

# Lecture-12

SF6 Circuit Breaker

# Topic Covered

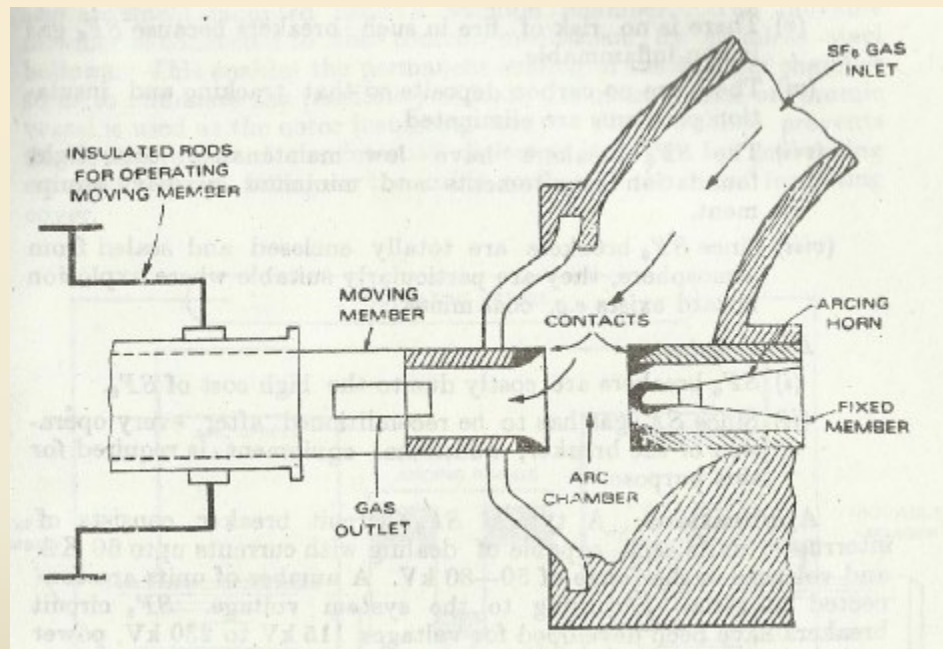
- ▶ SF6 circuit Breaker
- ▶ Working
- ▶ Advantage and Disadvantage
- ▶ Isolaters

# SF6 circuit Breaker gas)

## (Properties of SF6

- Electronegative –It has the ability of an atom to attract and hold electrons. Such gas have high dielectric strength.SF6 is electronegative .It forms negative ions ,Negative ions are heavy and immobile so they do not flow easily .Hence SF6 gas has high dielectric strength.
- Rate of rise of dielectric strength is very high.
- Can be liquefied and stored in steel tanks
- Dielectric strength increase linearly with pressure.
- Gas is inert. Therefore contacts will not get eroded.
- Gas is non –inflammable , Colorless ,odorless, Non–toxic
- Thermally stable up to 55 degrees

# Sulfur Hexafluoride Circuit Breaker



# Operation of SF6 Circuit Breaker

- ▶ Under normal operating conditions the contacts are closed .
- ▶ On occurrence of fault contacts are opened. The movable contact moves away from the fixed contact.
- ▶ The arc is struck between the fixed and moving contacts.
- ▶ High pressure SF6 gas now flows over the arc and it absorbs the free electrons from the arc.
- ▶ This builds up the dielectric strength between the gap very fast and the arc is extinguished

