Circuit Breakers

When selecting a circuit breaker for a particular application the principal factors to consider are; system voltage, rated load current, and fault level at the point of installation

Voltage rating

At medium voltages the phase to neutral voltage may be 250v but the potential difference between two phases with the neutral insulated would be 440v. At these voltages no difficulties should arise in selecting the circuit breaker equipment. However, on a 3.3kV insulated neutral system the phase to neutral voltage is 3.3kV/ж 3 = 1.9kV. If an earth fault develops on one phase the potential of the other two phases to earth is 3.3kV. To ensure the insulation is not subject to excessive stress a circuit breaker designed for a normal system voltage of 6.6kV may be fitted. Also on insulated neutral systems high over voltages may be caused by arcing faults. Medium voltage systems switch gear insulation should be able to withstand such voltages, but 3.3kV and above, the margin of safety is reduced. When a high voltage system is installed both the voltage rating of the circuit breaker and the method of earthing must be considered.

Current…

Current rating

Consider three factors;

a. Maximum permissible temperature of circuit breaker copperwork and contacts
b. temperature due to LOAD CURRENT
c. Ambient temperature

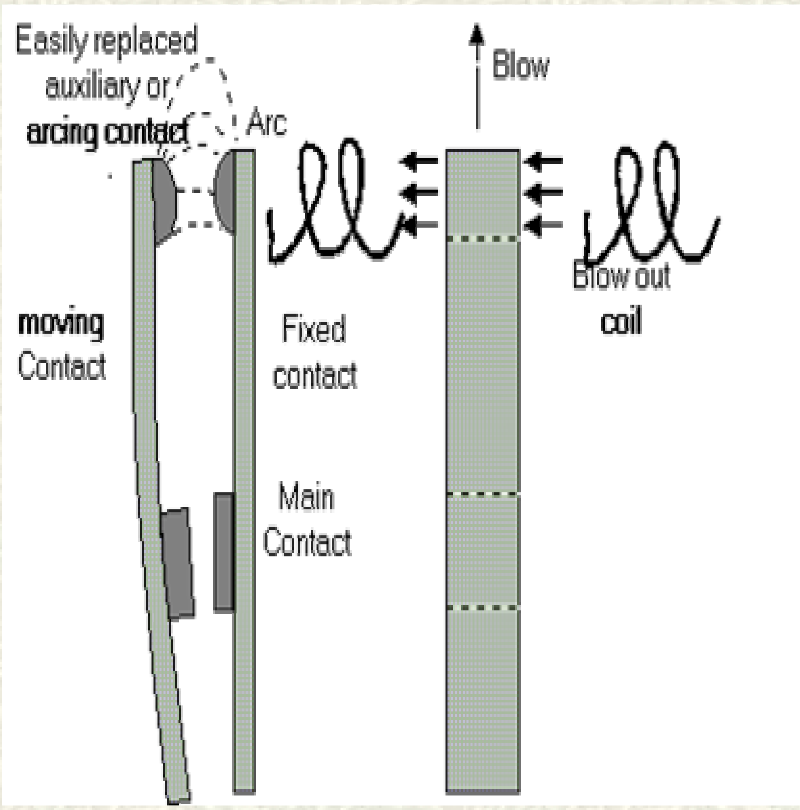
In industrial use the ambient temperature considered is usually 35oC. If uses in a marine environment temperature of 40oC (Restricted areas) and 45oC (unrestricted areas) are used, therefore the circuit breaker rating may be 'free air' value and this does not consider the degree of ventillation, the number and position of the circuit breakers or the layout of the bus bars. The final switchboard arrangement could be only 80 to 90% of the free air rating

Fault rating

Breakers should be rated to accept a breaking current of about 10 times the full load current. The breaker should also be able to make against a fault condition where the making current may be 25 times the full load current when the contact first make. Circuit breakers must remain closed for a short time when a fault occurs in order to allow other devices which are nearer to the fault to trip first. The breaker should be capable of carrying its breaking current for a specified time of usually about one second.

