



Sulphur Hexafluoride (SF₆) Circuit Breaker

- In SF₆ Circuit Breakers. SF₆ gas is used as an arc quenching medium.
- SF₆ circuit breakers have been found to be very effective for high power and high voltage services.
- Various types of circuit breakers (SF₆) are designed by various manufacturers ranging from 3.6 to 760 kV.

→ SF₆ gas is an electronegative gas and has a high tendency to absorb free electrons



→ The negative ions are heavier as compared to free e⁻ and they do not get sufficient energy to lead to cumulative ionization in the gas under a given electric field.

- This property give rise to a very high dielectric strength of SF₆.
- The gas has a unique property of fast recombination after the arc quenching process.

* PHYSICAL PROPERTIES:

- The gas is non-inflammable.
- The gas is colourless, odourless and non-toxic.
- High density.
- Liquification starts at low temperature which depends on pressure.
- Excellent Heat transfer properties.
- The gas is Electronegative.

* CHEMICAL PROPERTIES:

- The gas is chemically Inert. Life of metallic part contacts is longer in SF₆ gas.
- Metallic fluorides are good dielectric materials.

* Non-Puffer Type SF₆ Circuit Breaker:

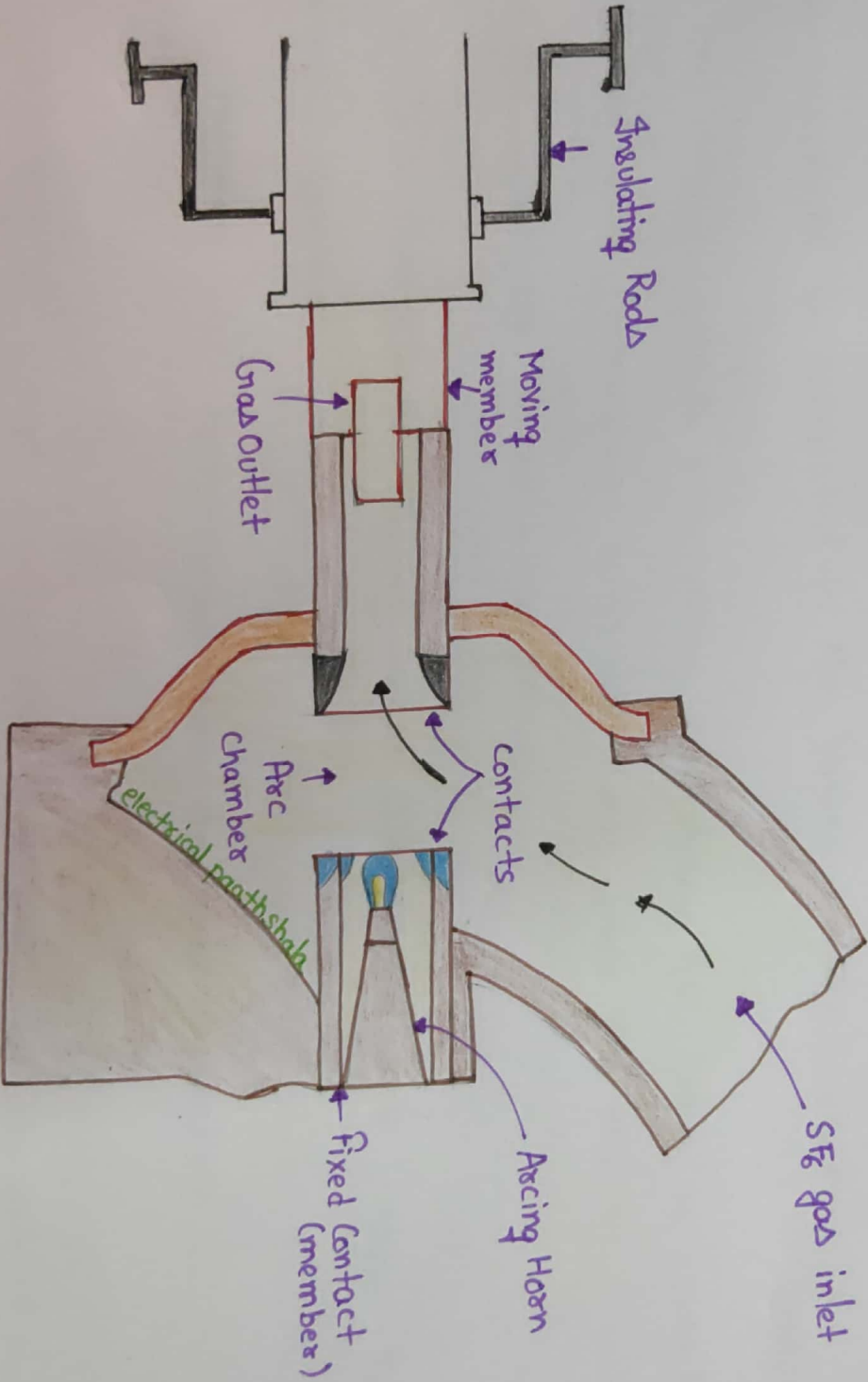


Fig: Interruption chamber of a SF₆ Circuit Breaker.

CONSTRUCTION:-

- Interruption Chamber containing SF₆ gas has fixed and moving Contacts.
- A SF₆ gas reservoir is connected to the Interruption chamber.
- Both fixed and moving contacts are hollow cylinders, Arc Horn is connected to the fixed contact and Rectangular holes are made into the moving contact to permit SF₆ gas after the interruption process.
- The tips of both contacts and Arcing Horns are coated with copper-tungsten Arc-resistant material.
- SF₆ gas is Restored and Reconditioned after the each operation.

WORKING

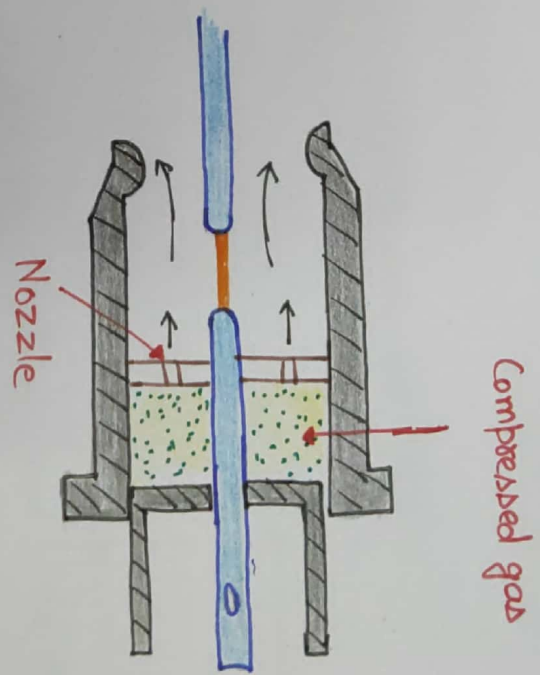
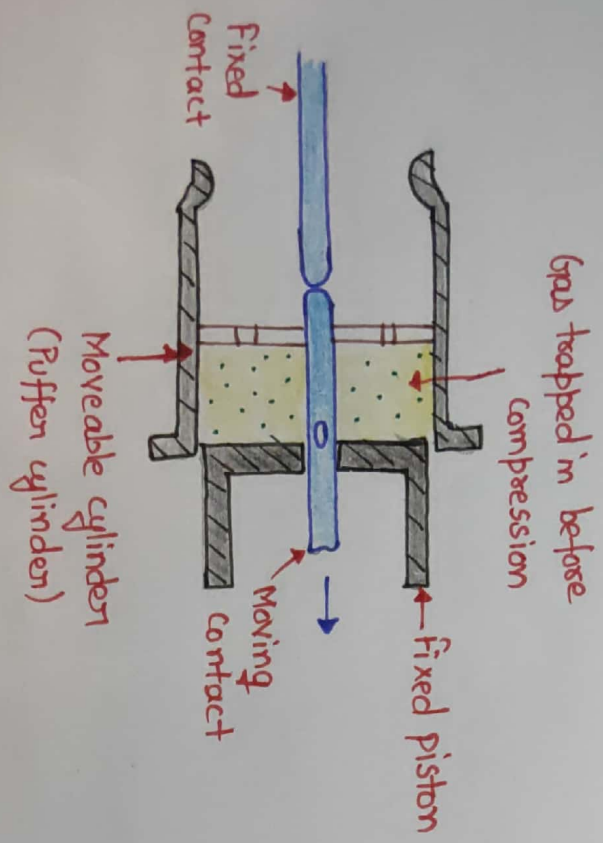
- Initially contacts are at closed position and surrounded by SF₆ gas at a pressure of about 2.8 Kg/cm².
- When there is a fault in the system then the breaker operates and moving