# Advantages and Disadvantages of SF6 Breaker

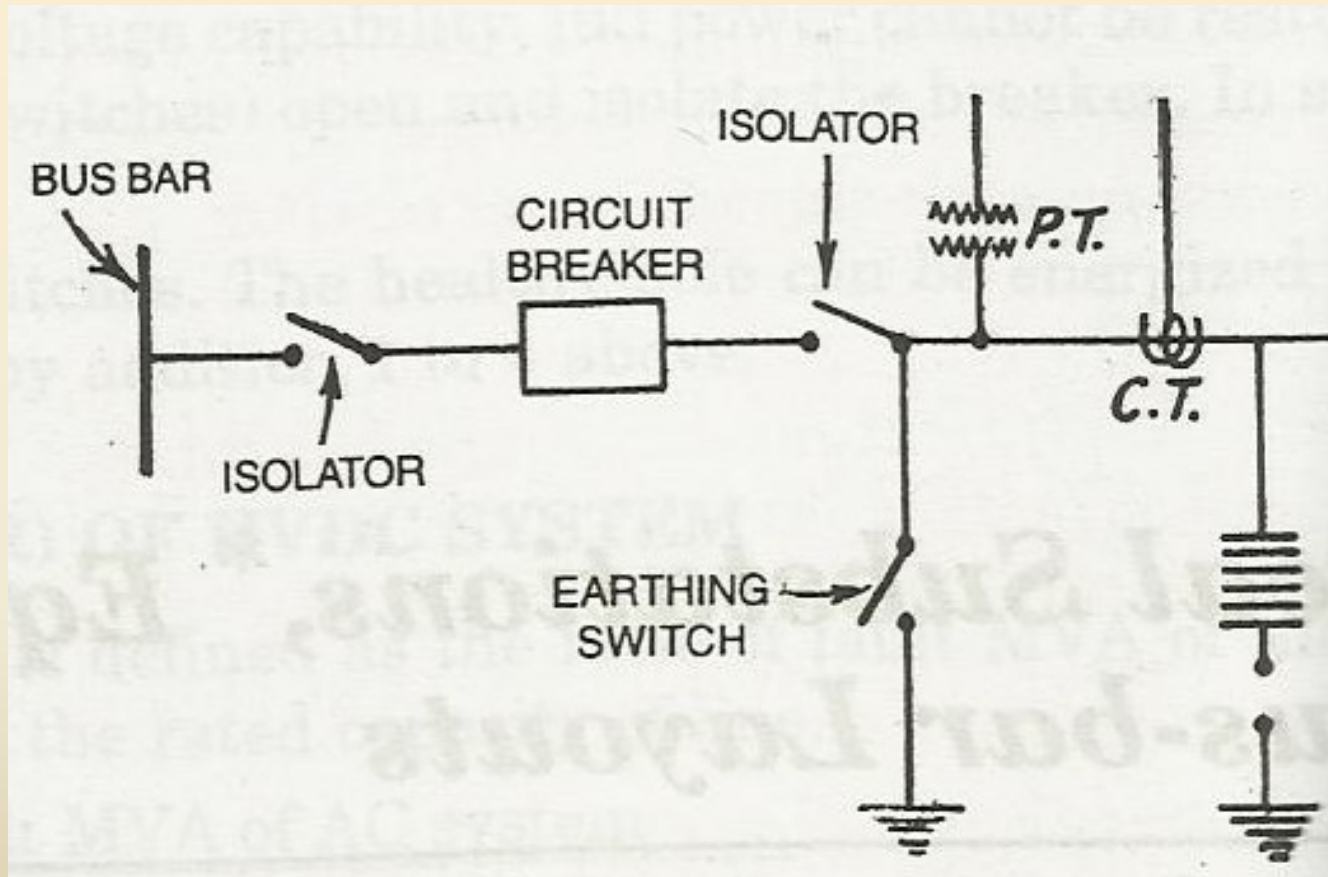
## Advantages

- Silent operation, compact size
- Vary short arcing time
- No risk of fire
- No reduction in dielectric strength due to operation
- No current chopping problem
- Can interrupt larger currents
- Suitable for explosive environment due to totally enclosed body

## Disadvantages

- Costly
- Requires conditioning of SF6 gas from time to time
- SF6 gas is suffocating ,so its leakage can cause suffocation of the persons in surrounding areas.
- Special facilities are required for transporting gas
- Additional equipments are required for reconditioning

# Isolators



# Isolators

Isolator(disconnecting switch) operates under no load condition. It does not have any current breaking capacity or current making capacity. Isolator is not even used for breaking load currents.

Isolators are used in addition to circuit breakers ,and are provided on each side of every circuit breaker to provide isolation and enable maintenance.

Sequence of operation

While opening -Open circuit breaker first and then isolators

While closing -Close isolators first and then close circuit breakers



# Circuit Breaker Controls

Different types of controls are required for successful operation of circuit breakers.

1. Relays – These are required to give a trip signal to circuit breaker in case of fault condition. Different types of relays are available like over current, over voltage, under voltage, loss of excitation, reverse power etc.
2. Sensor equipments are required to check the condition of circuit breakers arc extinguishing medium .

The controls are pressure sensors to sense the pressure of air in case of air blast circuit breakers .

In case of Sulfur hexafluoride circuit breakers also the pressure sensors are required.

In case of vacuum circuit breakers also sensors are required to check the vacuum level in the breaker.