


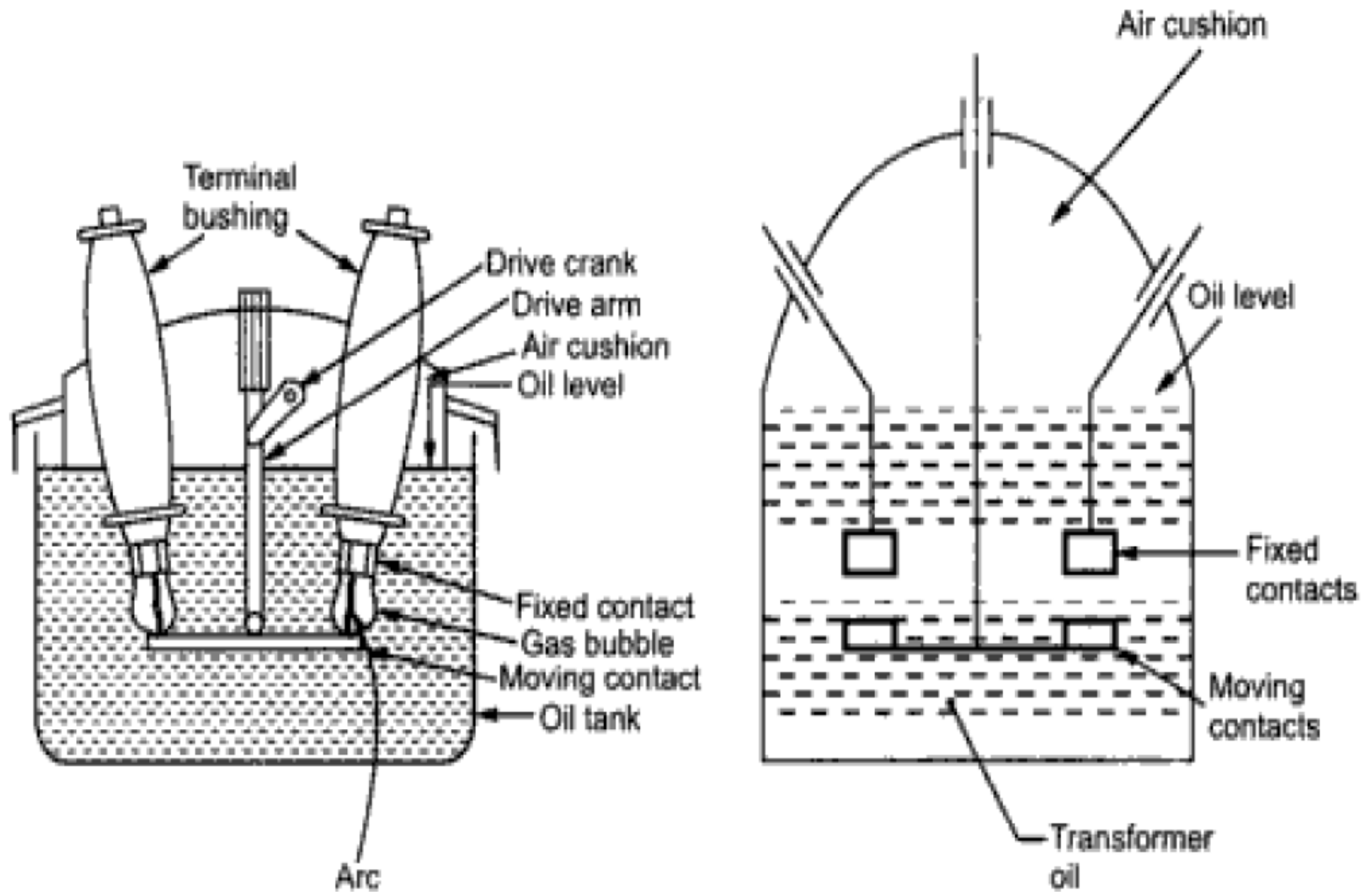
# Lecture-1 1

bulk oil,  
minimum oil Circuit Breaker

# Topic Covered

- ▶ Oil Circuit Breakers
  - ▶ Working
  - ▶ Advantage and Disadvantage
- 

# Oil Circuit Breakers



# Oil Circuit Breakers

This breaker makes use of oil for quenching the arc.

The circuit breaker which uses more oil or which is bulky is called bulk oil circuit breaker.

The construction is simple and it consists of fixed and moving contacts enclosed in a strong weather-tight earthed tank containing oil up to a certain level and an air cushion above the oil level.

## Application

These breakers are used up to 11 KV with an interrupting capacity of 250MVA.

# Oil Circuit Breaker (Working)

Under normal working conditions, the fixed and moving contacts are closed. On the occurrence of fault, the moving contacts come down and an arc is struck between the contacts. The oil between the contacts gets decomposed and hydrogen gas bubble is formed around the contacts. The hydrogen gas cools the arc and the turbulence effect cause the lengthening of arc. The deionization of medium between contacts takes place and at some critical length of gap between the contacts ,the arc is extinguished.

The hydrogen gas bubble produces a very high pressure in the oil. The tank is therefore made strong to withstand a large pressure. The oil moves upwards when hydrogen bubble is formed. The air is present between the oil level and tank top and acts as cushion and absorbs mechanical shock produced due to upward oil movement.