pulled apart and an arc is struck between them.

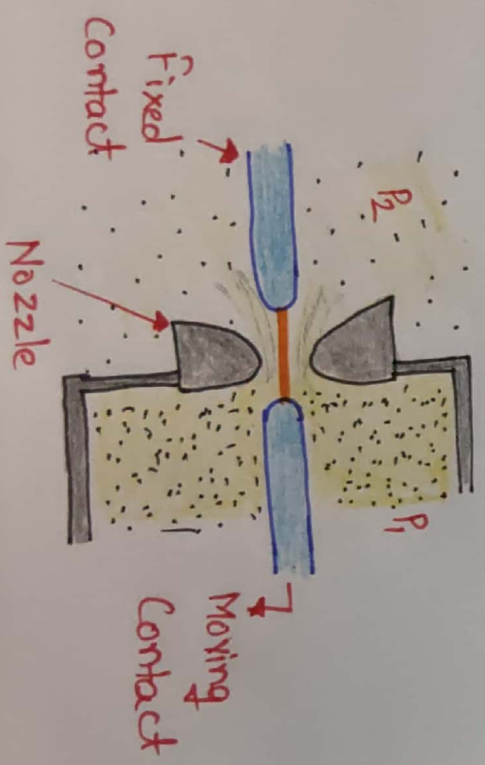
- As soon as moving contact start separating from fixed contact, the valve which is synchronized with the contact gets opened which permits SF₆ gas at 14 kg/cm² pressure to the arc interruption chamber.
- Now, SF₆ gas flow will absorb free e⁻ and create immobile negative ions which are unable to do cumulative ionization process.
- Hence, dielectric strength between the contacts and builds up rapidly and it causes the extinction of arc.
- The Valve is closed with the action of a set of springs after the breaker operation.
- The gas moves out of the interruption chamber through the holes of moving contacts and then reconditioned with suitable methods.

ELECTRICAL PAATHSHALA

* Single Pressure Puffer Type Circuit Breaker:



* Double Pressure Puffer Type SF₆ Circuit Breaker:



$$P_1 > P_2$$

* ADVANTAGES :

- No Risk of fire as the gas is non-inflammable.
- There are no carbon deposits so that insulation problems are eliminated.
- Very short Arcing time.
- These breakers can interrupt large currents.
- Noiseless operation.
- These breakers are totally enclosed and sealed from atmosphere, so they are particularly suitable where explosion hazard exists e.g. coal mines.
- No moisture and dust problems.
- Minimum maintenance Required
- Problems connected with current chopping are minimum.

ELECTRICAL PAATHSHALA

www.electricalpaathshala.com

* Disadvantages:

- These breakers are costly due to high cost of SF₆ gas.
- Additional Equipment is Required to Recondition the gas after each operation.
- Imperfect Joints lead to leakage of Gas.
- Arched SF₆ gas is poisonous.

THANK YOU

Please Like this Video.