Arc…

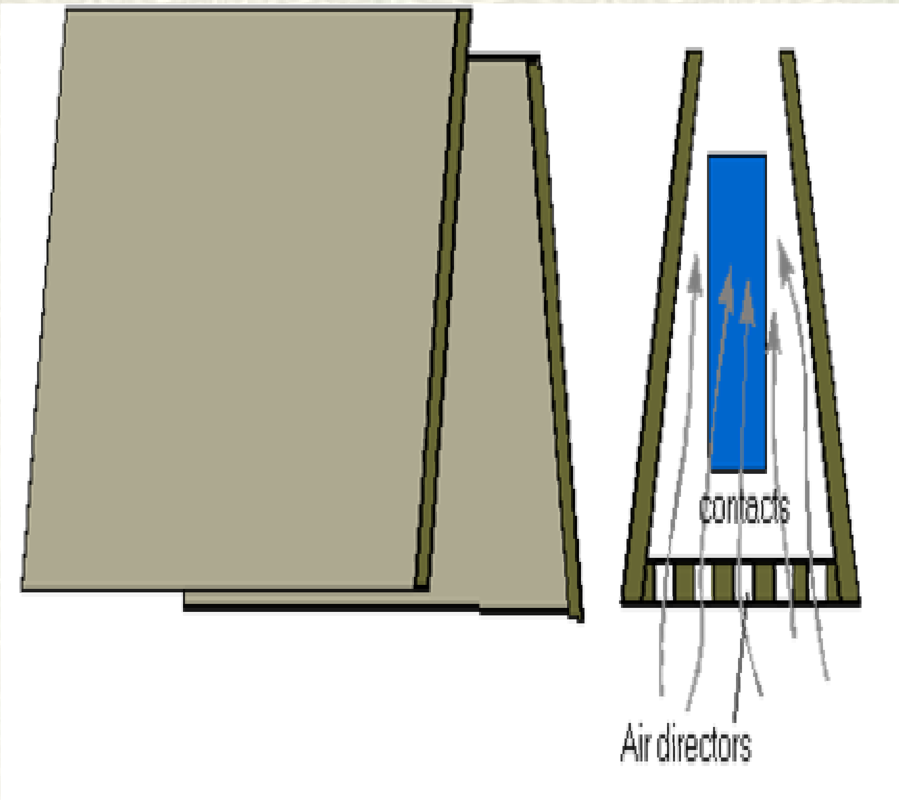
Arc suppression



Blow force at right angles to arc and field.

The…

The blow out coils, which are connected in series with the circuit breaker contacts, form an electro-magnetic field which reacts with the arc to give a deflecting force which tends to bloe the arc outwards. The increase in effective length of the arc causes it to extinguish more quickly. The blow out coils are protected form the arc by arc resistant material which may be in the form of an air shute.



Hot ionised gases around the arc and contacts are displaced by cold air forming eddy current air flow. This helps to increase resistance between contacts.

Contacts

Attention should be paid to all contacts likely to deteriorate due to wear, burning, inadequate pressure, the formation of a high resistance film or becoming welded together. Faulty contacts are often indicated by overheating when loaded. Different contact materials may need different treatment.

Copper is widely used but is liable to develop a high resistance film, and copper contacts may become welded together if the contact pressure is low and the contents have to carry a high current. Copper is commonly used for contacts which have a wiping action when closing and opening., this action removing the film. Copper contacts are used on knife switches, laminated (brush) contacts of regulators and other controllers, drum contacts, etc.

Carbon and metallized carbon contacts are unsuitable for carrying high currents for long periods but, as they do not weld together, they are used for arcing contacts on some control gear. Pure silver and silver ally contacts tends to blacken in service but the oxide film has a low resistance. Copper- tungsten (sintered compound), grey I colour, is used in contact facing. This material has a high surface resistance which resists heavy arcing and does not weld. Silver tungsten (sintered) has similar properties to copper tungsten but has a lower contact resistance and is less liable to overheat on continuous load

Servicing contacts

Copper contacts should be filed up if necessary to restore the profile required to ensure correct wiping action. Copper contacts which have become burnt or pitted or otherwise damaged, may be carefully dressed with a file. Emery cloth should not be used. Some contacts are provided with pressure adjustment, so if the contact pressure is reduced by dressing it should be readjusted. Using a spring balance pulled in a direction normal to the contact surface a reading should be taken when a piece of paper placed between the contacts is released. Inadequate spring pressure may also be due to the pressure springs becoming weak due to fatigue or overheating.

Carbon contacts should receive the same attention as copper contacts except that they should not need lubrication. Silver, Silver alloy and copper tungsten contacts do not require cleaning. As there is no need to remove surface film from pure silver contacts they may be used for light butt contacts.

Where some contacts have the appearance of pitting on both faces this is sometimes referred to as being 'burnt in'. Some manufacturers recommend that the contacts, unless there is loss of material, are not dressed as this may destroy the contact area.

Selesai…

Kembali ke Menu Utama