CIRCUIT BREAKER

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WHAT IS A CIRCUIT BREAKER?

► A circuit breaker is an equipment that breaks a circuit either manually or automatically under all conditions at no load, full load or short circuit.
Operating Principle

Two contacts called electrode remains closed under normal operating conditions. When fault occurs on any part of the system, the trip coil of the circuit breaker get energized and contacts are separated.
Arc Phenomenon

An arc is struck when contacts are separated. The current is thus able to continue. Thus the main duty of a circuit breaker is to distinguish the arc within the shortest possible time.
The arc provides the low resistance path to the current and the current in the circuit remains uninterrupted.
The arc resistance depends upon the following factors.

- Degree of ionization
- Length of the arc
- Cross Section of the arc
Methods of Arc Extinction

High Resistance Method

Low Resistance Method
TYPES OF CIRCUIT BREAKER

- OIL CIRCUIT BREAKER
- AIR BLAST CIRCUIT BREAKER
- SF6 CIRCUIT BREAKER
- VACCUM CIRCUIT BREAKER
Breaker Used In 132KV Grid Station

- Oil Circuit Breaker
- Vacuum Circuit breaker
- SF6 Circuit Breaker
Bulk Oil Circuit breaker

Air cushion
Low Oil Circuit Breaker

- Consists of two parts.
  - Supporting Chamber.
  - Circuit-Breaking chamber (consist of fixed and moving contact)
Disadvantages Of Oil Circuit Breaker

► It is inflammable and there is a risk of fire.
► It may form an explosive mixture with air.
► It requires maintenance.
► Absorbs moisture, so dielectric strength reduces.
► Oil leakage problem.
► Oil has to be replaced after some operations because of the carbonization of oil.
Vacuum Circuit Breaker

- Vacuum is used as an arc quenching medium.
- Have greatest insulating strength.
- $10^{-7}$ to $10^{-5}$ pressure is to be maintained.
- Used in 11KV panel in control room of grid station.
Vacuum Circuit Breaker
Advantages

► Compact, reliable and have longer life.
► No fire hazards.
► No generation of gas during and after operation.
► Can interrupt any fault current.
► No noise is produced while operating.
► Require less power for control operation.
SF6 Circuit Breaker

1. Sulphur Hexafluoride (SF6) gas is used as an arc quenching medium.
2. SF6 is an electro-negative gas.
3. It has strong tendency to absorb electrons.
4. When contact are opened in a high pressure flow of SF6 gas, arc produced.
5. Free electron in the arc are captured by the gas.
6. Which build up enough insulation strength to extinguish arc.
7. It is much effective for high power and high voltages services,
Advantages

- Simple construction, less cost.
- SF6 gas is non flammable, non toxic & chemical inert gas.
- Same gas is recirculated in the circuit.
- Maintenance free C.B.
- Ability to interrupt low and high fault current.
- Excellent Arc extinction.
Advantages Of SF6 Over Oil Circuit Breakers

► Short arcing time
► Can interrupt much larger currents
► Gives noiseless operation due to its closed gas circuit
► No moisture problem
► No risk of fire
► No carbon deposits. So no tracking and insulation problems
► Low maintenance cost