmission. The most squeezing issues in the power segment have been with the conveyance framework, which is portrayed by overwhelming framework misfortune and poor accumulation execution. This report depends on our temporary position exercises which we have done at DPDC (Dhaka Power Distribution Company Limited). This report centers on the task of DPDC, their vision, supply limit, monetary condition, appropriation of power and future arranging. Dhaka Power Distribution Company Limited (DPDC) is one of the biggest power circulation organizations in Bangladesh. Dhaka Power Distribution Company Limited (DPDC) had been consolidated on 25th October, 2005 under the Companies Act 1994 with an approved offer capital of Tk. 10,000 (ten thousand) core isolated into 100 (one hundred) crore customary offer of Tk. 100 each. The organization was conceded authorization to begin business from 25th October, 2005 and began its capacity from fourteenth May 2007. Organization began its business task on first July of 2008 by assuming control over all advantages and liabilities from the then

DESA. While the organization began its activity the quantity of clients were 6,55,908, presently we have around 11,74,987 (on January 31, 2018) Temporary job is such a chance to take in those exercises that are identified with our genuine building world. Amid my entry level position period, I have possessed the capacity to assemble some learning on matrix substations and their task and upkeep which are firmly identified with my examination materials. We have additionally watched their authoritative exercises of control room; main task room, IT (Information and Technology) and one point activity which will without a doubt assist us with visualizing the viability in our commonsense life.

Chapter-1

Introduction

1.1 Broad Objective

The Broad Objectives of this research are mainly to understand of this each and every equipment of distribution substation.

1.2 Specified Objective

In order to obtain the broad objectives I have to find out of the following objectives. They are follows:

- Study on Substation.
- Test and check the equipments of Substation.
- Identifying different types of apparatus for operating this Substation.
- Learning probable solution of the different problems.

1.3 Company Profile

The historical backdrop of intensity age and dissemination in Dhaka city is significant. Custom goes that the Nawab of Dhaka presented power in Dhaka in 1901 when he introduced a little generator in his living arrangement Ahsan Manzil. Power age for open use began in 1930 when an exclusive organization M/S DEVCO built up a power dispersion framework. Privately owned businesses oversaw control age and circulation framework in Dhaka until the finish of British guideline in 1947. In 1957 the Government of Pakistan assumed control over the private possessed organizations in Dhaka and in 1959 they were set under the recently settled East Pakistan Water and Power Development Authority (EPWAPDA). After the freedom of Bangladesh, Bangladesh Power Development Board (BPDB) supplanted EPWAPDA's Power wing in 1972. The power age

and dispersion arrangement of Dhaka was overseen by BPDB until 1991. An independent association named Dhaka Electric Supply Authority (DESA) was made by a law proclaimed by the President in March 1990 to enhance administrations to the buyers and to improve income accumulation by decreasing the overarching high framework misfortune. DESA assumed control over the power dissemination framework in and around Dhaka city in October 1991, yet the locale of intensity age stayed with BPDB. Later in 1998, an auxiliary organization Dhaka Electric Supply Company Limited (DESCO) was framed to assume control over a couple of territories of the Dhaka city from DESA. Furthermore, in 2008, DESA was canceled and supplanted by DPDC. At its of initiation, DPDC territory was around 7473 square kilometer in and around the capital city. Therefore, according to government choice, subsequent to giving over the city peripherals to Rural Electrification Board (REB) and a few sections of the Metropolitan zone to Dhaka Electric Supply Company Ltd (DESCO), DPDC region is diminished to just around 350 square kilometer, extended in the southern piece of the capital city of Dhaka and abutting townships of Narayanganj. DESA, the predecessor of DPDC was built up as a major aspect of a change procedure to guarantee better administrations to the power shoppers, build up the power dispersion framework and decrease framework misfortune. Before the setting up of DESA, the power advancement board endured a framework loss of 45%. DESA figured out how to chop it down to around 26%. Be that as it may, as it additionally turned into a losing worry because of different reasons, DPDC was presented as a major aspect of the change procedure to supplant DESA. DPDC has figured out how to chop down the framework misfortune to single digit as of late.

1.4 Summary

Sub-Stations are important part of power system. There are different kind of sub-stations which works at different purpose. Transmission substation transforms the voltage to a level suitable for transporting electric power over long distance. Distribution substation transforms the voltage to a level suitable for the distribution system. So, the assembly of apparatus to change some characteristic of electric supply is called a sub-station. Different kinds of apparatus like transformer, switchgear, PFI are used for substation. Transformer is the main component employed to change the voltage level of electric supply. Switchgear detects the fault and disconnects the unhealthy section from the system. PFI improves the earning capacity of a power station.

1.5 Methodology

The research of this paper has been done with the help of different sources. The paper was checked by the authorized persons of the Grid North-2, DPDC during preparation. The data was chosen accurately throughout the entire period of the session. Although there were several sources but some of them are mentioned here as the references. The information of this report has been collected from the following sources:

- Construction Operation and Maintenance Department.
- Member Service Department.
- General Service Department.
- Engineering Department.

Chapter-2

Sub-station

2.1 Substation

An electrical substation is a social affair of electrical fragments including bus bars, switchgear, control transformers, assistants, etc. These fragments are related in an unmistakable progression with the true objective that a circuit can be killed in the midst of run of the mill assignment by manual heading and moreover therefore in the midst of strange conditions, for instance, impede. Basically an electrical substation involves number of drawing closer circuit. Furthermore, heartfelt circuit. Related with a run of the mill Bus-bar structures. A substation gets electrical power from delivering station by methods for moving toward transmission lines and passes on pick. Control by methods for the dynamic transmission lines.

2.2 Main tasks of major sub-stations in the T&D:

Principle errands related with real sub-stations in the transmission and distribution framework incorporate after:

1. Insurance of transmission framework.
2. Controlling the Exchange of Energy.
3. Guarantee enduring State and Transient security.
4. Load shedding and aversion of loss of synchronism. Keeping up the framework recurrence inside focused points of confinement.
5. Voltage Control; diminishing the responsive power stream by remuneration of receptive power, tap-evolving.
6. Anchoring the supply by demonstrating satisfactory line limit.
7. Information transmission by means of electrical cable transporter with the end goal of system observing; control and assurance.
8. Blame investigation and stick pointing the reason and resulting enhancement around there of field.

9. Deciding the vitality exchange through transmission lines.
10. Solid supply by nourishing the system at different focuses.
11. Foundation of monetary load conveyance and a few related capacities.

2.3 Classification of sub-station

The substations can be ordered in a few different ways including the accompanying:

1 Classification dependent on voltage levels

For example: A.C. Substation: EHV, HV, MV, LV; HVDC Substation.

2 Classification dependent on Outdoor or Indoor

Outside substation is under open Sky. Indoor substation is inside a building.

3 Classification dependent on design

Customary Air protected open air substation or

SF6 Gas Insulated Substation (GIS)

Composite substations having mix of the over two

4 Classification dependent on application

- i. Venture Up Substation – Associated with creating station as the producing voltage is low.
- ii. Essential Grid Substation – Created at appropriate load focus along essential transmission lines.
- iii. Auxiliary Substation – Along optional transmission line.
- iv. Dissemination Substation – Created where the transmission line voltage is venture down to supply voltage.
- v. Mass supply and mechanical substation – Similar to dissemination sub-station however made independently for every buyer.
- vi. Mining Substation – Needs exceptional plan thought due to additional precautionary measure for security required in the activity of electric supply.
- vii. Versatile Substation – Temporary necessity.

2.4 2.4 Substation parts and rigging

Each sub-station has the going with parts and rigging:

1. Outside Switchyard

- Incoming Lines
- Outgoing Lines
- Bus bar
- Transformers
- Bus post separator and string defenders
- Substation Equipment, for instance, circuit-estimating utensils, isolators, earthling switches, surge arresters, CTs, VTs, neutral building up equipment.
- Station Earthling structure including ground tangle, risers, colleague tangle, earthling strips, earthling spikes and earth anodes.
- Overhead earth wire ensuring against helping strokes.
- Galvanized steel structures for towers, gantries, outfit supports.
- PLCC outfit including line trap, tuning unit, coupling capacitor, etc.
- Power joins
- Control joins for affirmation and control

- Roads, Railway track, interface trenches

- Station light system

2. Principle Office Building

- Administrative building

- Conference room, etc.

3. Switchgear and Control Panel Building

- Low voltage a.c. Switchgear

- Control Panels, Protection Panels

4. Battery Room and D.C. Course System

- D.C. Battery structure and charging gear

- D.C. course structure

5. Mechanical, Electrical and Other Auxiliaries

- Fire fighting combating structure

- Diesel Generator (D.G.) Set

- Oil cleaning structure

2.5 Visited sub-stations and details:

2.5.1 Name of sub-station: Moghbazar 132/33 Kv Grid Sub-station.

Address: 17/1, ShahidTajuddinsarani, FDC more, Tejgaon, Dhaka.

Incoming Line: 4 incoming line of 132 kvRampura 1 and Rampura 2.

Outgoing Line: 24 outgoing line of 33 kv.

Power Transformer: 7 power transformer. GT-1, 2, 3& TR 1,2,3,4.

Name of 33Kv feeder : Doctor lane, T&T, EcorAis, Aambag, Tejgaon S/S 1&2, Modhubag, Banglamotor, Mogbazar nearest, MP suit, Konipara, Iskaton, Garden, Ispahani, BGMEA, Noyatola, BSRS, OLD building, TCB, Pollibhaban 1 &2, Sangsad, Holiday Inn.

2.5.2 Name of sub-station: Moghbazar local 33/11 Kv Grid Sub-station.

Address: 17/1, ShahidTajuddinsarani, FDC more, Tejgaon, Dhaka.

Incoming Line: 2 incoming line of 33kv.

Outgoing Line: 14 outgoing line of 11 kv.

Power Transformer: 7 power transformer. GT-1,2,3& TR 1,2,3,4.

Name of 11Kv feeder : Tejgaon-1,2,3, Lalmatia-1,2, Green road-1,2, Moghbazar T&T-1,2, Kawran bazar and Local transformer TR-1,2,3,4.

Sub-station layout plan:

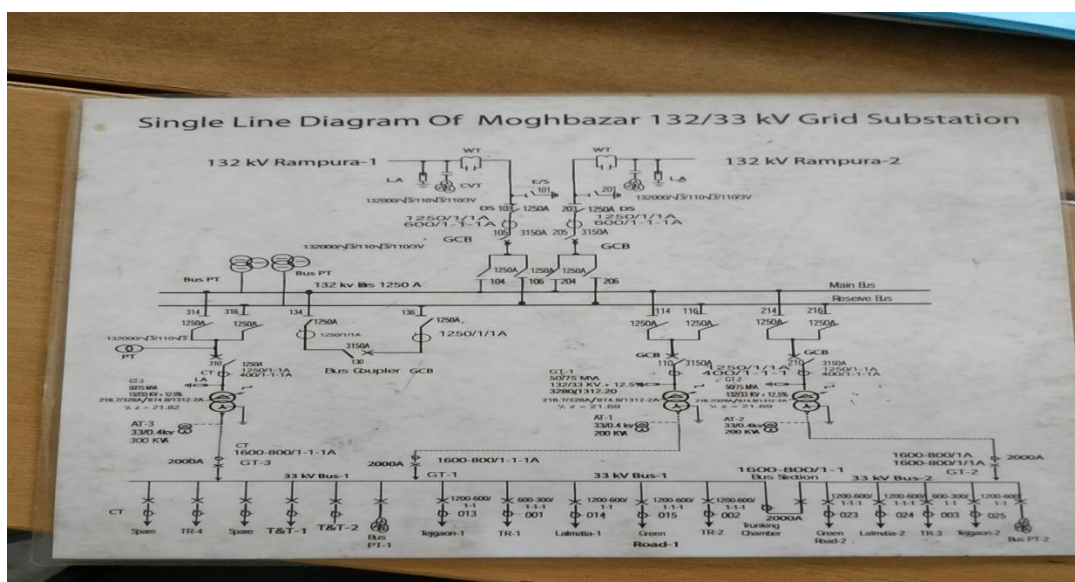


Fig 2.3: Single line diagram of Moghbazar 132/33/11 Kv Grid Sub-station

2.5.3 Name of sub-station: Tejgaon 33/11KV Sub-station.

Address: 206, Tejgaon industrial area, Dhaka.

Incoming Line: 3 incoming line of 33kv from Moghbazar circuit 1,2 (underground) and Moghbazar circuit 3 (overhead).

Outgoing Line: 17 outgoing line of 11kv

Power Transformer: 3 power transformer TR1,2,3.

Name of 11Kv feeder : Sat rong, Rangsbhaban, Orion lab, Nina kabyo, Lucas, Babli, Karnaguly, Baddameghna, Nakhlapara, Rasul bag, Ahsanullah, Santa, Civil aviation, Tejgaon s/s, GMG, Link road, Shikachor.

Sub-station layout plan :

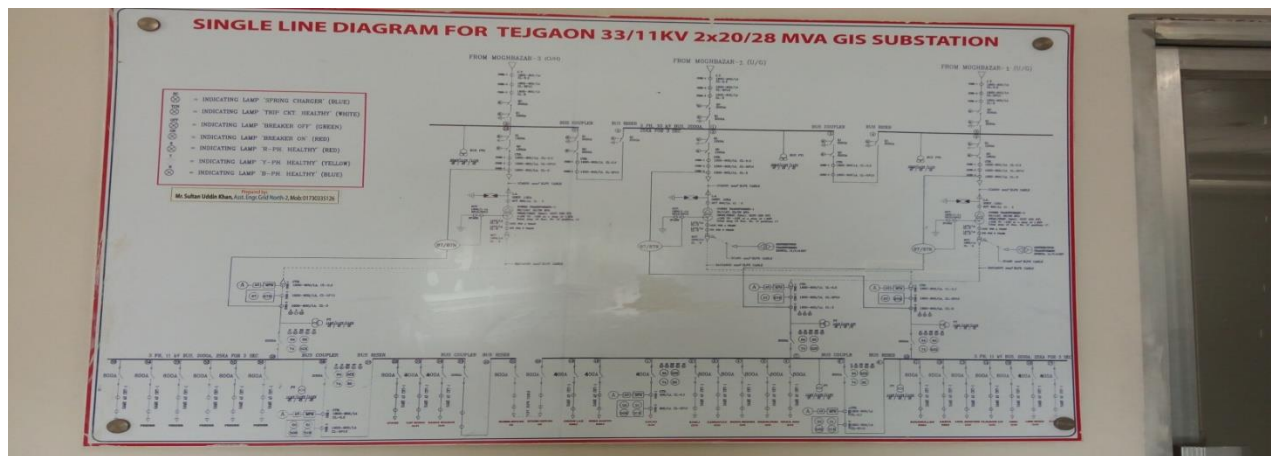


Fig 2.4: Single line diagram of Tejgaon 33/11KV Sub-station

Address: Asad gate, Near Arong,

Incoming Line: 2 incoming line of 33kv from Shatmasjid 1,2.

