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Advancements in Inverter Technology for Industrial Applications

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***Abstract*: An inverter is simply an electronic device that converts low voltage DC battery power 230 volts AC electrical power. They are used in applications ranging from microwaves, laptops to satellite systems X-ray machines etc. Most industrial applications require high frequency high voltage power supply. These increased power requirements have lead to significant development in inverted technology. An inverter is an electrical device that converts direct current to alternating current; the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching control circuits. The inverter performs the opposite function of a rectifier.**

***Keywords*: Conventional CCFL inverter, Grid tie inverter, Inverter, Power inverter, Solid state inverter, Electromechanical inverter.**

1. Introduction

From the late nineteenth century through the middle of the twentieth century, DC to AC power conversion was accomplished using rotary converters or motor-generator sets. In the early twentieth century, vacuum tubes and gas filled tubes began to be used as switches in inverter circuits. The most widely used type of tube was the thyratron.

The origins of electromechanical inverters explain the source of the term inverter. Early AC to DC converters used an induction or synchronous AC motor directly connected to a generator so that the generator's commutator reversed its connections at exactly the right moments to produce DC.

Inverters can be used in a number of applications. The use can vary from small applications in a personal computer to large industrial complexes which require bulk power. An inverter is basically a logic gate that converts input into output and both of them are in opposite state. It implies that if input is false then output is true and vice versa. Inverters are classified by their ac output waveform: i) Square wave, ii) Modified sine wave, iii) True sine wave.

2. Methodology

- Significant improvements have been made to the traditional pulse width modulations inverters to make power distribution system more efficient and more suitable to reactive power compensation and harmonic filtering.
- Solid state inverters have no moving parts and are used in a wide range of applications from small switching power supplies in computers, to large electric utility high voltage direct current applications that transport bulk power. Inverters are commonly used to supply AC power from DC sources such as solar panels or batteries.
- A later development is the synchronous converter, in which the motor and generator windings are combined into one armature, with slip rings at one end and a commutator at the other and only one field frame. The result with either is AC-in, DC-out. With an M-G set, the DC can be considered to be separately generated from the AC; with a synchronous converter, in a certain sense it can be considered to be "mechanically rectified AC".
- Since early transistors were not available with sufficient voltage and current ratings for most inverter applications, it was the 1957 introduction of the thyristor or silicon-controlled-rectifier that initiated the transition to solid state inverter circuits.
- A power inverter turns DC power into AC power.
- A solar inverter or PV inverter is a type of electrical inverter that is made to change the direct current electricity from a photovoltaic array into alternating current for use with home appliances and possibly a utility grid.

Fig. 1. Grid tie inverter system

- Grid tie inverters: Many solar inverters are designed to be connected to a utility grid, and will not operate when they do not detect the presence of the grid. They contain special circuitry to precisely match the voltage and frequency of the grid.

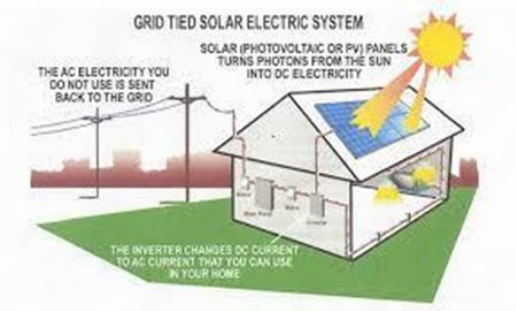

Fig. 2. Grid tie inverters

- Solar power inverters: The solar inverter performs the conversion of the variable DC output of the PV cells into a clean sinusoidal 50 or 60 Hz current.
- Conventional CCFL inverter: A CCFL inverter is a device (an inverter) for providing drive power to a cold cathode fluorescent lamp. CCFLs are often used as inexpensive light units in electrical devices.

3. Result

- Inverters ensure an uninterrupted power supply. They can vary in size according to their capacity. Inverters can have one switched as well as two switched modes of power supply.
- An inverter has the capability to improve the DC power into AC power that are useful for generating equipment like household items, computers, power tools and much more by simply plugging typically equipment into the inverter.
- Standalone (off-grid) – Supply generated or stored power solely to connected loads.

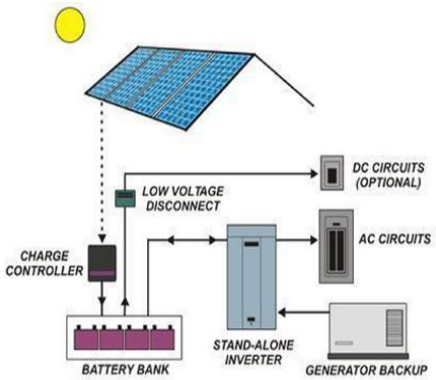

Fig. 3. Standalone inverter

- Grid tie – Allow generated or stored power to be supplied to a utility's distribution network when not needed by the load.

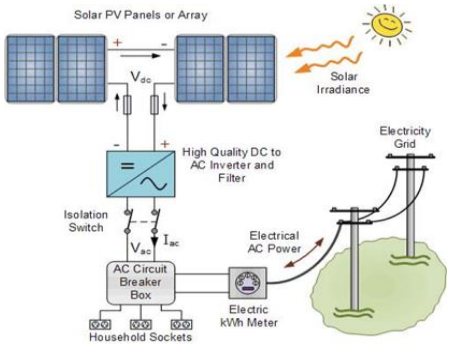

Fig. 4. Grid system

- Inverters are designed to optimize transfer of power from DER to load, often through a technique called Maximum Power Point Tracking.
- A central component of an inverter's efficacy is the ability to construct an output AC waveform that is synchronized with the utility distribution system.
- When fault conditions are present, a grid tied inverter is required to disconnect from the distribution system at the point of common coupling.
- An inverter may enable the integration of a battery or other energy storage device with a distributed generator.

4. Conclusion

The efficiency of a square wave inverter is higher than that of appropriate sine wave inverter due to its simplicity. Power inverter as source of power source means that the output a.c. has the same frequency as the utility power supply (i.e. 50 Hz) in India.

References

[1] Bumice Doyle Bedford, Richard Gibson Hoft, "Principles of Inverter Circuits", R.E. Krieger Publishing Company.
[2] Fang Lin Huo, Hong Ye, "Advanced DC/AC Inverters: Applications in Renewable Energy", CRC Press. Manahar Lotia, "Modern Digital Inverter", BPB Publications.
[3] Qing-Chang Zhong, Tomas Hornik, "Control of Power Inverters in Renewable Energy and Smart Grid Integration", Wiley.
[4] Stephen D. Chastain, "Generators and Inverters", Chastain Publishing.