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Design of 132/33KV Substation

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ABSTRACT

The project work assigned to us was to design a 132/33 KV EHV sub-station. We considered incoming power at 132 KV and the power was transferred to main bus through isolator-circuit breaker-isolator combination. The power from main bus was fed into a 20MVA transformer which stepped the voltage down to 33KV. The power is then fed into a 33KV bus from which different loads were tapped. In the process, the surge impedance loading of 132 KV and 33 KV lines were calculated and they were used to estimate the maximum power that can be transferred by one transmission line. The design of the entire substation was made keeping in mind the most basic requirements of a proper substation including the civil and domestic requirements. The design is then submitted to our mentor for verification

KEYWORDS: *1) Bus bar 2) Control Cable 3) Earthing 4) Insulation-Coordination 5) Insulator 6) Isolator 7) Lightning Arrester 8) Power Transformer 9) Sub-Station 10) Switchgear*

I. INTRODUCTION

The work designated to the students was to design a 132KV/33KV EHV sub-station. The work was carried out under Prof. S. Pal, H.O.D.- EE dept., Techno India. Any sub-station which handles power at over 33KV is termed as extra High Voltage sub-station by the rules implemented by Indian government. The design process of an EHV sub-station begins with very elemental work of selection of site and estimation of requirements which includes capital and material. It is also needed to keep in mind, the civil aspects of a sub-station design.In India about 75% of electric power used is generated in thermal and nuclear plants, 23% from mostly hydro station and 2% comes from renewable and other resources. The distribution system supplies power to the end consumer, while the transmission system connects between the generating stations and distribution system through transmission line. The entire network forms a power grid and each power grid across the country is interconnected which facilitates uninterrupted supply.

While designing a power grid the following aspects must be taken into consideration:

- ✓ Low capital cost.
- ✓ Reliability of the supply power.
- ✓ Low operating cost
- ✓ High efficiency
- ✓ Low cost of energy generation.
- ✓ Simplicity of design.
- ✓ Reserve capacity to meet future requirements

Starting from the generating stations to the end users, voltage is needed to be stepped up and down several times in various substations. This ensures efficient transmission of power, minimizing the power losses. Our project is to design a 132KV/33KV EHV sub-station where the incoming power is received at 132 KV from a generating station. The power factor is corrected here and the voltage is stepped down to 33KV and power is then transferred to distribution system of the grid to meet the requirements of the end consumers at their suitable voltage.

II. A DESIGN LAYOUT OF 132/33 KV, 200 MW SUB-STATION

The sub-station is connected with three substations or load viz. A (3.2 mw), B (3.2MW) and C (3.2MW) at 33KV and D (36MW) at 132 KV. The generated 16.2 KV is stepped up to 132 KV and is supplied to the 132KV sub-station through two double circuit transmission lines. After analyzing the requirements of the loads & SIL of transmission lines the whole arrangements are done in the following way:

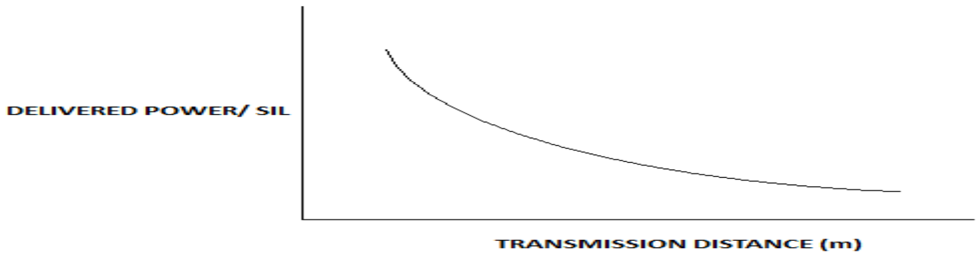
2.1 Assumptions

- The value of surge impedance of transmission lines under consideration = 325 Ω
- Total load requirement = 3.2 MW + 3.2 MW + 3.2 MW + 36 MW
- The distance between the substation & the neighboring generating station is 50km.