Outgoing Line: 11 outgoing line of 11kv.

Power Transformer: 2 power transformer TR1,2.

Name of 11Kv feeder : Gonobhaban, Town hall, Iqbal Road, Post office, B.B.S jadughar, WASA, Shukrabad, Rapa plaza, Zakirhossain, New colony, Aowrangajeb, Shongshod, Sonar bangla, Humayon Road, Asadgate, Spare.

Sub-station layout plan :



Fig 2.5: Single line diagram of Asad-gate 33/11KV Sub-station

Address: Central road, Dhanmondi, Dhaka.

Incoming Line : 2 incoming line of 33kv from Moghbazar CKT 1 & Dhanmondi grid circuit 1.

Outgoing Line : 11 outgoing line of 11kv.

Power Transformer : 2 power transformer TR1,2 of 20/28MVA.

Name of 11Kv feeder : Local RMU, Green view, Central road, New market, DPH, Kathal Bagan, Green road east, North road, Green road s/s, Plane majsid, Malancha.

Sub-station layout plan :

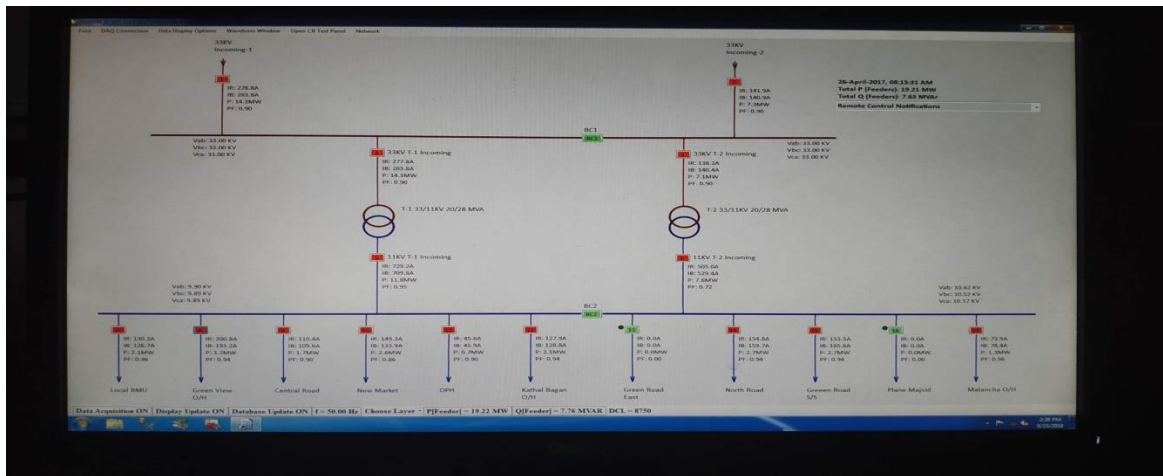


Fig 2.6: Single line diagram of Green road 33/11KV Sub-station

Address: House no: 22/1, Road no: 14 (New), 25(Old) AA/A, Dhaka.

Incoming Line : 3 incoming line of 33kv from Moghbazar, Shat masjid and Kollanpur.

Outgoing Line : 16 outgoing line of 11kv.

Power Transformer : 2 power transformer TR1&2 of 20/28MVA.

Name of 11Kv feeder : Musium, 13/A, Shankar, Zafrabad, Lalmatia, Road no-15, Asad gate, Road no-27, Ibinsina, Road no-31, Satmosjid west, Officers quarter, Road 32, 12/A, Incoming Zigatola, Road 25.

Sub-station layout plan :

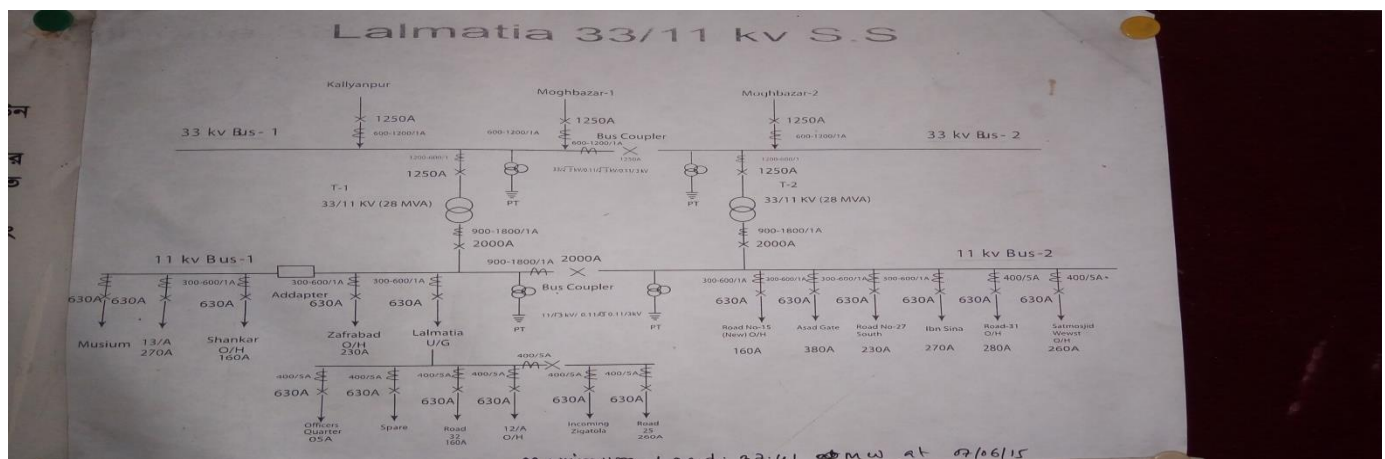


Fig 2.7: Single line diagram of Lalmatia 33/11KV Sub-station

Address: 1460/2/Kha, Block A, Jhilpara, Taltola, Khilgaon, Dhaka.

Incoming Line : 2 incoming line of 33kv from Ullon1 &Ullon 2.

Outgoing Line : 12 outgoing line of 11kv.

Power Transformer : 3 power transformer TR1,2&3 of 20/28MVA & 10/14MVA.

Name of 11Kv feeder : Adorshobag, Tilpa para, TV road, Khilgaongovtcoloney, Central Basabo, East Rampura, Model college, Chowdhuray para, Reaj bag, Nearest overhead, Haji para, MatirMoshjid.

Battery charger: 2

2.5.4 Name of sub-station :Khilgaon(Gulbag) 33/11KV Sub-station.

Address: 412, Gulbag, Khilgaon, Dhaka.

Incoming Line : 3 incoming line of 33kv from Ullon, Taltola and Maniknagar.

Outgoing Line : 9 outgoing line of 11kv.

Power Transformer : 2 power transformer TR1&2 of 20/28MVA.

Name of 11Kv feeder : West Shantibag, Police line, BTV, Gulbag, Shantinagar S/S1, East Malibag, Shahajahanpur, BanjirBagun, Shantinagar 2.

Battery Charger: 2

2.5.5 Name of sub-station :Ullon 33/11KV Sub-station.

Address: Ullon Local 33/11kv substation, WABDA road, Ullon, West Rampura, Dhaka.

Incoming Line : 2 incoming line of 33kv from PGCB 1&2.

Outgoing Line : 6 outgoing line of 11kv.

Power Transformer : 2 power transformer TR1&2 of 10/14MVA.

Name of 11Kv feeder : West Malibag, Bagichartek, Ullon, Mirbag, West Rampura, Mohanagar.

Battery Charger : 4

2.5.6 Name of sub-station :Madartek 132/33KV Sub-station.

Address : 3no East Madartek, Dhaka.

Incoming Line : 2 incoming line of 132kv from Rampura 1 & 2.

Outgoing Line : 4 outgoing line of 33kv.

Power Transformer : 2 power transformer TR1&2 of 50/75MVA.

Name of 11Kv feeder : Local 1,2 &3, Goran.

Battery Charger : 2

Sub-station layout plan :

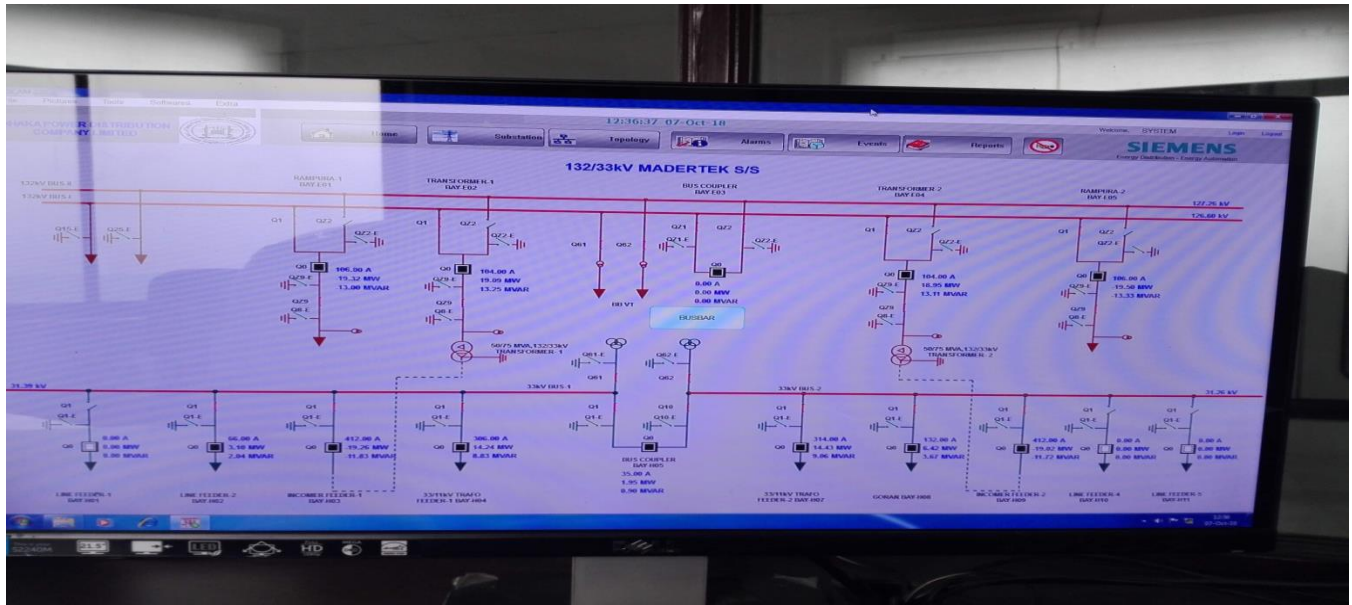


Fig 2.8: Single line diagram of Madartek 132/33KV Sub-station

2.5.7 Name of sub-station :Madartek(local) 33/11KV Sub-station.

Address : 3no East Madartek, Dhaka.

Incoming Line : 3 incoming line of 33kv.

Outgoing Line : 15 outgoing line of 11kv.

Power Transformer : 3 power transformer TR1,2&3 of 20/28MVA & 10/14MVA.

Name of 11Kv feeder :Sobujbag, Madartek, Rajarbag, Goran, DokkhinKhilgaon, Manda, Town, Bisshoroad, Mugdapara, Singapore road, Mayakanon, Ahmedbag, WASA road, Nandipara, Thihomony.

2.5.8 Name of sub-station :Ullon 33KV GIS Switching-station.

Address :Ullon 132/33kv grid sub-station. WABDA road, Ullon, West rampura, Dhaka.

Incoming Line : 2 incoming line of 33kv.

Outgoing Line : 6 outgoing line of 33kv.

Power Transformer : 5 power transformer TR1&2, GT1,2&3.

Name of 11Kv feeder :Taltola ckt1, Kakrail, Taltola Ckt2, Basundhara City, Goran, Khilgaon.

Sub-station layout plan :

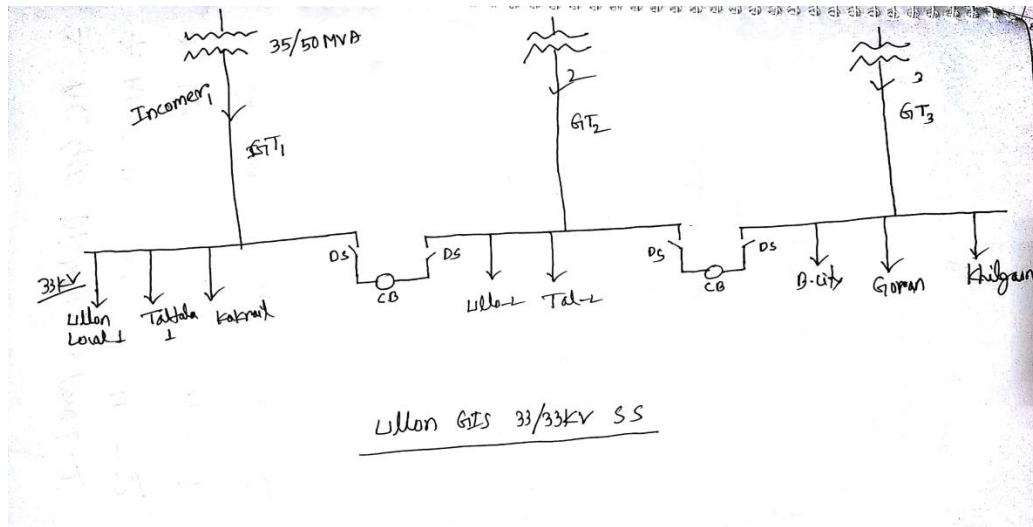


Fig 2.9: Single line diagram of Ullon 33KV GIS Switching-station

Address : Plot no M1, Block-M, Road no-7, South Banasree, Rampura, Dhaka-1219.

Incoming Line: 3 incoming line of 33kv from Ullon.

Outgoing Line: 7 outgoing line of 11kv.

Power Transformer: 3 power transformer TR1,2&3 of 10/14MVA.

Name of 11Kv feeder:Meradiya, Forazi, Shiphaibag, Buyen para, Ideal, West Banasree, Nearest.

