Three-phase electric power

Three-phase electric power is a common method of alternating-current electric power generation, transmission, and distribution. It is a type of polyphase system and is the most common method used by electrical grids worldwide to transfer power. It is also used to power large motors and other heavy loads. A **three-phase system** is usually more economical than an equivalent single-phase or two-phase system at the same voltage because it uses less conductor material to transmit electrical power. The **three-phase system** was independently invented by Galileo Ferraris, Mikhail Dolivo-Dobrovolsky and Nikola Tesla in the late 1880s.

In a **three-phase system**, three circuit conductors carry three alternating currents (of the same frequency) which reach their instantaneous peak values at one third of a cycle from each other. Taking one current as the reference, the other two currents are delayed in time by one third and two thirds of one cycle of the electric current. This delay between phases has the effect of giving constant power transfer over each cycle of the current and also makes it possible to produce a rotating magnetic field in an electric motor.

Three-phase systems may have a neutral wire. A neutral wire allows the **three-phase system** to use a higher voltage while still supporting lower-voltage single-phase loads. In high-voltage distribution situations, it is common not to have a neutral wire as the loads can simply be connected between phases (phase-phase connection).

1. Three-phase has properties that make it very desirable in electric power systems: The phase currents tend to cancel out one another, summing to zero in the case of a linear balanced load. This makes it possible to reduce the size of the neutral conductor because it carries little to no current; all the phase conductors carry the same current and so can be the same size, for a balanced load.
2. Power transfer into a linear balanced load is constant, which helps to reduce generator and motor vibrations.
3. **Three-phase systems** can produce a rotating magnetic field with a specified direction and constant magnitude, which simplifies the design of electric motors.

Most household loads are single-phase. In North American single-family dwellings, **three-phase power** generally does not enter the home; multiple-unit apartment blocks may have **three-phase power** but **three-phase power** is not used for household appliances. Utilities that supply **three-phase power** for lower-load-density area homes typically distribute only one phase to individual loads. Some large European appliances may be powered by **three-phase power**, such as electric stoves and clothes dryers.

Wiring for the three phases is typically identified by color codes which vary by country. Connection of the phases in the right order is required to ensure correct rotation of three-phase motors. For example, pumps and fans may not work in reverse. Maintaining the identity of phases is required if there is any possibility two sources can be connected at the same time; a direct interconnection between two different phases is a short-circuit. Wikipedia, Three-phase electric power

See Also

13.06 - Triple Currents of Electricity
16.29 - Triple Currents of Electricity
Part 13 - Rotation from Vibration and Oscillation
Rotating Magnetic Field