The SIL of 132 KV line = $(132KV)^2/325$ = 53.61 = 54 MW (approx)

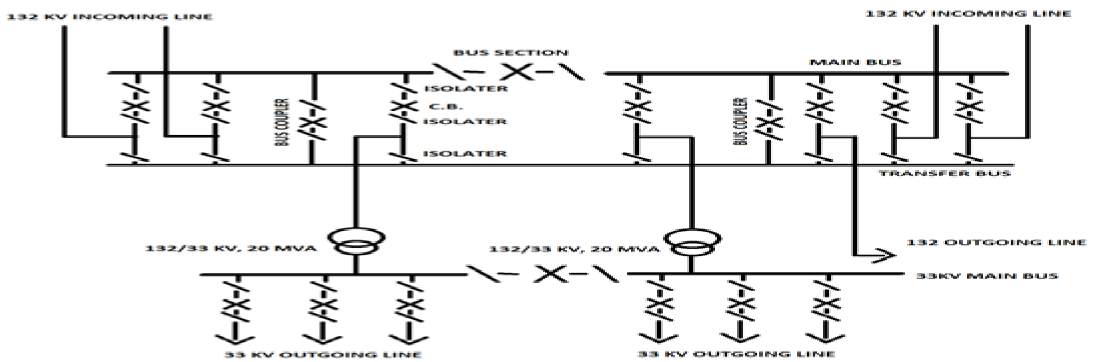
The SIL of 33 KV line = $(33KV)^2/325$ = 3.35 = 3.5 MW (approx)

Observing the total load demand, the input to the substation must be greater than the requirement. So one double circuit 132KV transmission lines (54 X 2 = 108 MW) only can satisfy this. The second double circuit tower is constructed keeping in mind the future load demand increase. The lines first supply the power to the 132KV bus A of the sub-station. As the distance between the substation and the generating station is only 50km, the SIL can increase to 1.2 times of the theoretical value. Hence the input of the substation can be as high as (108 X 1.2) MW i.e. almost 130 MW.



THE CHARACTERISTICS CURVE OF
DELIVERED POWER/SIL Vs. TRANSMISSION DISTANCE

(The curve is closely applicable in determining transmission line loading based on transient stability & also steady state stability for operating voltages between 66 & 500KV) For load A, B and C it is suitable to step down the incoming 132KV voltage to 33KV. Hence power transformers of rating (132/33KV, 20 MVA are used). Another transfer of same rating is installed to meet future increase in demand. On the other hand, a double circuit line from 132 KV bus A is useful to serve the load D.33 KV is supplied to load A, B and C through one double circuit transmission lines (SIL capacity 3.5 X 2 = 7 MW) and to load D through one double circuit transmission lines(SIL capacity 54 X 2 = 108 MW) where actually one circuit will be left for emergency or maintenance reason.The stepped down 33KV is further stepped down to 11KV and then finally to 440V to meet the demand of local station loads.A transfer bus is installed in the system for providing provision for maintenance of the main bus.



SUB STATION LAYOUT

III. DESIGN OF EARTH-MAT

3.1.Calculation

Fault current = 40KA

Fault duration = 1.0 sec

Soil resistivity = 10 ohm

Depth of burial = 0.6 M

Earth electrode = 40 mm dia. G.I. pipe, 3 M long

Earth mat conductor = M.S. Round

Riser = G.I. strip

Minimum cross-section of grounding conductor having required thermal stability can be calculated by using the formula,

Amin = required conductor section

If =fault current in Amps

t = time in sec for operation of protection relay

c = constant which is equal to 70 for M.S.round

Hence Amin = (4000x√1)/70=571 mm^2

Next standard size M.S. round =32 mm (diameter)

Considering soil resistivity for conductor sizing as 10 ohm-M, correction factor is taken as 1.3

Hence cross-section area of each conductor with correction = 1.3x571 mm^2 = 742 mm^2

Or, (∏/4)*(dia. Of conductor) = 742 mm^2

Or, diameter of the conductor = 30.74 mm^2

Nearest standard size is 32 mm diameter

For riser connection above ground, no tolerance is required.