Battery charger: 2

Sub-station layout:

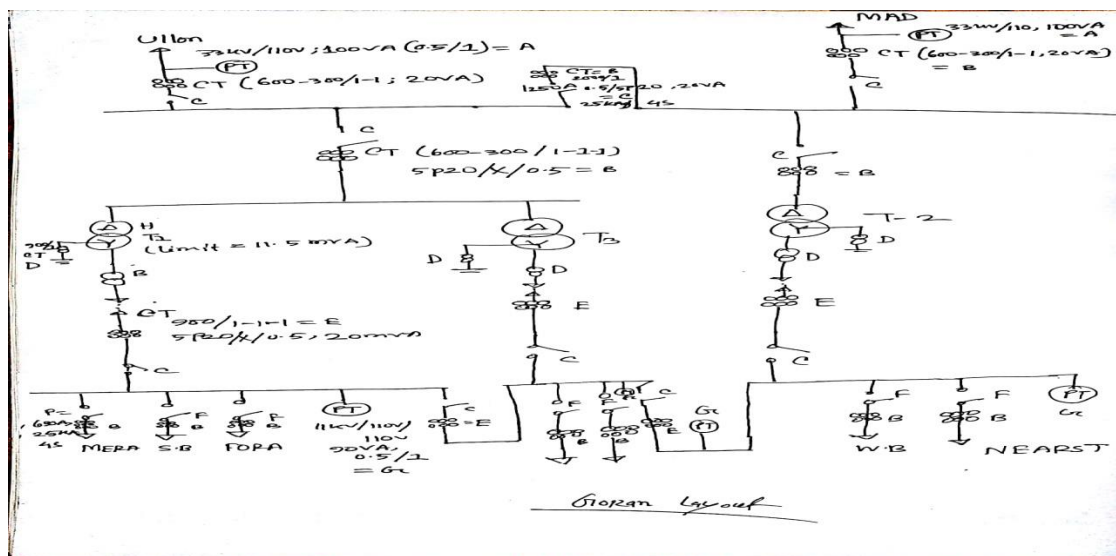


Fig 2.10: Single line diagram of Goran 33/11KV Sub-station

Chapter-3

Protection of Alternators and Transformer

3.1 Introduction

We can isolate alternator faults in two sort - Internal point the finger at, External fault. There is inside Fault like 1.Stator Winding Fault (most genuine), 2.Excitation circuit fault or frustration of rotor field, 3.Unbalanced stacking. On the other hand, there is outside accuse like 3.Failure of prime Mover, 4.Over current, 5.Over/under Voltage, 6.Over Speed; 7.over/under frequency.8. Loss of synchronism or pulling out of stage 9. Over or under repeat fault of alternator.

3.2 Stator winding shortcoming:

It is the most genuine fault and considered most basic for alternator security. This principal affirmation of alternator stator is Differential coursing current arrangement or Mertz esteem differential current protection plan of alternator is discussed in an alternate post.

3.3 Alternator Prime Mover disappointment blame or switch control blame:

What is prime mover in an alternator-We think about prime mover. It's the mechanical system that turns the rotor in alternator or just in clear word runs the alternator. Standard prime movers are diesel or gas engines, steam turbine, wind – tidal power, water stream static power in hydroelectric plant with dam and so on. Since we grasp about prime mover, it is obviously reasonable that at whatever point a prime mover may disregard to keep the alternator running. The fundamental drivers are so essential like fuel stream calms down in gas/diesel engine, inadequate water stream in hydroelectric plants, etc. The effect of prime mover frustration in an alternator– we can imagine the situation, an alternator is joined with prime mover running, and it is explicitly connected with the cross section or some parallel electrical transport giving force. Right when the prime mover misses the mark, it is up 'til now connected with the live electric transport. By then the alternator fails to supply control anyway starts getting power from live electric transport. This time the synchronous alternator takes control goes about as a synchronous motor and run the engines or turbine in uncontrolled quick. This is called switch control. Reality of pivot control: For gas turbine

and any hydroelectric system the turbine presented is prepared for running in high speeds, so when quick happens on account of transform control, any pro can decouple the electrical switch. In any case, for diesel/engine structure, the turnaround control is so risky, as the over speed limit of engines re apparent like 120% of assessed speed. As point of reference our plant's Wasilla engines assessed speed was 750 RPM, and its quick limit was 840/880 RPM. Fix - A reverse control hand-off is suggested. In any case, this hand-off should have time delay to sidestep false outing if there ought to be an event of brief time structure unsettling influence, stage swinging and change in synchronization. Consequently when a turnaround control issue occurs, the primary concern is to decouple the relating electrical change to isolate the alternator from live line. If it is caught, shut down the whole transport, in case that additionally is silly, shut the whole power plant for engine based power plant in a manner of speaking.

3.4 Over current blame on an alternator:

Explanations behind over current fault on an alternator is the Partial breakdown of internal winding security, Overload on the supply framework. Over current affirmation for alternator is inconsequential because of high inside impedance of alternator, Modern arrangement thought of alternator is to set high inside impedance of alternator. In this way if over current accuse happens, because of high internal impedance alternator can withstand hamper a while. It can physically separate from the vehicle. False discovering an alternator by over current protection exchange is ought to be considered as this may isolate alternator from transport for some fault outside of plant. This will cause interruption of endless errand, so over current hand-off used must have time delay.

3.5 Over voltage security of an alternator:

In the event that we talk about over voltage of an alternator, its interior over voltage. Over voltage blame of an alternator is extremely uncommon, as the excitation current that controls the voltage has shut supervision with AVR, programmed voltage controller framework. Nonetheless, if by one way or another alternator abruptly separated from the heap, its speed surpasses evaluated speed, over voltage may

happen. So an over voltage transfer is recommenced to introduce where alternator rpm isn't firmly directed.

3.6 Uneven stacking of an Alternator:

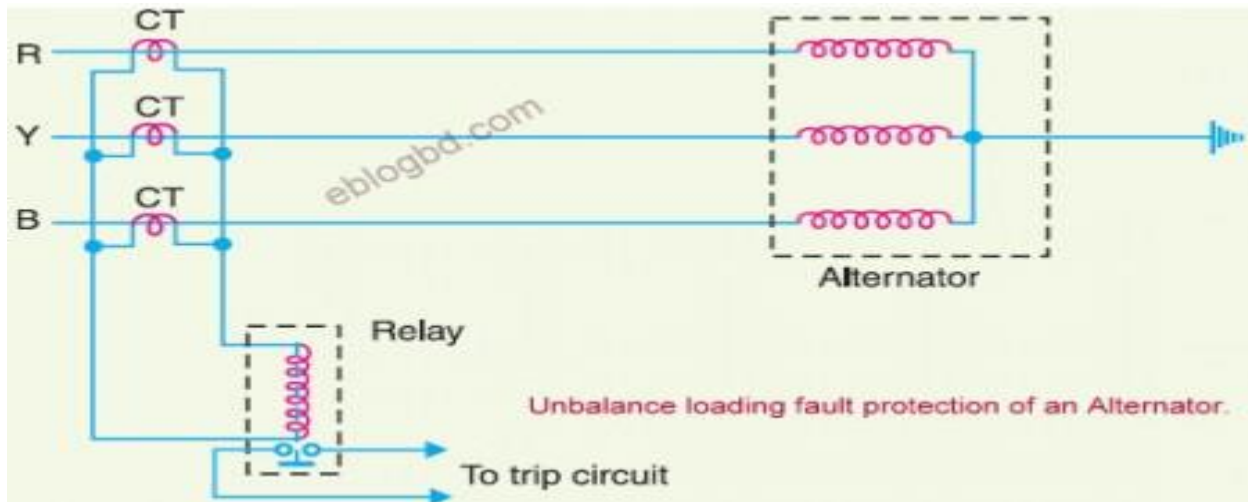


Fig 3.1: Uneven stacking of an alternator

This is certainly not an immediate blame, only a side effect of some serious shortcomings. Be that as it may, we can abridge those deficiencies in a single blame classification to apply a typical security plot for it. Most importantly, unequal stacking implies there are distinctive current in three periods of alternator. In typical condition, the distinction in stage current fluctuates $\pm 5\%$, yet when this distinction surpasses then it is uneven condition. As it is expressed before this lopsided isn't itself a blame, does not make a difference any ham but rather the reason for uneven is unsafe like establishing of one stage, or short out of stage to stage. To detect and secure the uneven stacking a straightforward origination is utilized that the three stage current is equivalent in size yet 120 degree separate by stage edge. So when we vectorically whole up three stage current-the outcome is zero. Along these lines we can apply some basic instrument transformer to keep an eye out the summation of three stage to zero, if by a few methods there is some esteem other than zero that isn't in the scope of middle of the road, at that point this circuit can send a trek flag. The underneath circuit follow the above origination. See the secondary's of three CT's are shorted, so the total of typical stage flows is zero, no current in

the trek loop. By some example in the event that there is some uneven, there will be some present in the auxiliary, that will in the end seen trip flag. Unbalanced loading fault protection of an alternator with a protection relay.

3.7 Stator entombs turn insurance of alternator:

This explicit security is for alternators with numerous loops turns like in twofold stage twisting utilized in expansive steam turbine alternators. The idea is that this assurance conspire covers the stator curl entomb swing to turn impede, loop to coil (phase to stage) or loop to ground (phase to ground). It's like a neighborhood blame in one of the loop. The security plan to cover stator entomb turn blame is essentially basis sing the hypothesis of differential hypothesis. In typical condition, the two loop or multi curls exclusively convey same extent of current yet with a stage uprooting. In the event that this current is summed up in a typical circuit, the outcome will be zero. So we can simply put some CT's with their secondary's shorted and primaries with individual curls. In the event that some blame endures, there will be present in the secondary's which will stimulate the outing circuit.

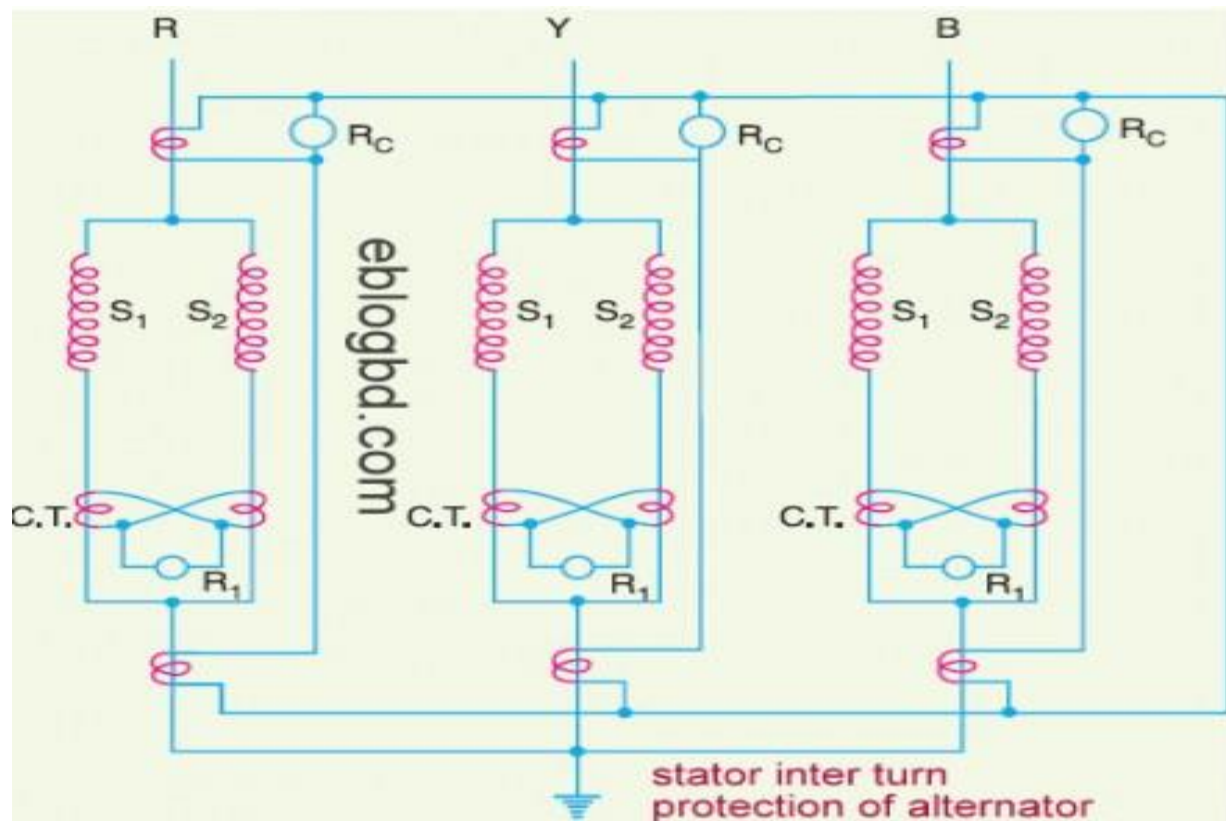


Fig 3.2: Stator inter turn protection of alternator

3.8. Control transformer assurance gadgets clarified in subtleties

3.8.1. Oil Transformer affirmation:

The power transformer affirmation is recognized with two different sorts of contraptions, specifically the devices that are evaluating the electrical sums impacting the transformer through instrument transformers and the devices that are exhibiting the status of the physical sums at the transformer itself.



Fig 3.3: Oil Transformer

3.8.2 Protection Devices:

The accompanying talks about security gadgets commonly conveyed as a piece of the power transformer conveyance.

1. Buchholz (Gas) Relay
2. Pressure Relay
3. Oil Level Monitor Device
4. Winding Thermometer

The power transformer insurance all in all and the usage of the beneath introduced security gadgets are not talked about here.

3.8.2.1. Buchholz (Gas) Relay

The Buchholz security is a mechanical point the finger at discoverer for electrical faults in oil-immersed transformers. The Buchholz (gas) hand-off is set in the diverting between the transformer essential tank and the oil conservator. The conservator pipe must be inclined to some

degree for strong movement. Regularly there is a bypass pipe that makes it possible to expel the Buchholz exchange from organization.



Fig 3.4: Installed Buchholz gas relay

The Buchholz security is a fast and tricky accuse locator. It works free of the amount of transformer windings, tap changer position and instrument transformers. In case the tap changer is of the on-tank (compartment) type, having its own one of a kind oil separated zone with oil conservator, there is a dedicated Buchholz exchange for the tap changer. An ordinary Buchholz confirmation contains a turned float (F) and a pivoted vane (V) as showed up in Figure 1. The float passes on one mercury switch and the vane moreover passes on another mercury switch. Conventionally, the bundling is stacked up with oil and the mercury switches are open.

