



SNS COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE AND DESIGN

COURSE NAME : 19EE01 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

I YEAR /II SEMESTER - COMPUTER SCIENCE AND DESIGN

Unit 2 – ELECTRICAL MACHINES

Topic 1 : Application of DC generator



Applications of DC Generators

DC generators are electric machines that change mechanical energies to an electric current having the typical form of DC.

They find various use in different applications, such as powering and lighting, battery charging for vehicles, and motorcycles, welding through functionality, and toys.

DC generators are based on the induction principle, which means there is a magnetic field within the conductor, and moving the magnetic field relative to the conductor results in electromotive force (EMF) generation. In this article, we will learn about various applications of DC generators.



What are DC Generators?+

A DC generator is a device that transforms mechanical energy into electrical energy by inducing magnetic fields in a device consisting of an armature of conductors and a magnetic circuit. The principle of electromagnetic induction states that a changing magnetic field induces an electromotive force (EMF) or voltage in a conductor, which can be made into the flow of current when the circuit is closed.

In DC generators, the key components like the stator, rotor, armature windings, yoke, poles, and pole shoe, along with the commutator, sit side by side to promote the production of direct current. A DC generator is a machine used in multiple applications, including speed regulation, battery charging, lighting installation, supplying power to DC motors, arc welding, and many other applications.



What are Applications of DC Generator in Real Life?

DC generators are electrical machines that convert mechanical energy into electrical energy in the form of direct current (DC). They are used for a variety of applications. Various applications of DC generators in real life scenarios are mentioned below:

Power Generation

Dc generators are often used for generating power . A typical example is the off-grid modal, where DC generators produce DC in distant locations or as an alternative source of energy when the main power sources are down.

These generators are the types that incorporate a coupling device, or a flywheel, to convert mechanical energy to electrical energy via a principle known as electromagnetic induction. In the industrial zone, DC generators are found in pieces of machinery, welding gadgets, and even electroplating.



Transportation

DC generators occupy a very important place in the transportation field that relies on DC electricity for different kinds of vehicles as well as operation of other systems. DC electricity is another typical product that can be attained using DC generators in an electric vehicle.

The DC power is the result of conversion of mechanical energy of wheels of the electric vehicle into electricity. Synchronous and asynchronous pairs are two of the primary types of electric generators which can be used in electric cars, buses, and other forms of electric vehicles while ensuring economic and ecological performance.

In train, we install DC generators to supply the electrical systems on board with power, for instance, lightings and communication equipment, as well as control systems that run the train. They provide the consistent power which is necessary for trains to run.



Telecommunications

DC generators are used in the telecommunications industry for various applications, including powering communication towers, ensuring service continuity, and reducing environmental impact.

They are often used in hybrid generator systems, which combine different energy sources to produce electricity. These hybrid generators offer numerous advantages over conventional systems, including reduced energy costs, lower environmental impact, increased system reliability, and flexibility in adapting to environmental conditions and specific energy needs.

Hybrid generators are particularly useful in telecommunications systems, where reliable electricity is essential for service continuity, especially in remote areas or emergencies. They ensure greater energy efficiency by providing continuous power to communication towers without interruption, even in extreme weather conditions.



Medical equipment

In medical field, DC generators serve to facilitate the operation of the life-saving equipment therefore allowing the delivery of vital electrical power for the critical health devices that need a continuous supply of electricity. Conversion of direct current into the alternating current is used to provide power to the X-ray machines.

Static and regularly maintained electricity power must power an X-ray machine for the production of X-ray images as the diagnostic requirement. DC generators are the source of the required direct current electricity that is then used by the X-ray machines, which in turn helps to perform the imaging correctly and makes the diagnosing more precise.

On top of that, DC generators are not only used in X-rays but in other machines like MRI scanners, CT scanners, and ultrasound devices as well. Such devices include ECGs and some types of x-ray devices, all of which require a reliable energy source to operate at their full capacities and correctly present the results to healthcare workers.

This is another factor that stimulates usage of energy sources as medical devices are powered by electricity which is required to match the power level so as to outperform the image qualities produced by the older machines on the market.



Renewable Energy System

The DC generators are the power generators of choice in a renewable energy system, including wind and solar, when it is necessary to transform the rotational energy generated by these systems into electrical energy.

In solar power systems, they function as solar cell in photovoltaic (PV) panels that transforms the radiation energy from the sun into electricity. In regard to wind power, this material serves as an essential component to the production of electricity in wind turbines.

Along with that, the motors or pumps are typically employed in various renewable energy systems, such as hydro power systems, where the turbines or generators are supplied with the water from a reservoir, which flows down a hill and through a penstock to the impellor or the generator that works for the transformation of mechanical into electrical energy.

The drilling techniques we use in geothermal power systems creates heat from the Earth's core that produces steam, which in turn turns the generator producing electricity.



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