Hence selected size of M.S flat = 75x8 mm

Calculation of Tolerable Touch & Step Potential

The reduction factor Cs can be approximately by the equation,

Cs = 1-[0.9(1-(P/Ps))/(2hs+0.09)]

Where, P = soil resistivity = 10 diameter

Ps = surface layer resistivity = 2500 ohm-m

hs = surface layer thickness = 0.1 meter

Hence, Cs = 1-[{0.9x(1-(10/2500))}/(2x0.1+0.09)]

= 1-(0.08964/0.2)

=0.691

Following operation can be used to compute the tolerable touch and step voltages respectively:

Etouch = (1000+1.5xCs.Ps)x0.116/√ts

Where, ts =duration of shock for determining allowable body current

= 1 sec.

Hence, Etouch = (1000+1.5x0.691x2500)x0.116/√1

= 416.59 volts

Estep = (1000+6.0xCsxPs)x0.116/√ts

= (1000+6.0x0.691x2500)x0.116/√1

=1318.34 volts

3.2.Determination of grid resistance:

The equivalent length of earth-mat area (L) = 300M

The equivalent width of earth-mat area (W) = 250M

No. of conductors along length (NL) = 16

No. of conductors along width (NW) = 20

Minimum no of electrodes = fault current/500= 80

Keeping a margin of 50% extra, no. of electrodes (N) = 1.5x80= 120

Length of individual electrode (Lr) = 3

Hence, LT=Lc+LR=(LxNL+WxNW)+(NrxLr)

Or, LT = (3000x16+250x20) + (120x3)

= 10160 m

Total area of earth-mat (A) = 75,000 m^2

3.3.Safety Check

For the safe earthing design, attainable step and touch voltage should be less tolerable values respectively.

Volt	Attainable	Tolerable
Touch Voltage	12.5	416.59
Step Voltage	36.72	1318.34

The attainable touch as well as step voltage is well below tolerable limit. Hence the design is safe

3.4.Earthing

Earthing means that, making a connection to the general mass of the earth. The use earthing is so widespread in an electrical system that at particular every point in the system, from the generators to the consumer equipment, earth connections are made.

The subject of earthing may be divided into

1.1 Neutral Earthing
1.2 General Earthing

IV. INSULATION COORDINATION

Insulation co-ordination is the process of determining the proper insulation levels of various components in a power system as well as their arrangements. It is the selection of an insulation structure that will withstand voltage stresses to which the system or equipment will be subjected to, together with the proper surge arrester. The process is determined from the known characteristics of voltage surges and the characteristics of surge arrester. Its final objective is to ensure safe, optimized distribution of electric power. By optimized is meant finding the best possible economic balance between the various parameters depending on this co-ordination: n cost of insulation, n cost of protective devices, n cost of failures in view of their probality.

V. DESIGN OF BUS BARS

Bus bars are Cu/Al rods of thin walled tubes and operate at constant voltage. The bus-bars are designed to carry normal current continuously. The cross section of conductors is designed on the basis of rated normal current and the following factors: System voltage, position of sub-station. Flexibility, reliability of supply and cost. Our design must ensure easy and uninterrupted maintenance, avoiding any danger to the operating of operating personnel. It must be simple in design and must possess provision for future extension. Any fluctuation of load must not hinder its mechanical characters. The sub-station bus bars are broadly classified in the following three categories:

1.3 Outdoor rigid tubular bus-bars.
1.4 Outdoor flexible ACSR or Al alloy bus-bars.
1.5 Indoor bus bars.

In our substation, we have chosen ONE MAIN BUS AND ONE TRANSFER BUS system. The buses are coupled using a bus-coupler which facilitates load transfer while maintenance and fault conditions.

Load catered = 200 MW

Voltage = 132 KV

Rated current is taken to be I ampere, we get

$P = \sqrt{3}\ VI \cos\varphi$

We take power factor as 0.9

= 971.97 ampere

Going by the rated current that is required to be catered and keeping in mind the future provision of load we chose twin moose conductor for the purpose of main bus and normal single moose and normal moose for transfer bus.