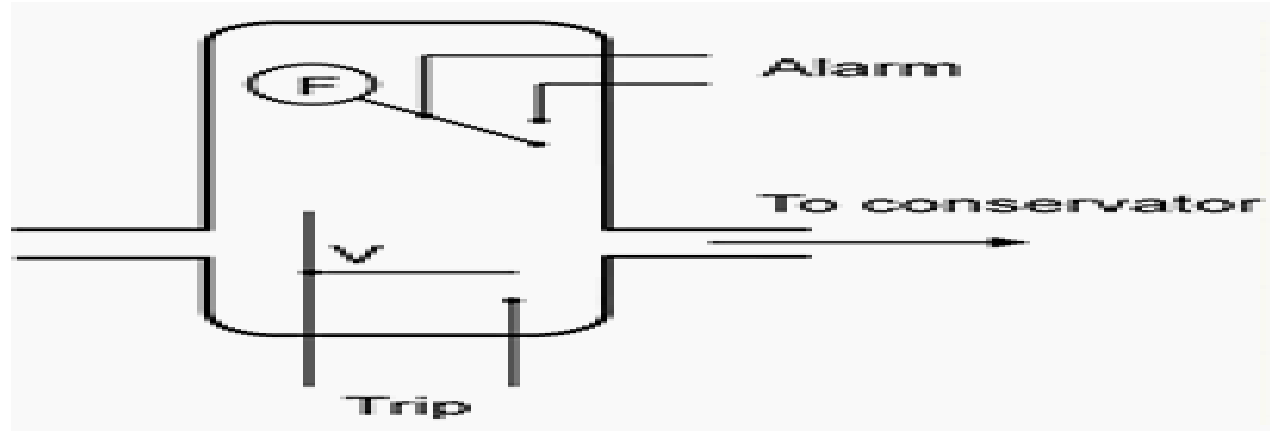


Fig 3.5: Buchholz relay principal construction

Right when minor accuse occurs...

Here is acknowledged that a minor accuse occurs inside the transformer. Gases made by minor issues climb from the accuse region to the most astounding purpose of the transformer. By then the gas rises pass the channeling to the conservator. The gas air stashes will be tapped in the bundling of the Buchholz security. This infers the gas replaces the oil in the bundling. As the oil level falls, the float (F) will seek after and the mercury switch tilts and close an alert circuit.

Right when noteworthy accuse occurs...

It is in like manner acknowledged that an important fault, either to earth of between stages or windings, occurs inside the transformer. Such faults rapidly make colossal volumes of gas (more than 50 cm³/(kWs) and oil vapor which can't escape. They in this way make a grandiose improvement of weight and unstick oil. This sets up a speedy spill out of the transformer towards the conservator. The vane (V) responds to high oil and gas stream in the pipe to the conservator. For this circumstance, the mercury switch close an excursion circuit. The working time of the trek contact depends upon the region of the fault and the significance of the accuse current. Tests finished with mirrored working conditions have shown that undertaking in the time expand 0.050-0.10 seconds is possible. The working time should not outperform 0.3 seconds. The gas gatherer exchange moreover gives a whole deal conglomeration of gasses related with overheating of

various parts of the transformer conductor and security systems. This will recognize accuse sources in their starting periods and balance colossal damage.



Fig 3.6: – A typical outlook of a Buchholz relay with flanges on both sides for pipe connections

Right when the transformer is first put into organization, the air got in the windings may give pointless alert signs. It is standard to oust the air in the power transformers by vacuum treatment in the midst of the filling of the transformer tank with oil. The gas gathered without this treatment will, clearly, be air, which can be attested by seeing that it isn't inflammable. In addition, the Buchholz exchange can recognize whether the oil level falls underneath that of the hand-off as a result of a spillage from the transformer tank.

Other specific articles related to Buchholz hand-off

1. Ensuring Oil Type Transformer with Buchholz Relay
2. The Purpose of Transformer Gas Relay

3.8.2.2. Weight Relay

Many power transformers with an on-tank-type tap changer have a load confirmation for the distinctive tap changer oil compartment. This security perceives a sudden rate-of-augmentation of load inside the tap changer oil fenced in territory.

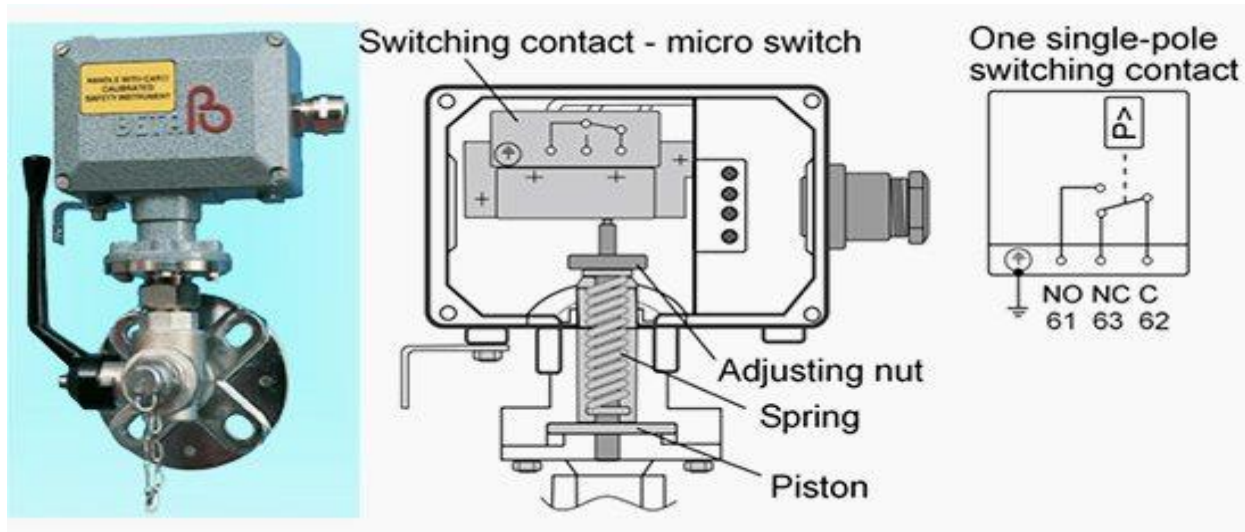


Fig 3.7: Weight relay

Right when the load before the chamber outperforms the counter intensity of the spring, the barrel will move working the trading contacts. The scaled down scale switch inside the trading unit is hermetically settled and pressurized with nitrogen gas. An inside fault in an oil-filled transformer is ordinarily joined by overpressure in the transformer tank. The slightest complex sort of weight lightening contraption is the by and large used frangible circle. The surge of oil caused by a staggering internal accuse impacts the plate and empowers the oil to discharge rapidly. Quieting and limiting the load rise deflect flimsy break of the tank and ensuing flame. Also, at whatever point used, the distinctive tap changer oil alcove can be fitted with a load lightening device.

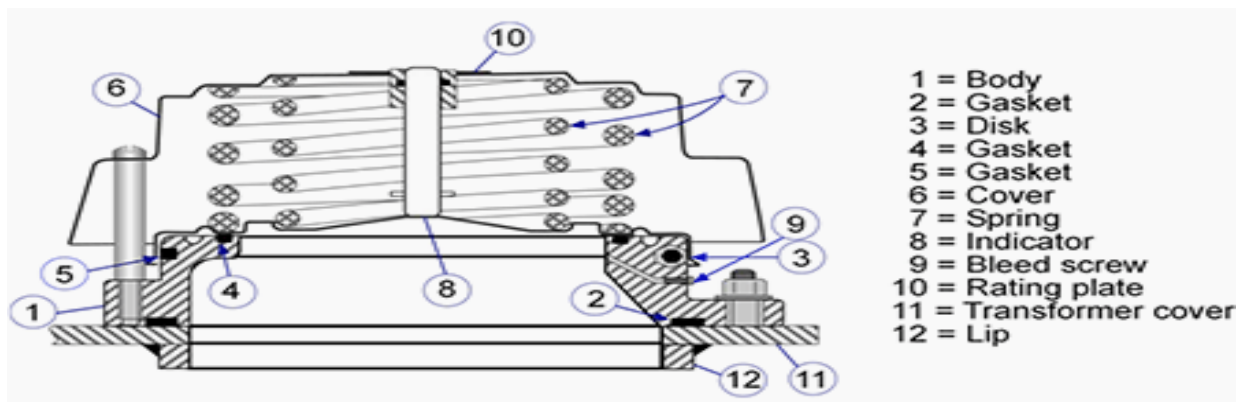


Fig 3.8: Principle construction of a pressure relief device

The weight help gadget can be fitted with contact unit(s) to give a flag to circuit breaker(s) stumbling circuits.

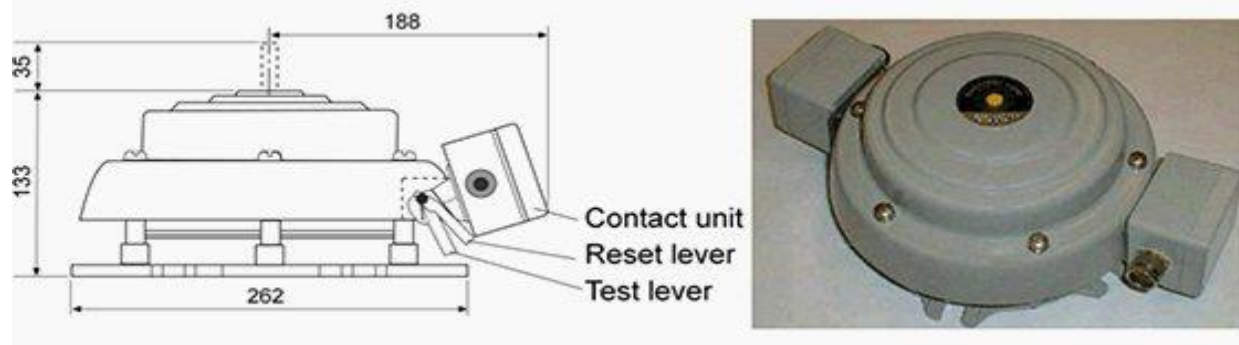


Fig 3.9: A pressure relief device with contact units

A drawback of the frangible circle is that the oil remaining in the tank is left displayed to the atmosphere after a split. This is avoided in an inexorably suitable contraption, the load encourage valve, which opens to allow the arrival of oil if the load outperforms the pre-adjusted limit. By outfitting the transformer with a load easing valve, the overpressure can be limited to an enormity harmless to the transformer. If the sporadic weight is modestly high, this spring-controlled valve can work inside several milliseconds and give brisk staggering when suitable contacts are fitted. The valve closes subsequently as the internal weight falls underneath a fundamental measurement.

3.8.2.3. Oil Level Monitor Device

Transformers with oil conservator(s) (advancement tank) regularly have an oil level screen. Customarily, the screen has two contacts for alert. One contact is for most outrageous oil level alert and the other contact is for slightest oil level caution.

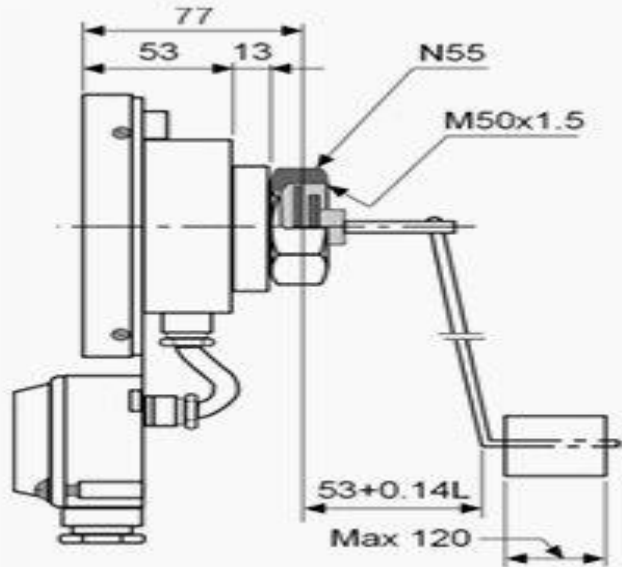


Fig 3.10: A typical outlook of an oil level monitor device

The best oil thermometer has a liquid thermometer handle in a pocket at the most elevated purpose of the transformer. The thermometer evaluates the best oil temperature of the transformer. The best oil thermometer can have one to four contacts, which sequentially close at continuously higher temperature. With four contacts fitted, the two most decreased measurements are routinely used to start fans or guides for obliged cooling, the third measurement to begin an alert and the fourth way to trip stack breakers or de-engage the transformer or both. The figure underneath shows the advancement of a thin sort top-oil thermometer, where the handle is masterminded in a "stash" enveloped by oil over the transformer. The handle is related with the assessing thunder inside the key unit by methods for a restricted chamber. The thunder moves the marker through mechanical linkages, achieving the errand of the contacts at set temperatures.

