

5.6 Current chopping:

- ✓ It is the phenomenon of current interruption before the natural current zero is reached.
- ✓ Current chopping mainly occurs in air-blast circuit breakers because they retain the same extinguishing power irrespective of the magnitude of the current to be interrupted.
- ✓ When breaking low currents (*e.g.*, transformer magnetising current) with such breakers, the powerful de-ionising effect of air-blast causes the current to fall abruptly to zero well before the natural current zero is reached.
- ✓ This phenomenon is known as current chopping and results in the production of high voltage transient across the contacts of the circuit breaker

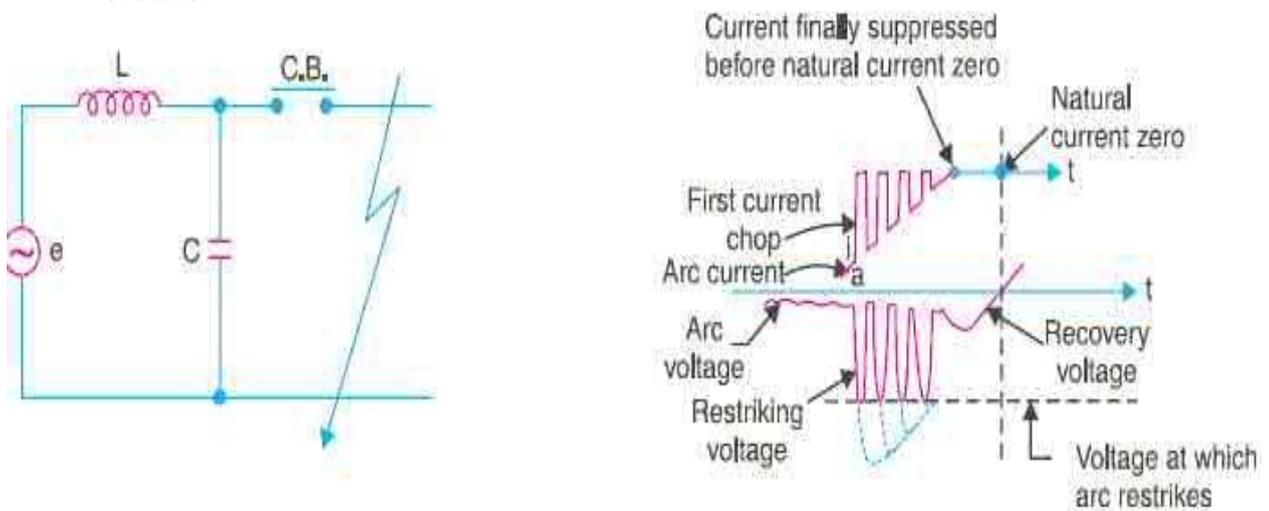


Figure 5.6.1 Equivalent circuit and Characteristic of Current chopping

[Source: "Principles of Power System" by V.K Mehta, Page: 466]

- ✓ Suppose the arc current is I when it is chopped down to zero value as shown by point a in Fig
- ✓ As the chop occurs at current i , therefore, the energy stored in inductance is $L i^2/2$. This energy will be transferred to the capacitance C , charging the latter to a prospective voltage e given by :

$$\frac{1}{2} L i^2 = \frac{C e^2}{2}$$

$$e = i \sqrt{\frac{L}{C}} \text{ volts}$$

- ✓ The prospective voltage e is very high as compared to the dielectric strength gained by the gap so that the breaker restrikes. As the de-ionising force is still in action, therefore, chop occurs again but the arc current this time is smaller than the previous case.
- ✓ This induces a lower prospective voltage to re-ignite the arc. In fact, several chops may occur until a low enough current is interrupted which produces insufficient induced voltage to re-strike across the breaker gap.
- ✓ Consequently, the final interruption of current takes place. Excessive voltage surges due to current chopping are prevented by shunting the contacts of the breaker with a resistor (*resistance switching*) such that reignition is unlikely to occur.