VI. INSULATORS

The insulators serve two purposes. They support the conductors (or bus-bars) and confine the current to the conductors. The most commonly used material for the manufacture of insulator is porcelain. There are several type of insulators, and their use in the sub-station will depend upon the service requirement. The main four types of insulators are as follows:

8.1 Pin Type Insulators
8.2 Suspension Type Insulators

8.3 Strain Insulators
8.4 Shackle Insulators

VII. CIRCUIT BREAKER

Circuit breakers are a piece of electrical device that
9.1 Make or break a circuit either manually or by remote control under normal conditions.
9.2 Break a circuit automatically under fault conditions.
9.3 Make a circuit either manually or by remote control under fault conditions.

Classification of Circuit Breakers:

The most common method of classification of circuit breakers is on the basis of medium used for arc extinction. Accordingly they are classified as:

1.5.1 Oil circuit-breaker.
1.5.2 Air-blast circuit breaker.
1.5.3 Sulphur hexafluoride circuit breakers.
1.5.4 Vacuum circuit breakers.

Relays

A protective relay is a device that detects the fault and initiates the operation of the circuit breaker to isolate the defective element from the rest of the system. The relay constantly measures the electrical quantities which are different under normal and fault condition. Having detected the fault the relay operates to close the trip circuit of the breaker. The trip circuit is operated by a direct voltage. A relay must be highly selective to the normal and fault conditions to avoid unwanted tripping. It must operate with suitable speed so that fault is eliminated before it can cause any damage. A relay must also be sensitive to work with low values of currents.

Classification of Relay

a. Electromagnetic attraction type- which operates on the principle where the relay armature is attracted by an electromagnet.
b. Electromagnetic induction type- which operates due to mutual interaction of two different fluxes which are differing at a certain phase angles, having same or different amplitude and nearly equal frequencies. The net torque that operates to rotate the induction disc is proportional to the product of the amplitudes and sine of the phase diff

Functional Relay Types

[1] Induction type over-current relay
[2] Induction type reverse power relay
[3] Distance or Impedance relay
[4] Differential relay
[5] Translay scheme

BUCHHOLZ RELAY

It is a gas actuated relay installed in a oil immersed transformers for protection against all kinds of faults. This relay is used to give an alarm in case of incipient (slow developing) faults in transformer and to disconnect the transformer from the supply in the event of severe internal faults. It is usually connected in the pipe connecting the conservator to the

Main Tank.

CURRENT TRANSFORMER

CT has a primary winding one or more turns of thick wire connected in series with the line carrying the current to be measure. The secondary consist of a large no of turns of fine wire and feeds a standard 5 amp. ammeter. It is used for the measuring and protection purpose. The secondary of current transformer should never be left open under any circumstances.

POTENTIAL TRANSFORMER

These transformers are extremely accurate ratio step down transformer s and are used in conjunction with standard low range voltmeter (100-120V) whose deflection when divided by transformation ratio, gives the true voltage on primary side. In general they are shell type. Their rating is extremely small for safety operation secondary is completely insulated from high voltage primary. Its primary current is determined by the load on secondary.

Lightning Arrester

An electric discharge between clouds and earth, between clouds or between the charge centers of the same cloud is known as lightning. It is a huge spark and takes place when the clouds are charged to such high potential with respect to earth or a neighboring cloud that the dielectric strength of neighboring medium is destroyed. A lightning may strike the power system (e.g. overhead lines, towers or sub-stations) directly and the current path may be over the insulators down to pole to the ground or it may strike indirectly, resulting from electrostatically induced charges on the conductors due to the presence of charged clouds.