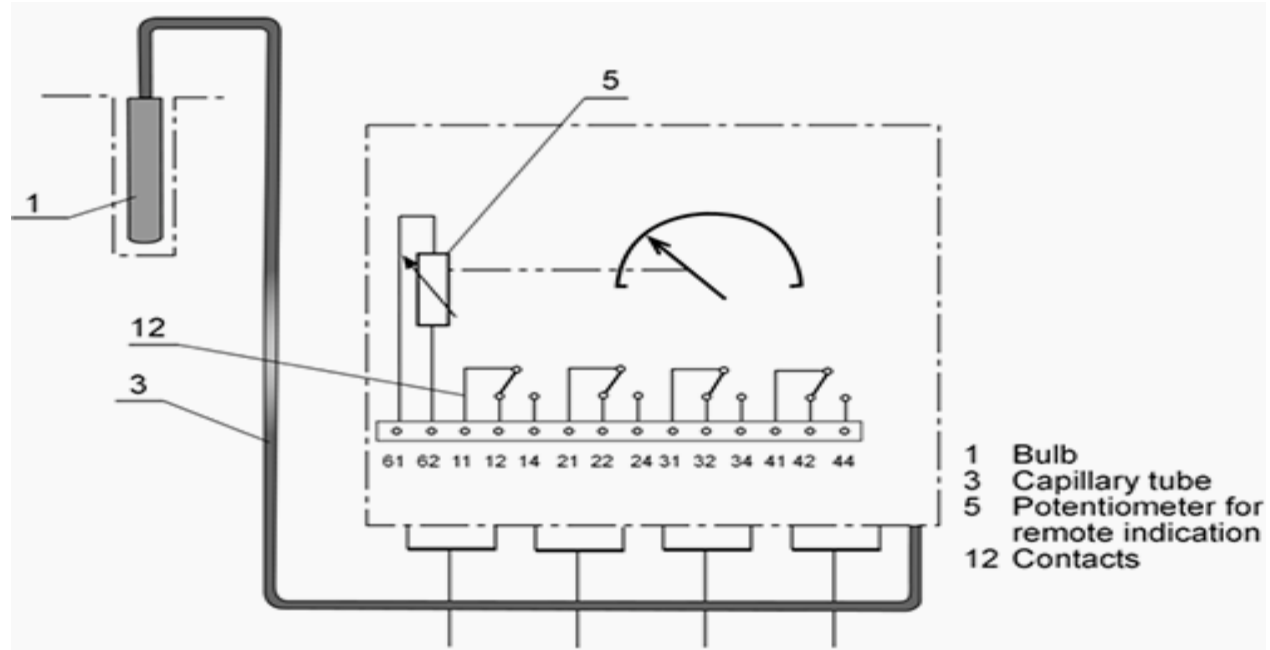


Fig 3.11: Capillary type of top-oil temperature measurement device

The best oil temperature may be amazingly lower than the winding temperature, especially not long after a sudden load increase. This suggests the best oil thermometer is anything but a feasible overheating affirmation. Regardless, where the methodology towards transformers' loss of life licenses, unearthing top-oil temperature may be classy. This has the extra favored point of view of explicitly checking the oil temperature to ensure that it doesn't accomplish the burst temperature.

3.8.2.4. Winding Thermometer

The winding thermometer, showed up in the figure underneath, responds to both the best oil temperature and the warming effect of the load current.

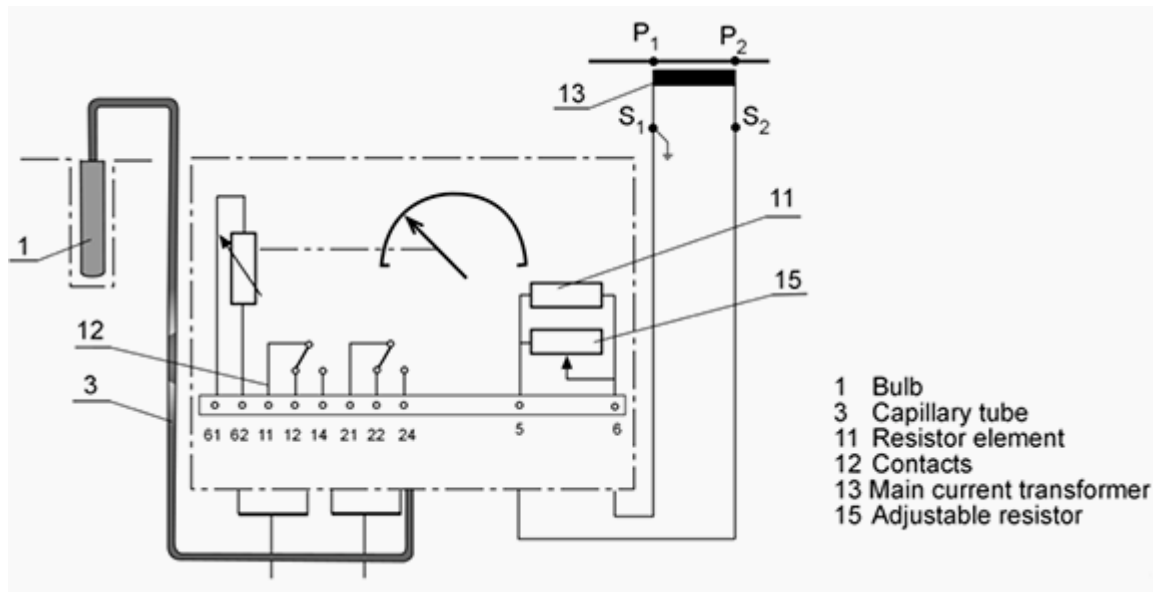


Fig 3.12: Capillary type of winding thermometer

The winding thermometer makes an image of the most sizzling bit of the winding. The best oil temperature is evaluated with a relative procedure as displayed previously. The estimation is moreover reached out with a present banner in respect to the stacking current in the winding. This present banner is taken from a present transformer arranged inside the bushing of that explicit winding. This current is lead to a resistor segment in the central unit. This resistor heats up, and on account of the present traveling through it, it will in its turn warm up the estimation yell, realizing an extended marker improvement.

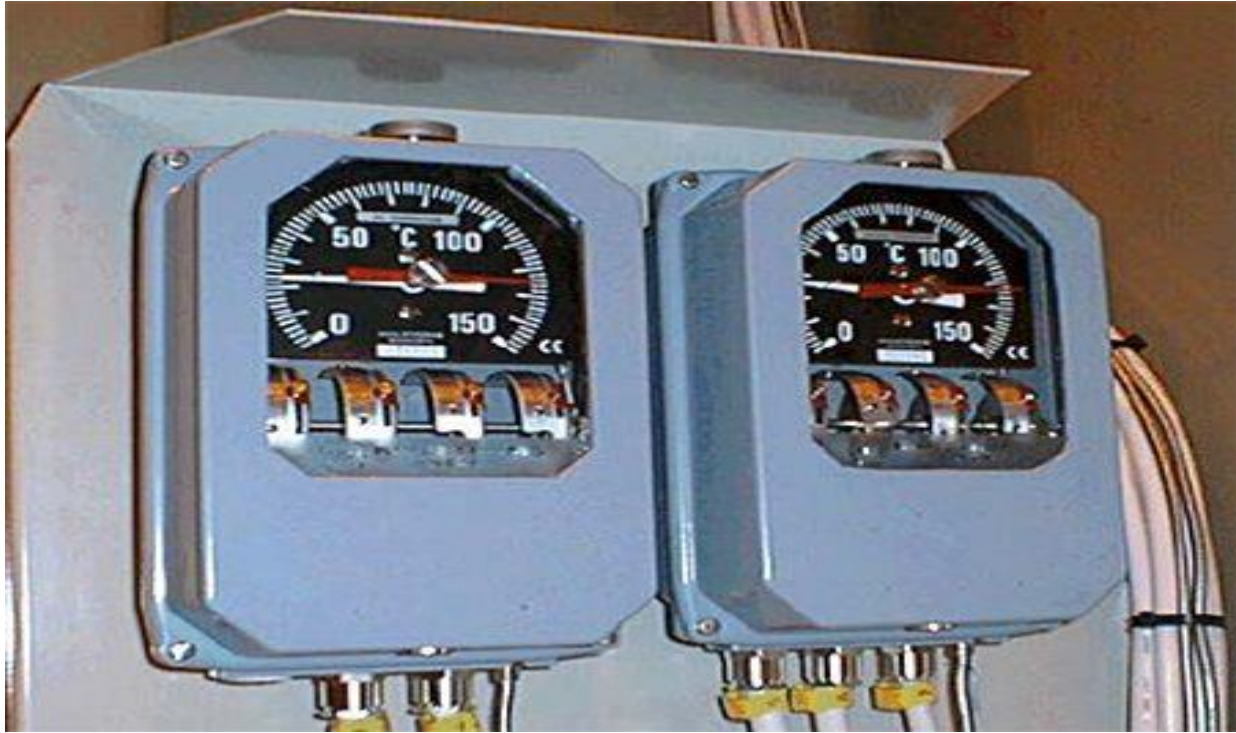


Fig 3.13: Top-oil thermometer and winding thermometer main units fitted on the side of a power transformer

The temperature tendency is in respect to the obstacle of the electric warming (resistor) part. The result of the glow run offers data to modify the obstacle and subsequently the temperature tendency. The tendency should contrast with the refinement between the issue region temperature and the best oil temperature. The time enduring of the warming of the pocket should organize the time steady of the warming of the winding. The temperature sensor by then gauges a temperature that is proportional to the winding temperature if the inclination is equal to the temperature differentiate and the time constants are equal. The winding thermometer can have one to four contacts, which sequentially close at logically higher temperature. With four contacts fitted, the two most diminished measurements are normally used to start fans or guides for compelled cooling, the third measurement to begin an alert and the fourth way to trip stack breakers or de-enable the transformer or both. If a power transformer is fitted with best oil thermometer and winding thermometer, the last one normally manages the obliged cooling control.

Chapter-4

Switchgear

4.1 Switchgear

The mechanical assembly utilized for exchanging, controlling and securing the electrical circuits and gear is known as switchgear. The term 'switchgear' is a conventional term including a wide scope of items like circuit breakers, switches, switch intertwine units, off-stack isolators, HRC wires, contactors, earth spillage circuit breakers (ELCBs), and so forth...

4.2 Parts of Switchgear

A switchgear basically comprises of exchanging and securing gadgets, for example, switches, wires, isolators, circuit breakers, transfers, control boards, lightning arrestors, current transformers, potential transformers, and different related types of gear. A few types of gear are intended to work under both ordinary and unusual conditions. A few supplies are intended for exchanging and not detecting the blame. Amid ordinary activity, switchgear licenses to turn on or off generators, transmission lines, merchants and other electrical hardware. Then again, when a disappointment (e.g. impede) on any piece of intensity framework, an overwhelming current moves through the hardware, compromising harm to the gear and interference of administration to the clients. In any case, the switchgear identifies the blame and separates the undesirable segment from the framework.

4.3 Development of Switchgear

The switchgear hardware is basically worried about exchanging and interfering with flows either under ordinary or unusual working conditions.

- The tumbler switch with conventional wire is the most straightforward type of switchgear and is utilized to control and secure lights and other gear in homes, workplaces and so on.

- For circuits of higher rating, a high-breaking limit (H.R.C.) interwine related to a switch may fill the need of controlling and ensuring the circuit. Be that as it may, such a switchgear can't be utilized beneficially on high voltage framework (33 kV) for two reasons.
- Firstly, when a breaker blows, it takes at some point to supplant it and thusly there is intrusion of administration to the clients.
- Secondly, the circuit can't effectively intrude on extensive blame flows that outcome from the deficiencies on high voltage framework.



Fig 4.1:-Switchgear

With the headway of intensity framework, lines and different supplies work at high voltages and convey extensive flows. At the point when a short out happens on the framework, substantial current coursing through the gear may cause significant harm. So as to hinder such substantial blame flows, programmed circuit breakers (or essentially circuit breakers) are utilized.

- A electrical switch is a switchgear which can open or close an electrical circuit under both ordinary and irregular conditions. Indeed, even in occasions where a wire is satisfactory, as respects to breaking limit, an electrical switch might be best.
- It is on the grounds that an electrical switch can close circuits, and in addition break them without substitution and along these lines has more extensive scope of utilization inside and out than a wire.

4.4 Basic Features of Switchgear

The basic highlights of switchgear are :

Complete unwavering quality: With the proceeded with pattern of interconnection and the expanding limit of creating stations, the requirement for a solid switchgear has happened to fundamental significance. This isn't amazing on the grounds that switchgear is added to the power framework to enhance the reliability. At the point when blame happens on any piece of the power framework, the switchgear must work to separate the flawed segment from the rest of.

Absolutely certain segregation: When blame happens on any segment of the power framework, the switchgear must have the capacity to separate between the flawed segment and the sound segment. It ought to disconnect the broken area from the framework without influencing the solid segment. This will guarantee congruity of supply.

Quick task: When blame happens on any piece of the power framework, the switchgear must work rapidly with the goal that no harm is done to generators, transformers and other hardware by the short out flows. In the event that blame isn't cleared by switchgear rapidly, it is probably going to spread into solid parts, subsequently jeopardizing complete close down of the framework

Provision for manual control: A switchgear must have arrangement for manual control. On the off chance that the electrical (or gadgets) control falls flat, the vital activity can be helped out through manual control.

4.5 Order of Switchgear

Switchgear can be ordered based on voltage level in to the accompanying

1. Low voltage (LV) Switchgear
2. Medium voltage (MV) Switchgear
3. High voltage (HV) Switchgear

1. Low Voltage Switchgear

Generally electrical switchgear assessed upto 1 kV is named as low voltage switchgear. The term LV Switchgear consolidates low voltage circuit breakers, switches, off load electrical isolators, HRC wires, earth spillage electrical switch, littler than anticipated circuit breakers (MCB) and formed case circuit breakers (MCCB, etc for example all of the embellishments required to guarantee the LV system. The most broadly perceived usage of LV switchgear is in LV flow board.

2. Medium Voltage Switchgear

From 3 kV to 36 kV switchgear structure is delegated medium voltage switchgear or MV switchgear. These switchgears are of various sorts. They may metal encased indoor sort, metal encased outside sort, outdoors type without metal separated territory, etc. The obstruction vehicle of this switchgear may be oil, SF and vacuum. The crucial need of MV control arrange is to encroach upon current in the midst of flawed condition autonomous of what sort of CB is used in the MV switchgear structure. Regardless of the way that it may be prepared for working in various conditions as well.

A medium voltage switchgear, should have the capacity to do,

1. Normal ON/OFF trading movement.
2. Short circuit current interruption.
3. Switching of capacitive streams.
4. Switching of inductive streams.
5. Some novel application.

3. High Voltage Switchgear

The power system oversees voltage above 36kV, is implied as high voltage.

As the voltage level is high the arcing made in the midst of trading undertaking is also high. Thusly, extraordinary thought to be taken in the midst of arranging of high voltage switchgear. High voltage electrical switch, is the essential section of HV switchgear, hence high voltage electrical change should have novel features for shielded and strong undertaking. Broken staggering and trading action of high voltage circuit are outstandingly raise. Usually these circuit breakers remain, at ON condition, and may be worked after a broad stretch of time. So CBs must be adequately reliable to ensure safe errand, as when required.

4.6 Switchgear Equipment

Switchgear covers a wide extent of apparatus stressed over trading and meddling with streams under both regular and bizarre conditions. It consolidates switches, wires, circuit breakers, exchanges and other rigging. A succinct record of these devices is given underneath.

1. Switches

A switch is a contraption which is used to open or close an electrical circuit beneficially. It will in general be used under full-stack or no-load conditions anyway it can't encroach upon the accuse streams. Right when the contacts of a switch are opened, a bend is conveyed observable all around between the contacts. This is particularly legitimate for circuits of high voltage and broad current limit.

The switches may be described into

1. air switches

2. oil switches.