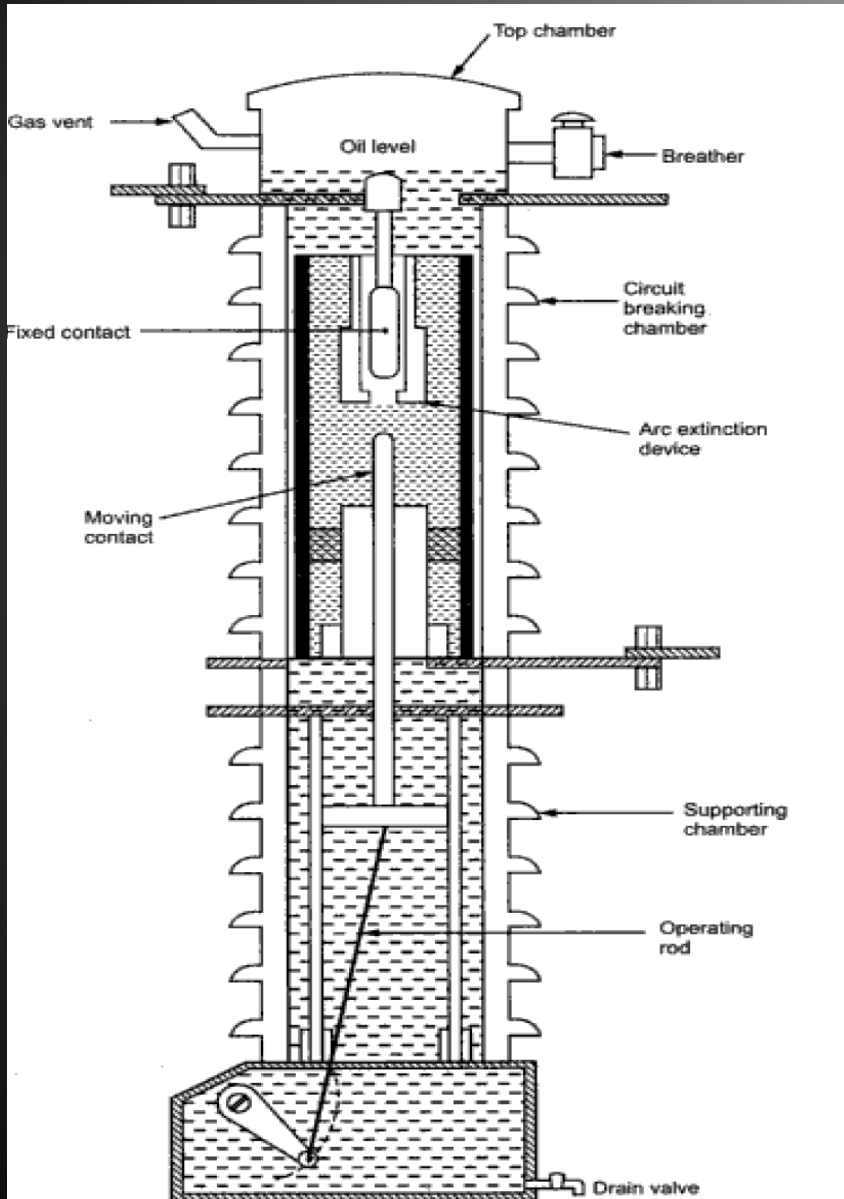
# Bulk Oil Circuit Breaker

- ▶ oil has high dielectric strength
- ▶ Oil absorbs arc energy while decomposing
- ▶ Good cooling property of the gas formed due to decomposition
- ▶ It acts as an insulator between the live parts and earth
- ▶ Long arcing time
- ▶ Do not permit high speed of interruption
- ▶ Arc interruption control can be obtained only by increasing the length of arc

Advantages

Disadvantages

# Low Oil circuit Breakers



## Operation

When the contacts are separated in oil arc is formed. The heat of arc decomposes oil and gases are formed. These gases expand due to heating of the arc. The gas flowing near the contact zone cause cooling and splitting of the arc and the arc gets extinguished.

# Minimum Oil Circuit Breakers

In this breaker, the supporting ,current interruption and top chamber are made of porcelain .Hence, clearance between live parts is small and requires less quantity of oil, hence the breaker is called Minimum Oil Circuit Breaker. The chambers are completely filled with oil. The oil from upper chamber does not come to lower.

The fixed contact is enclosed in the quenching chamber. Moving contact makes sliding contact with the lower fixed contact. The operating rod is operated by operating mechanism, the three poles operate simultaneously.

The voltage ratings are from 3.6kV to 420 KV.

Applications –Minimum oil circuit breakers are available in for all voltages and highest breaking capacity hence they are preferred in almost all protection schemes



# Maintenance of Oil Circuit Breakers

The maintenance of oil circuit breakers consists of checking of contacts and dielectric strength of the oil. After fault has been interrupted by circuit breaker, fault current flows for short time or load currents for several times, its contacts may be burnt due to arcing. Also there may be some loss of dielectric strength of oil due to carbonisation. This will reduce rupturing capacity of the breaker. Thus periodic checking of circuit breakers is essential after regular interval of 3 or 6 months. Following points should be kept in mind while checking,

- i) Check the current carrying parts. If they are burnt replace them.
- ii) Check the dielectric strength of oil. If its colour is changed then it should be changed or reconditioned. The oil in good condition withstands 30 kV for one minute with 4mm gap between electrodes.
- iii) Check the insulation for any damage. Clean the surface with removal of carbon deposits with strong and dry fabric.
- iv) The oil level should be checked.
- v) The closing and tripping mechanism should be checked.

# Minimum Oil Circuit Breaker

- Requires less quantity of oil
- Requires smaller space
- Maintenance is less
- Cost per breaking capacity in MVA is less
- Suitable for both manual and automatic operation
- Possibility of fire and explosion.
- Difficult to remove gases from the space between contacts.
- Oil deteriorates rapidly due to carbonization
- Smaller quantity of oil, so carbonization increases.

Advantages

Disadvantages