Types of Lightning Arresters

The lightning arrester mainly differs in their constructional features. However they work with the same operating principle, i.e. providing low resistance path for the surges. They are mainly classified as:

[1] Rod gap arrester
[2] Horn gap arrester
[3] Multigap arrester
[4] Expulsion type lightning arrester
[5] Valve type lightning arrester

VIII. SWITCHGEAR

The term switchgear, used in association with the electric power system, or grid, refers to the combination of electrical disconnects, fuses and/or circuit breakers used to isolate electrical equipment. Switchgear is used both to de-energize equipment to allow work to be done and to clear faults downstream. Switchgear is already a plural, much like the software term code/codes, and is never used as switchgears. The very earliest central power stations used simple open knife switches, mounted on insulating panels of marble or asbestos. Power levels and voltages rapidly escalated, making open manually-operated switches too dangerous to use for anything other than isolation of a de-energized circuit. Oil-filled equipment allowed arc energy to be contained and safely controlled. By the early 20th century, a switchgear line-up would be a metal-enclosed structure with electrically-operated switching elements, using oil circuit breakers. Today, oil-filled equipment has largely been replaced by air-blast, vacuum, or SF6 equipment, allowing large currents and power levels to be safely controlled by automatic equipment incorporating digital controls, protection, metering and communications.

Switchgear Panel

Power Transformer

This is the most important component of a sub-station. The main work of a sub-station is to distribute power at a low voltage, by stepping down the voltage that it receives in its incoming lines. Power is generally transmitted over long distances at very high voltages, generally in the range of 400 KV, 200 KV or 132 KV to the sub-stations. However consumer requires power at rather low voltages, 11 KV for industries and 440 V or 220 V for domestic consumers. The sub-stations use step-down transformers to attain this voltage and then distribute this power. All the other equipment in a sub-station works only to facilitate the smooth working of the power transformer.

Control Cable

Control cables are used in substations for connecting control systems, measurements, signaling devices, protection circuits etc. rated below 1000volts. They have a copper conductor. They may have another rubber insulation or PVC insulation. Control cables have several cores, each having independent insulation.To avoid interference due to stray magnetic fields, the control cables should be properly laid and their sheath should be properly earthed.

Design of Control and Relay Panel Complete with Protection for 132/33 KV Sub station

The scope of this section covers design, engineering, manufacture, installation, testing and commissioning of control and relay panels (Complete with protective relays, measuring and indicating equipments along with visual and audible alarm, interlocking schemes) inclusive of internal wiring and external connection to various switchyard equipments.

In a 132/33 KV substation the control panels are corridor type (also called duplex type). In this type the front and rear walls are erected independent with a common cover. The sides are open except the end panels, which are provided with doors and door switch for internal illumination. In between front and rear there is adequate space to move for inspection and wiring. In this type, the protective relays are mounted on rear board and the control and indication equipments on the front panels.The standard size of individual panel is Depth – 1983mm, width- limited to 1000mm, height – 2312 mm. the corridor is 762mm wide and access doors on end panels are 1900mm high. Panels are dust, moisture and vermin proof. These are free standing, floor mounting type but grounded with foundation bolts. Cable entries to panel are from bottom. The bottom plates of the panel are fitted with removable gland plates and fixed with cable glands. The cable glands are screwed type made of brass and suitable for PVC armored cable.

Mimic Diagram

Colored mimic diagram and symbols showing exact representation of the system are provided in the front panel. Mimic diagram are made of anodized aluminum or plastic, screwed to panel. The mimic buses are generally 2mm thick; width of mimic bus is 10mm for bus bar and 7mm for other connections. Indicating lamp, one for each phase for each bus is provided on mimic of bus coupler panel to indicate bus charged condition.

Color scheme for mimic diagram

VOLTAGE CLASS	COLOUR	SHADE INDEX OF IS
132KV	LIGHT ORANGE	557
33KV	SIGNAL RED	537

Semaphore indicators for each earth switches, control switch width on, off indicating lamps for isolators, and discrepancy type control switch with built-in indicating lamp, flush type for circuit breakers are mounted along mimic diagram at appropriate location in panel.