The contacts of the past are opened in air and that of the last are opened in oil.

(I) Air-break switch – It is an air switch and is expected to open a circuit under load. In order to stifle the curve that occurs on opening such a switch, extraordinary arcing horns are given.

(ii) Isolator or disengaging switch – It is essentially a cutting edge switch and is planned to open a Circuit under no pile.

(iii) Oil switches. As the name construes, the contacts of such switches are opened under oil, Normally transformer oil.

2. Circuits

A circuit is a short bit of wire or thin strip which softens when unreasonable current moves through it for adequate time. It is embedded in arrangement with the circuit to be secured. At the point when a short out or over-burden happens, the current through the wire component increments past its appraised limit. This raises the temperature and the wire component melts (or smothers), separating the circuit secured by it.

3. Circuit Breakers

An electrical switch is a hardware which can open or close a circuit under all conditions viz. no heap, full load and blame conditions. It is designed to the point that it very well may be worked physically (or by remote control) under typical conditions and naturally under blame conditions. For the last task, a transfer circuit is utilized with an electrical switch

4. Relay

A relay is a gadget which recognizes the blame and supplies data to the breaker for circuit intrusion. At the point when a blame happens the transfer contacts are shut and the outing loop of the electrical switch is invigorated to open the contacts of the electrical switch.

Chapter-5

Circuit breaker

5.1 Introduction

In the electrical and gadgets world, there are numerous situations where setback happens. It will prompt extreme harm to building, workplaces, houses, schools, businesses, and so forth. Believing voltage and current are not right, however wellbeing measures are taken. When circuit breakers are introduced it will control the sudden ascent of voltage and current. It will assistance from any mishap. Circuit breakers resemble the core of the electrical framework. There are distinctive kinds of circuit breakers where these are introduced by the rating of the framework. In house diverse sort of electrical switch is utilized and for ventures another kind of electrical switch is utilized. Give us a chance to talk about the distinctive kinds of circuit breakers and its significance in detail.

5.2 Circuit Breaker

Electrical switch is an exchanging gadget which can be worked naturally or physically to ensure and controlling of electrical power framework. In the advanced power framework the structure of the electrical switch has changed relying on the enormous flows and to keep from curve while working.

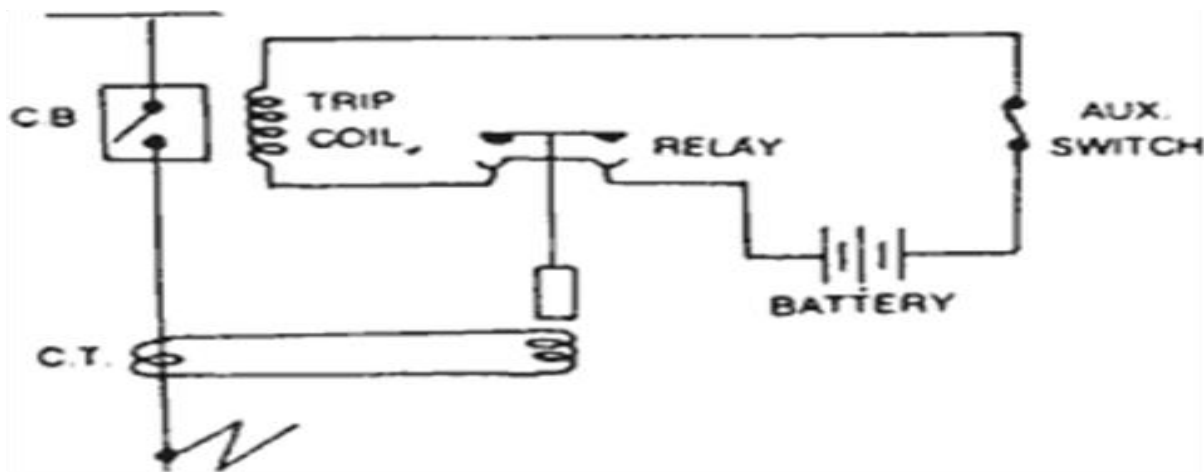


Fig 5.1: Circuit Breaker

Power which is going to the houses or workplaces or schools or businesses or to some other spots from the power circulation networks shapes an expansive circuit. Those lines which are associated

with the power plant shaping toward one side is known as the hot wire and alternate lines interfacing with ground framing opposite end. At whatever point the electrical charge streams between these two lines it creates potential between them. For the total circuit the association of burdens (machines) offers protection from the stream of charge and the entire electrical framework inside the house or ventures will work easily. They work easily as long as the apparatuses have adequately safe and don't cause any over current or voltage. The purposes behind warming up the wires are excessively charge moving through the circuit or short circuiting or sudden association of the hot end wire to the ground wire would warm up the wires, causing fire. The electrical switch will counteract such circumstances which just removed the rest of the circuit.

5.3 Different Types of Circuit Breakers

The different types of high voltage circuit breakers which includes the following

- Air Circuit Breaker
- SF6 Circuit Breaker
- Vacuum Circuit Breaker
- Oil Circuit Breaker
- Air Circuit Breaker

5.3.1 Air Circuit Breaker

This electrical switch will work noticeable all around; the extinguishing medium is an Arc at climatic weight. In a significant number of the nation's air electrical switch is supplanted by oil electrical switch. About oil electrical switch we will talk about later in the article. Hence the significance of ACB is as yet best decision to utilize an Air electrical switch up to 15KV. This is on the grounds that; oil electrical switch may burst into flames when utilized at 15V

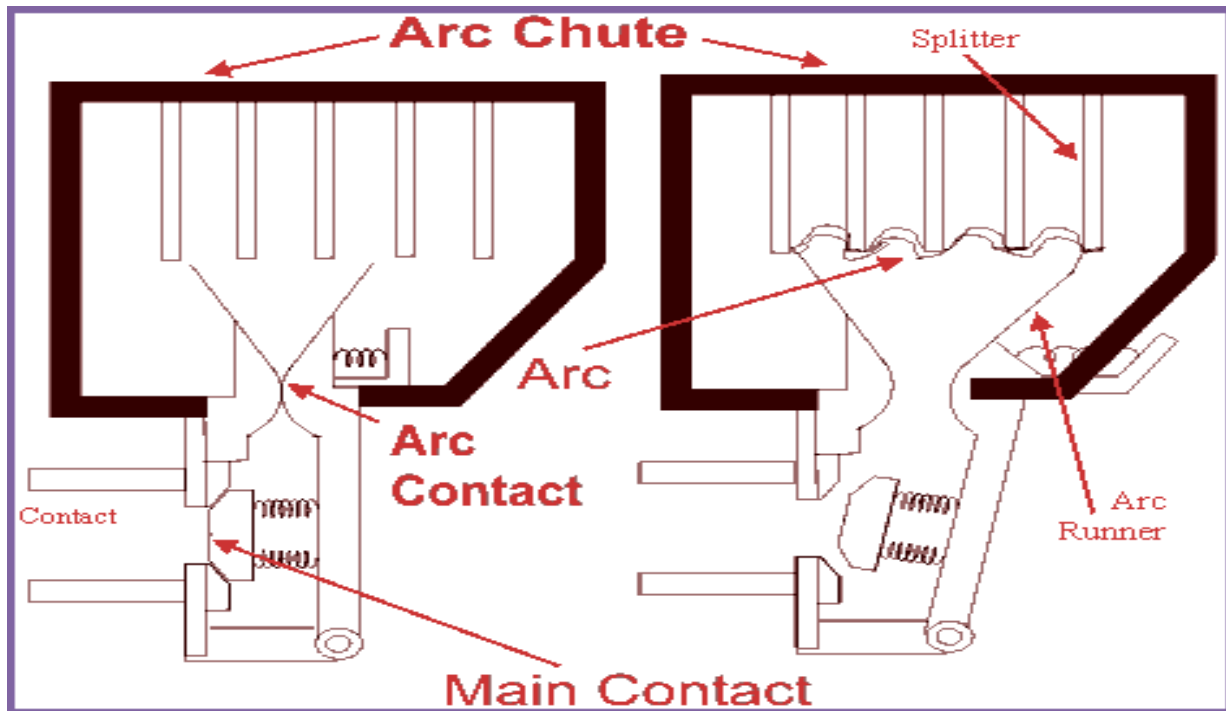


Fig 5.2:-Air Circuit Breaker

5.3.2 Air Blast Circuit Breaker

Air blast circuit breakers are used for system voltage of 245 KV, 420 KV

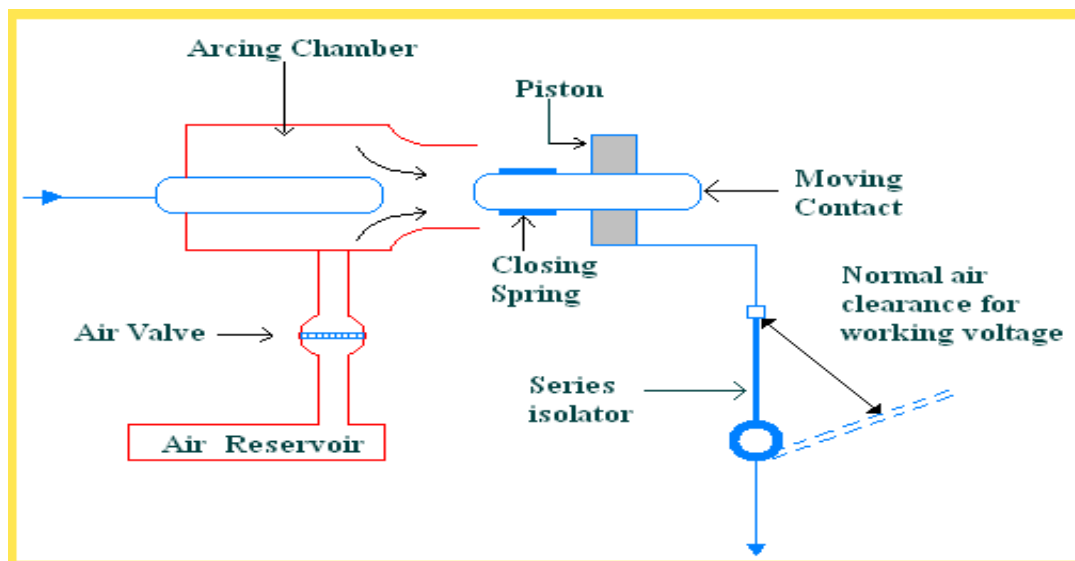


Fig 5.3:-Air Blast Circuit breaker

Preferences of Air-Blast Circuit Breaker

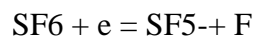
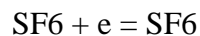
- It is utilized where visit activity is required in light of lesser curve vitality.
- It is sans hazard from flame.
- Small in size.
- It requires less support.
- Arc extinguishing is a lot quicker
- Speed of electrical switch is a lot higher.
- The time length of the circular segment is same for all estimations of current.

Detriments of Air-Blast Circuit Breaker

- It requires extra upkeep.
- The air has generally bring down circular segment quenching properties
- It contains high limit air blower.
- From the air pipe intersection there might be a shot of pneumatic stress spillage
- There is the shot of a high rate ascent of re-striking current and voltage cleaving.

5.3.3 SF6 Circuit Breaker

In the SF6 electrical switch the flow conveying contacts work in sulfur hexafluoride gas is known as a SF6 electrical switch. It is an astounding protecting property and high electro-cynicism. It very well may be comprehended that, high proclivity of retaining free electron. The negative particle is framed when a free electron slams into the SF6 gas atom; it is consumed by that gas atom. The two distinctive methods for connection of electron with SF6 gas atoms are



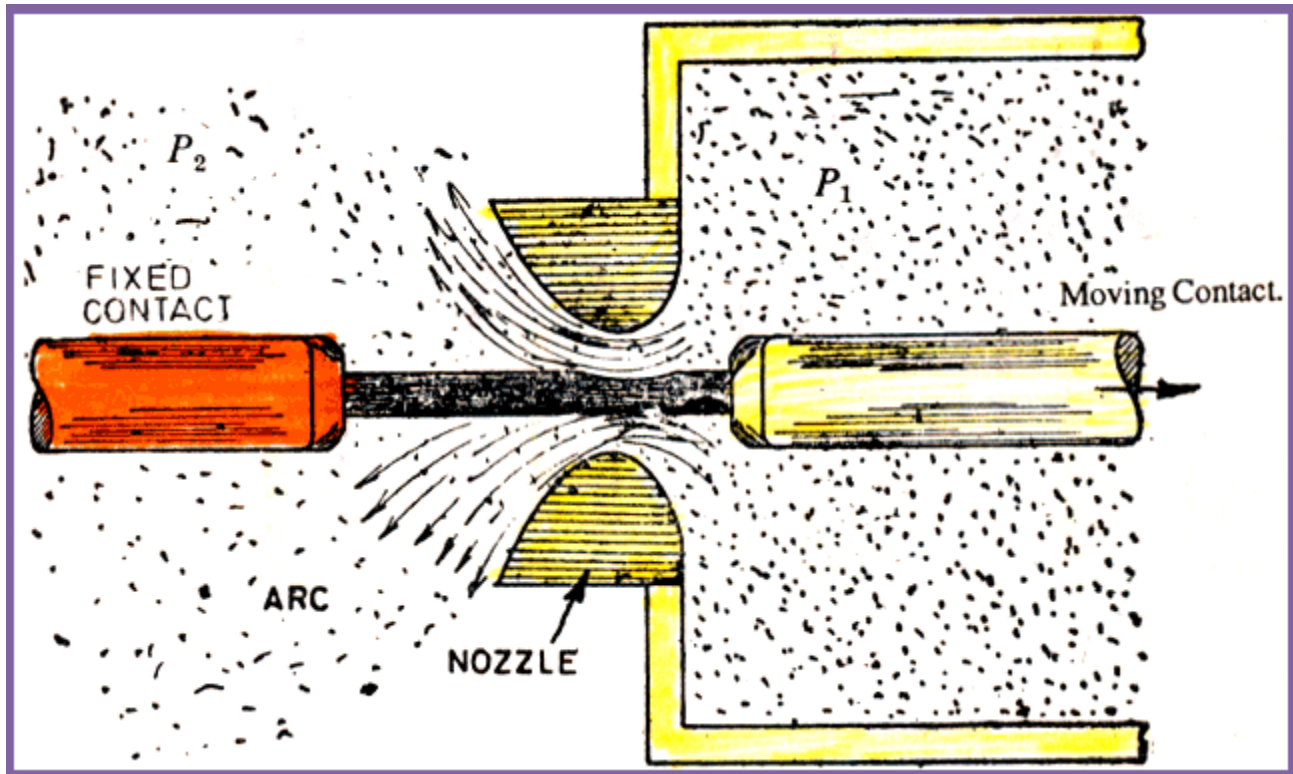


Fig 5.4:-SF6 Circuit Breaker

The negative particles which are shaped will be a lot heavier than a free electron. Consequently, when contrasted and other basic gases generally speaking portability of the charged molecule in the SF6 gas is substantially less. The versatility of charged particles is significantly in charge of leading current through a gas. Thus, for heavier and less versatile charged particles in SF6 gas, it secures high dielectric quality. This gas great warmth exchange property on account of low vaporous thickness. SF6 is multiple times more powerful in circular segment extinguishing media than air electrical switch. It is utilized for both medium and high voltage electrical power framework from 33KV to 800KV.

