

## Answer Question #70308, Physics / Electromagnetism

1. Fringing decreases the flux density in the air gap. how?
2. Air-gap flux is termed as useful flux. Why?
3. The relative permeability of a magnetic material changes with flux density. Why?
4. Does a magnetic circuit consume energy? Why'?
5. In all the magnetic circuits, leakage flux exists. Why?

### Answer:

1. Fringing is directly proportional to the length of the air gap that means if the length increases the fringing effect will also be more and vice versa.
2. The total magnetic flux produced by the coil due to current flowing in it is divided into following two component.
  - a) Useful flux, which flows throughout the magnetic circuit and is utilized for the useful purpose. In case of transformer, the flux, which links both the primary and secondary winding, is called useful flux and in case of rotating machines, the flux, which crosses the air gap, is called the useful flux.
  - b) Leakage flux. In case of transformer the flux which links with one winding only and complete its path though air is called leakage flux.
3. Understanding permeability as the ratio of the magnetic flux density to the magnetic field, the ratio of the phasors can be written and simplified as

$$\mu = \frac{B}{H} = \frac{B_0}{H_0} e^{-j\delta}$$

4. An electromagnet requires current flow to produce the magnetic field, so the product of current x voltage, in watts, gives the power consumed
5. Most of the flux is set up in the core of the solenoid and passes through the particular path that is through the air gap and is utilised in the magnetic circuit. This flux is known as Useful flux. As practically, it is not possible that all the flux in the circuit follows a particularly intended path and sets up in the magnetic core and thus some of the flux sets up around the coil or surrounds the core of the coil, and is not utilised for any work in the magnetic circuit. This type of flux, which is not used for any work, is called Leakage Flux and is denoted by  $\phi_l$ .

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