DC Circuit

There shall be only one DC incoming (220V) for the C&R board through a 32AMP switch-fuse unit. One HRC fuse-unit both at positive and negative side shall be provided for the DC incomer at the bus coupler panel. The said DC incoming bus shall run continuously in the total C&R board. DC annunciation bus shall also be teed off from the incomer DC bus through 6A HRC fuse at positive and a link in the negative side with necessary DC supervision relay.
DC supply to each individual panel thus teed off and distributed within the panel as below

[1] C.B. remote and local closing through HRC fuse and link.
[2] C.B. remote and protection trip to trip coil 1 with trip circuit supervision relay through a separate HRC fuse and link.
[3] C.B. remote and protection trip to trip coil 2 with trip circuit supervision relay through a separate HRC fuse and link.
[4] Protective relay and PT selection circuit with DC supervision relay.
[5] Indication circuit through 6A HRC fuse and link.
[6] Isolator control circuit through 10A HRC fuse and link.

Bus bar protection and LBB protection DC shall be teed off from the 132KV C&R board.

AC Circuit

A 132KV single phase AC supply to the entire C&R board will be fed from AC distribution board through a 32A switch-fuse unit. The supply shall be provided in bus coupler/ bus transfer panel.AC circuit for incoming DC and annunciation DC fail alarm scheme is provided in bus coupler panel. The above bus is teed off to each panel through separate switch-fuse unit. One supervision relay for incoming AC fail with test push button and reverse flag indication shall be provided for monitoring of AC supply healthiness through DC operated fascia annunciation of bus coupler panel.

PT Secondary Supply Distributions

The bus coupler panel shall receive PT secondary volt through fuses and link provided in PT kiosk in the switchyard. Selected PT secondary supply to protective relays of each panel shall be fed through individual fuses and links. Necessary arrangement for supervision of PT secondary supply is provided.Selected PT secondary supply to metering and indicating instrument of each panel shall be fed through fuses and links.

Annunciation Scheme

Other trip and non trip alarm scheme. Fascia annunciation system has to be provided in each control panel by means of visual and audible alarm to draw attention of operator. The annunciation can be divided into the following categories
Trip annunciation
Warning annunciation

Incoming DC fail and annunciation bus DC fail alarm scheme. Bus coupler panel shall have an "incoming DC fail and annunciation bus DC fail alarm scheme" common to the entire C&R board and operate from 230V AC supply for audible and visual alarm through lamp and bell arrangement. The scheme comprises of DC supervision relay with push buttons for incoming DC supply and annunciation bus DC system, one AC operated alarm accept relays, one indication lamp, one AC operated hooter and one push button for cancellation of audible alarm.Alarm inscriptions are engraved in facial window and the same should be prominently visible when fascia light is ON.Accept reset and lamp test push buttons for acknowledgement of alarm, reset of visual indicator and checking correctness of lamps are provided below each fascia.The annunciation scheme should be such that momentary closing of any fault contacts shall cause operation of annunciation.

Trip Annunciation

Trip annunciation shall draw attention of operation when a C.B. is tripped automatically thorough relay. The audible common alarm should buzz and the visual annunciation is provided by flickering of window fascia.

Warning Annunciation

Warning annunciation is used to draw attention of operator to abnormal operating conditions of equipment for immediate action to avoid tripping of C.B. audible alarm is provided by a separate common bell with different tone and visual annunciation of flickering of fascia window.

Protection Philosophy

The philosophy of protection is to design the protection scheme for lines, transformers, bus couplers, bus transfer bay depending upon the substation layout arrangement. The scheme shall be generally based on the requirement listed below.

Line Protections

Numerical distance relay with built-in auto enclosure or in standalone mode.
Separate fault locator or included in distance relay (available in ABB make RES SII type relay).
Disturbance Recorder (may be built in with Distance Relay).
Back up directional over-current relay
Back up directional earth fault relay.

132/33KV Autotransformer Protection

Percentage biased differential protection(3winding)
Backup directional voltage potential 3element IDMT over current with high set instantaneous element
Backup directional voltage polarized earth fault relay with high set instantaneous element.
Local break up back up protection at HV side only.
Over flux protection and overload alarm at HV side.
Flag relays for internal protection of transformer like buchholz relay, winding temperature, oil temperature and pressure relief Valve

132 KV Bus Coupler Protections

Bus differential protection scheme.
Local breaker back up protection.
AC supervision relay.