5.3.4 Vacuum Circuit Breaker

A Vacuum electrical switch is a circuit which vacuum is utilized to terminate the curve. It has dielectric recuperation character, magnificent interference and can intrude on the high recurrence flow which results from circular segment unsteadiness, superimposed hanging in the balance recurrence flow.

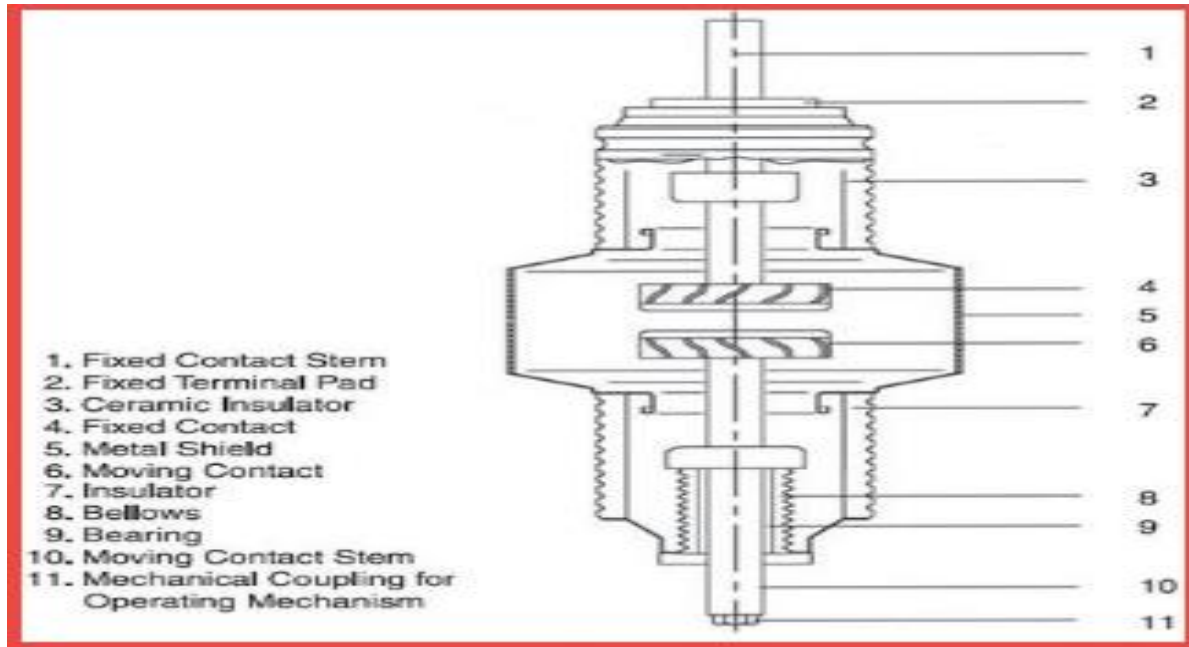


Fig 5.5:-Vacuum Circuit Breaker

In the guideline of activity of VCB will have two contacts called cathodes will stay shut under typical working conditions. Assume when a blame happens in any piece of the framework, at that point the outing curl of the electrical switch gets invigorated lastly contact gets isolated. The minute contacts of the breaker are opened in vacuum, i.e. 10^{-7} to 10^{-5} Torr a bend is delivered between the contacts by the ionization of metal vapors of contacts. Here the bend rapidly gets quenched, this happens on the grounds that the electrons, metallic vapors and particles delivered amid circular segment, consolidate rapidly on the surface of the CB contacts, bringing about snappy recuperation of dielectric quality.

Focal points

- VCBs are dependable, smaller and long life
- They can interfere with any blame current.
- There will be no fire dangers.
- No commotion is created
- It has higher dielectric quality.
- It requires less power for control activity.

5.3.5 Oil Circuit Breaker

In this sort of electrical switch oil is utilized, however mineral oil is best. It acts preferred protecting property over air. The moving contact and settled contact are immersed inside the protecting oil. At the point when the detachment of current happens, at that point bearer contacts in the oil, the curve in electrical switch is introduced right now of division of contacts, and as a result of this circular segment in the oil is vaporized and decayed in hydrogen gas lastly makes a hydrogen rise around the bend. This exceptionally compacted gas rise around and circular segment counteracts re-striking of the curve after current achieves zero intersection of the cycle. The OCB is the most seasoned sort of circuit breakers.

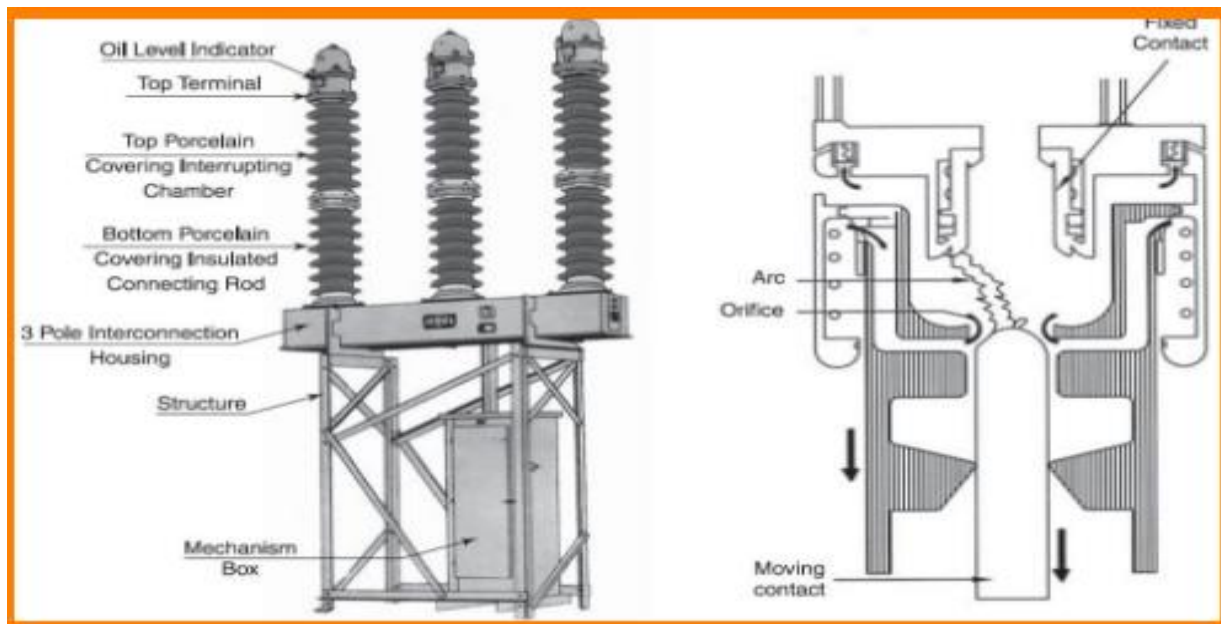


Fig5.6:-Oil Circuit Breaker

Points of interest

- Good cooling property as a result of decay
- Oil has high dielectric quality
- It acts like a cover among earth and live parts.
- The oil utilized here will assimilate curve vitality while deteriorating

Drawbacks

- It won't allow rapid of interference
- It takes long arcing time.

Chapter-6

Protective relay

6.1 Introduction

Transformers are the basic confirmation and furthermore trading devices in most of the control methodology or supplies. Every one of the exchanges respond to no less than one electrical sums like voltage or stream with the ultimate objective that they open or close the contacts or circuits. An exchange is a trading device as it endeavors to separate or change the state of an electric circuit beginning with one state then onto the following.



Fig:-6.1 Different types of relays

6.2 Distinctive Types of Relays

Request or the sorts of exchanges depend upon the limit with respect to which they are used. A part of the characterizations fuse cautious, reclosing, controlling, associate and watching exchanges. Cautious exchanges reliably screen these parameters: voltage, current, and control; and if these parameters maltreatment from set limits they deliver alert or isolate that explicit circuit. These sorts of exchanges are used to guarantee supplies like motors, generators, and transformers, and so forth.

Reclosing exchanges are used to relate diverse sections and contraptions inside the system sort out, for instance, synchronizing process, and to restore the distinctive devices not long after any electrical accuse vanishes, and a while later to interface transformers and feeders to line orchestrate. Coordinating exchanges are the switches that contacts with the true objective that voltage ups as because of tap advancing transformers. Colleague contacts are used in circuit breakers and other cautious kinds of apparatus for contact increase. Checking exchanges screens the system conditions, for instance, heading of force and as necessities be makes the alarm. These are also called directional exchanges. This present article's guideline point is to give a brief idea with respect to various exchanges that are used for a wide grouping of control applications. A bit of these exchanges are portrayed underneath. Dependent upon the working rule and fundamental features exchanges are of different sorts, for instance, electromagnetic exchanges, warm exchanges, control vacillated exchanges, multi-dimensional exchanges, and so forth, with changed assessments, sizes and applications.

1. Electromagnetic Relays

These exchanges are created with electrical, mechanical and alluring parts, and have working twist and mechanical contacts. In this manner, when the circle gets instituted by a supply structure, these mechanical contacts gets opened or close. The sort of supply can be AC or DC.

2. DC versus AC Relays

Both AC and DC exchanges tackle unclear standard from electromagnetic enrollment, yet the improvement is genuinely isolated and besides depends upon the application for which these exchanges are picked. DC exchanges are used with a freewheeling diode to de-engage the circle, and the AC exchanges uses secured focuses to prevent twirl current mishaps. or the sorts of transfers rely upon the capacity for which they are utilized. A portion of the classifications incorporate defensive, reclosing, controlling, assistant and observing transfers. Defensive transfers consistently screen these parameters: voltage, current, and control; and if these parameters abuse from set breaking points they produce caution or seclude that specific circuit. These sorts of transfers are utilized to ensure supplies like engines, generators, and transformers, etc.

Reclosing transfers are utilized to associate different segments and gadgets inside the framework organize, for example, synchronizing process, and to reestablish the different gadgets not long after any electrical blame vanishes, and afterward to interface transformers and feeders to line arrange. Directing transfers are the switches that contacts with the end goal that voltage helps up as on account of tap evolving transformers. Assistant contacts are utilized in circuit breakers and other defensive types of gear for contact augmentation. Checking transfers screens the framework conditions, for example, heading of intensity and as needs be creates the alert. These are additionally called directional transfers. This present article's principle point is to give a concise thought regarding different transfers that are utilized for a wide assortment of control applications. A portion of these transfers are depicted beneath. Contingent upon the working guideline and basic highlights transfers are of various sorts, for example, electromagnetic transfers, warm transfers, control fluctuated transfers, multi-dimensional transfers, etc, with changed evaluations, sizes and applications.

1. Electromagnetic Relays

These transfers are developed with electrical, mechanical and attractive parts, and have working curl and mechanical contacts. Thusly, when the loop gets enacted by a supply framework, these mechanical contacts gets opened or shut. The kind of supply can be AC or DC.

2. DC versus AC Relays

Both AC and DC transfers take a shot at indistinguishable standard from electromagnetic enlistment, yet the development is fairly separated and furthermore relies upon the application for which these transfers are chosen. DC transfers are utilized with a freewheeling diode to de-empower the loop, and the AC transfers utilizes covered centers to forestall swirl.

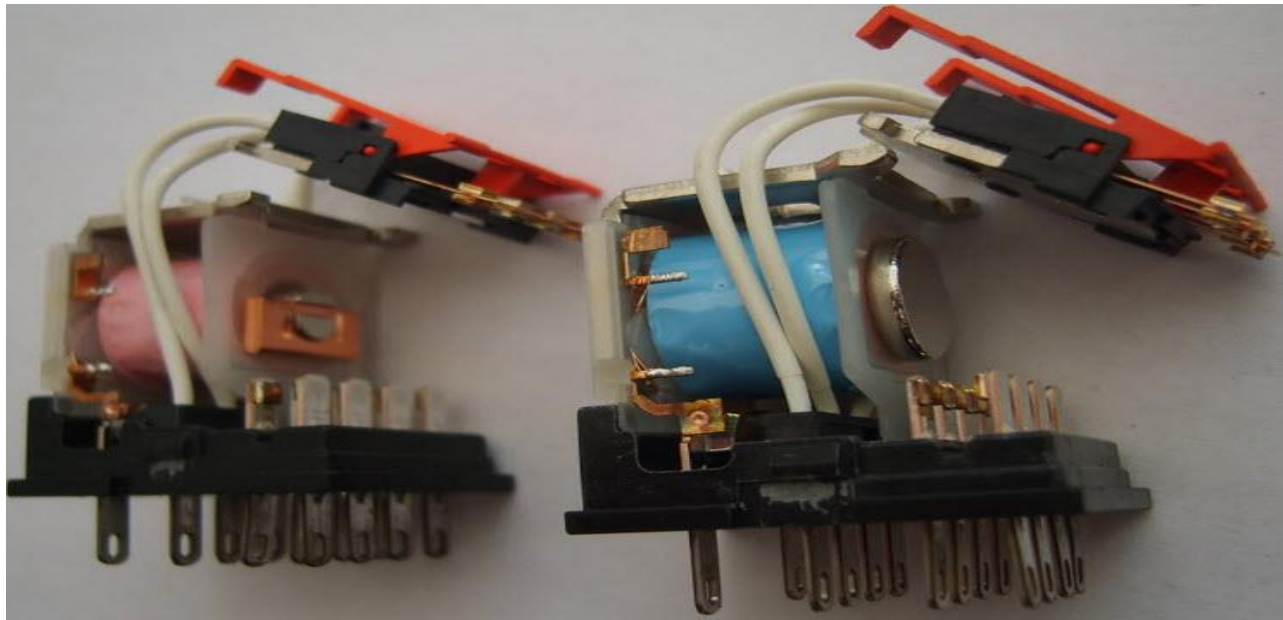


Fig 6.2:-DC versus AC Relays

The exceptionally intriguing part of an AC is that for each half cycle, the bearing of the present supply changes; in this manner, for each cycle the loop loses its attraction since the zero current in each half cycle makes the transfer consistently make and break the circuit. In this way, to keep this – furthermore some shaded curl electronic circuit is put in the AC hand-off to give attraction in the zero current position.