DC supervision relay.
DC fail relay
3phase trip relay.

132KV Transfer Bus Bay Protections

The breaker is used for transfer of any circuit through transfer bus in case of necessity. During the period of transfer the line side CT operated protection of transferred circuit will trip the transfer bus breaker in place of respective bay circuit breaker through trip transfer switch. Normally the protection scheme provided in transfer bus bay excepting the LBB protection shall be kept in operating with the help of protection IN/OUT selector switch. However, its own protection shall be used when there is trouble in the protection system of transferred circuit.

The protection scheme of this bay will be as follows
Numerical distance protection scheme for transferred feeder protection with protection IN/OUT switch but without carrier intertripping, auto reclose relay, in-built fault locater, disturbance recorder.
Local breaker backup protection.
Backup directional IDMT overcurrent relay with protection IN/OUT switch.
Backup directional earth fault relay.

Clamps and Connectors

The role of clamps and connectors can be felt during operation of substation. Connectors of bad quality often result in outage of system and can even lead to total bus fault. The cause of failure of connector is mainly due to heating and excessive electromechanical stress. That is why, choice of materials and design of connectors are given due consideration while designing the substation.

Isolators

When carrying out inspection or repair in a substation installation, it is essential to disconnect reliably the unit or section on which the work is to be done, from all other live parts on the installation in order to ensure complete safety of the working staff. To guard against mistakes it is desirable that this is done by an apparatus which makes a visible break in the circuit. Such an apparatus is the isolating switch or ISOLATOR.Isolators used in power systems are generally three pole isolator. The three pole isolators have three identical poles. Each pole consists of two or three isolator posts mounted on fabricated supports. The conducting parts are supported on insulator posts. The conducting part consists of conducting copper or aluminum rod, fixed and moving contacts. During the opening operation the conducting rod swings apart and isolation is obtained.
The simultaneous operation of 3 poles is obtained by mechanical interlocking of 3 poles. For all 3 poles there is a common operating mechanism. The operating mechanism is manual plus one of the following

- Pneumatic mechanism
- Electric motor mechanism

Pneumatic mechanism is the primitive mechanism of isolator operation. It operates on compressed air at 8 kg/cm^2, example of this type of isolator is a TMG make isolator.But the biggest disadvantage of pneumatic operation is that the whole process is dependent on compressor plant station. In case of breakdown in compressor plant or the airline, isolator becomes dysfunctional.Now days, however motor driven isolators are put to use. These are operated by 3ϕ ac motors. In case of breakdown of electrical system, manual operation is also possible.The pneumatic operated isolators are used only where a source of compressed air is available. Motorized systems are usually simpler and less costly and hence we are using these in our design.The operating mechanism is generally mounted direct on base frame of the isolator. The actuator unit then requires a bearing and additional link rod when the system is well off the ground. Emergency manual operation is possible with all operating mechanisms, if the power fails.The operating mechanisms also incorporate actuating switches for indicating the switching position and for control and interlock purposes. Motor driven units also include contactors and control devices. The control system is arranged so that only one switching pulse is needed and the actuators switch off automatically when end position is reached. In the event of emergency manual operation safety contact interrupts the motor circuit so that simultaneous actuation from control room is not possible.
To prevent maloperation, the operating mechanism of isolators and earthing switches can be interlocked relative to each other, motorized systems electrically, compressed air systems electro-pneumatically and manual systems mechanically.

IX. CONCLUSION

In conclusion to all the mentioned design aspects of the 132/33KV sub-station there are several other factors that are needed to be considered. This includes socio-economic factor of the surrounding locality, political developments, union of workers and contractors. Economic factors become chief aspect in any project which can take a prolonged period to complete. An assumption of price hike of all the materials to a higher precision is needed to be made in order to estimate the budget of this project.The mechanical and civil designs are also an essential part of any electrical substation design. Thus a lot of other engineering brains in those fields are also employed for the construction. Experts in the field of commerce and law are also employed to meet the various challenges that may rise up. It's an overall build up that ensures huge employment of people from different fields.

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