6.3 Attraction Type Electromagnetic Relays

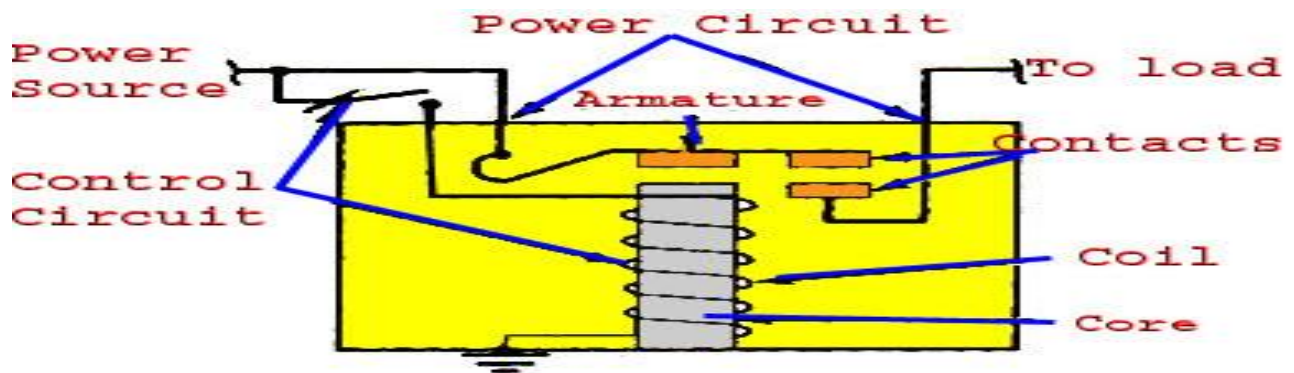


Fig 6.3:-Attraction Type Relays

These transfers can work with both AC and DC supply and pull in a metal bar or a bit of metal when control is provided to the loop. This can be a plunger being drawn towards the solenoid or an armature being pulled in towards the shafts of an electromagnet as appeared in the figure. These transfers don't have whenever delays so these are utilized for immediate task.

6.4 Enlistment Type Relays

These are utilized as defensive transfers in AC frameworks alone and are usable with DC frameworks. The activating power for contacts development is created by a moving conductor that might be a plate or a glass, through the association of electromagnetic motions because of blame flows

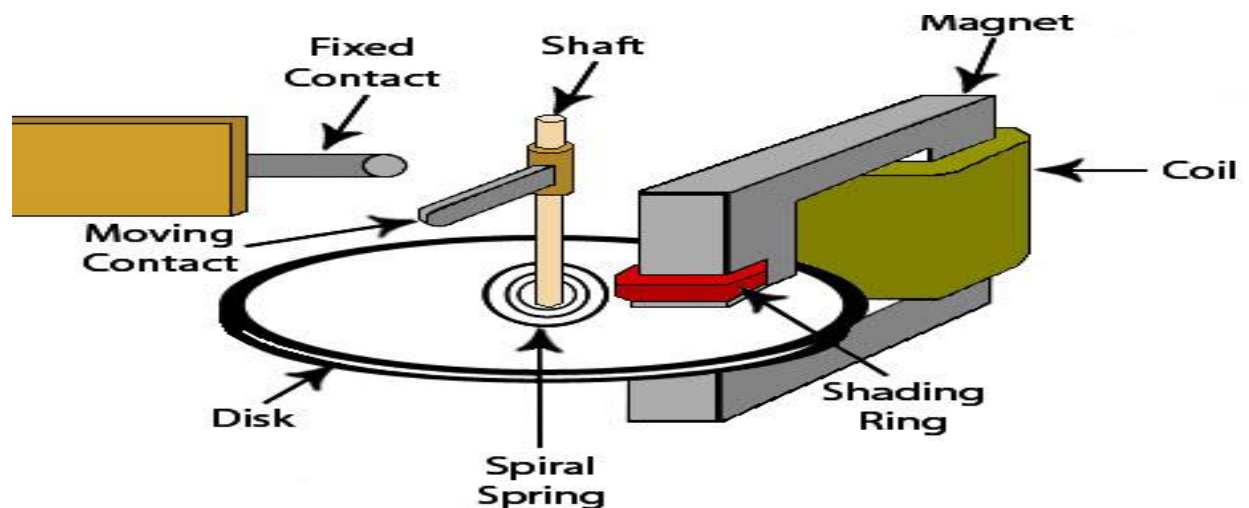


Fig 6.4:-Enlistment Type Relays

These are of a few kinds like shaded shaft, watt-hour and enlistment glass structures and are for the most part utilized as directional transfers in power-framework security and furthermore for fast exchanging task applications.

6.5 Attractive Latching Relays

These transfers utilize perpetual magnet or parts with a high settlement to remain the armature at indistinguishable point from the loop is zapped when the curl control source is removed.

6.6 Solid State Relays

Strong State utilizes strong state segments to play out the exchanging task without moving any parts. Since the control vitality required is much lower contrasted with the yield control with be controlled by this hand-off that outcomes the power increase higher when contrasted with the electromagnetic transfers. These are of various sorts: reed transfer coupled SSR, transformer coupled SSR, photograph coupled SSR, etc.

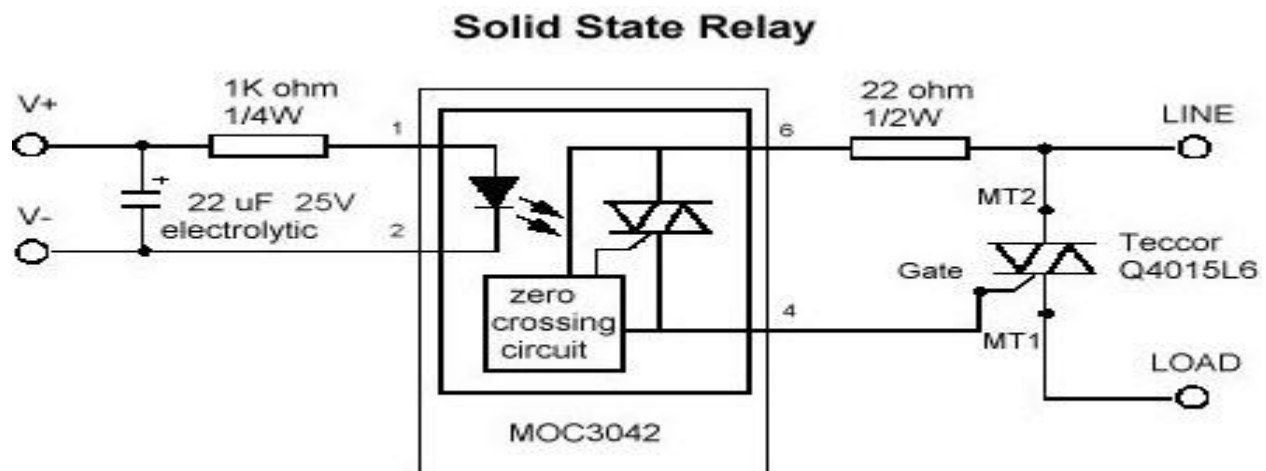


Fig 6.5:-Solid State Relays

The above figure demonstrates a photograph coupled SSR where the control flag is connected by LED and it is identified by a photograph touchy semiconductor gadget. The yield frame this photograph indicator is utilized to trigger the entryway of TRIAC or SCR that switches the heap.

6.7 Half and half Relay

These transfers are made out of electromagnetic transfers and electronic parts. More often than not, the information part contains the electronic hardware that performs correction and the other control capacities, and the yield part incorporate electromagnetic hand-off.

6.9 Reed Relay

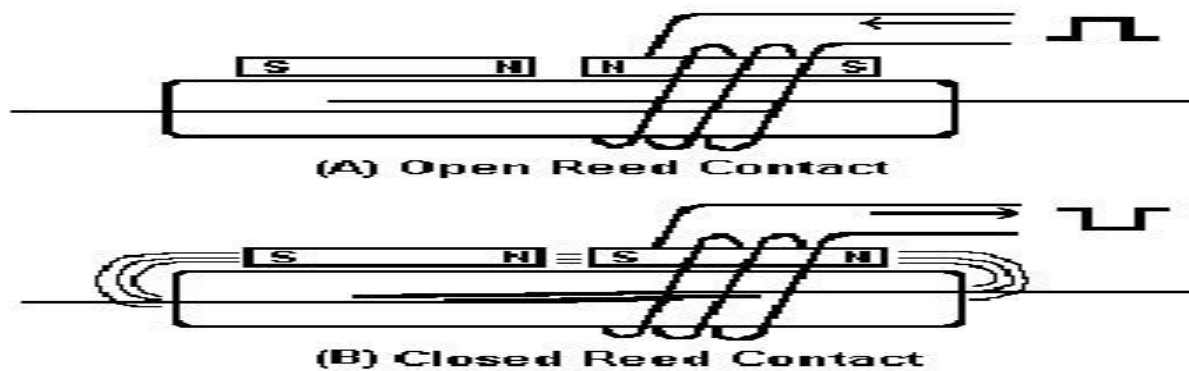


Fig 6.6:-Reed Relay

Reed Relays comprise of a couple of attractive strips (additionally called as reed) that is fixed inside a glass tube. This reed goes about as both an armature and a contact cutting edge. The attractive field connected to the curl is folded over this cylinder that makes these reeds move with the goal that exchanging task is performed. In light of measurements, transfers are separated as miniaturized scale smaller than usual, subminiature and little transfers. Likewise, in light of the development, these transfers are named hermetic, fixed and open sort transfers. Besides, contingent upon the heap working extent, transfers are of miniaturized scale, low, halfway and high power types. Transfers are additionally accessible with various stick designs like 3 stick, 4 stick and 5 stick transfers. The manners by which these transfers are worked is appeared in the beneath figure. Exchanging contacts can be SPST, SPDT, DPST and DPDT types. A portion of the transfers are typically open (NO) type and the other are regularly shut (NC) types.

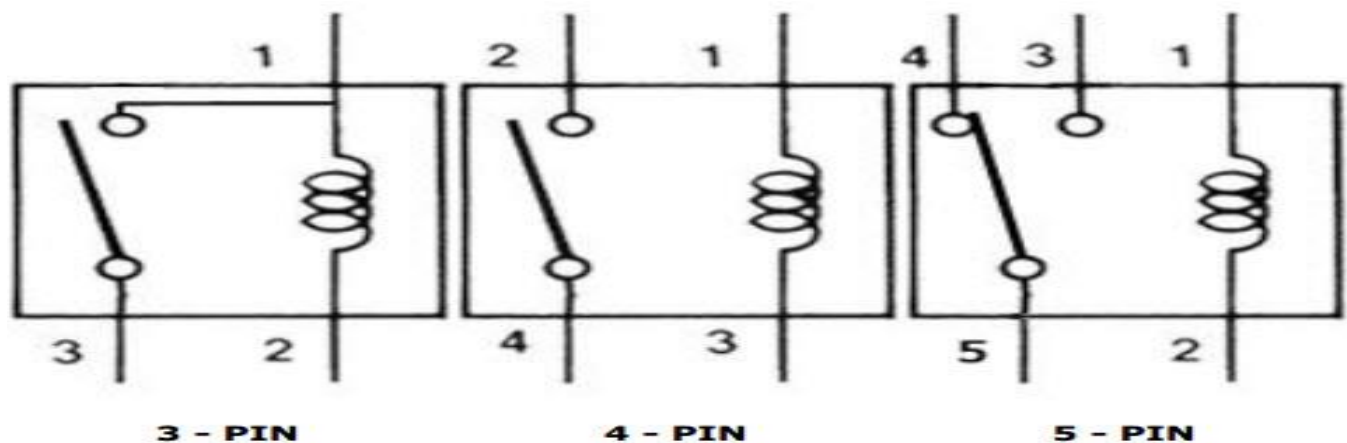


Fig 6.7:-Relay pin configurations

These are a portion of the distinctive kinds of transfers that are utilized in the vast majority of the electronic and also electrical circuits. The data about the diverse kinds of transfers fills perusers' need and we trust that they will locate this essential data exceptionally helpful. Considering the gigantic centrality of transfers with zvs in circuits, this specific article on them merits its perusers' criticism, questions, recommendations and remarks. In this manner, perusers can post their remarks here.

Chapter-7

Conclusion

7.1 Discussion

We have put in some astounding days at DPDC amid our entry level position program. DPDC is outstanding amongst other down to earth reason for the Electrical and Electronic Engineers in our nation. We should state the speculations that we have learned at our University was for all intents and purposes seen by us at DPDC. We see ourselves as particularly fortunate to have our entry level position program with a presumed power dispersion organization like DPDC. It allowed us a chance to actualize our hypothetical information in for all intents and purposes. Our accomplishments from DPDC are as per the following:

- Industrial preparing given by DPDC has improved our handy information.
- It has augmented our reasoning limit about down to earth activities of the distinctive gear.
- It has expanded our certainty level for confronting prospective employee meet-up in future.
- DPDC gave us a special affair of watching the hardware of substation.

The well-disposed condition in DPDC energized us to co-work with one another. We have taken in a great deal and got reasonable learning amid our temporary position at DPDC which will help us in future life.

7.2 Problems

We have officially assembled some learning about DPDC's down to earth activities. Yet, inside the constrained time it was extremely troublesome undertaking to assemble the entire learning about everything. Because of some security issue we couldn't get enough pictures and enough gets to each place. Because of some mechanical blame, it was extremely a troublesome errand to visit and accumulate some information around three of our exhorted substation. Around then because of the regular support at Ullon 33/11KV Sub-station; it was impractical for me to think about the coolers of the matrix. Because of some specialized issues I couldn't watch the single transport bar of Madartek (local) 33/11KV Sub-station.

7.3 Recommendation

Our assets are restricted, yet the correct use of this assets by the talented and prepared labor can help the improve utilization of this assets. So DPDC ought to be increasingly watchful about framework misfortune which can assist them with achieving the worthy misfortune levels.

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