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**A Comparison & Performance of Simulation Tools  
MATLAB/SIMULINK, PSIM & PSPICE for Power  
Electronics Circuits**  
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**Abstract**—The software packages available for simulation of power electronic circuits are MATLAB, PSIM and PSPICE. In this paper the simulation of rectifier and inverter circuits were performed in the MATLAB, PSIM and PSPICE environment and the comparison of results were made. Rectifier and inverter are the power electronic circuits which were highly used in all power supply units. The paper explains the theoretical approach of these circuits and then the simulation results are given in order to show the effectiveness of the system in the simulation arena.

**Keywords**—MATLAB, PSIM, PASCAL, DC-AC Converter, AC-DC Converter

**I. INTRODUCTION**  
Power Electronics is interdisciplinary and is at the confluence of three fundamental technical areas - power, electronics and control, and is used in a wide variety of industries from computers, chemical plants to rolling mills. The importance of power electronics has grown over the years due to several factors. Computer simulation can greatly aid in the analysis, design and education of Power Electronics. A computer simulation for "what-if" is an attempt to model a real-life or hypothetical situation on a computer so that it can be studied to see how the system works. By changing variables, predictions may be made about the behavior of the system. In our work towards this, we have endeavored to bring out the different responses of current and voltage in the power electronic circuits. However, simulation of power electronics systems is made challenging by the following factors:

- Extreme non-linearity presented by switches
- Time constants within the system may differ by several orders of magnitude and
- A lack of models

Therefore, it is important that the objectives of the computer analysis be evaluated carefully and an appropriate simulation package be chosen.

In view of the above considerations, a SPICE-based simulation package, MATLAB and PSIM have been used for simulating the power electronic circuits like rectifiers, inverters, choppers and AC voltage controllers. They have had the detailed device models and have been able to represent the controller portion of the converter system by its functional features in a simplified manner as possible. In this paper the simulation of rectifier and inverter circuits were taken into consideration.

A rectifier is an electrical device that converts alternating current (AC) to direct current (DC), a process known as rectification. Rectifiers have many uses including as components of power supplies and as detectors of radio signals. Rectifiers may be made of solid-state diodes, vacuum tube diodes, mercury arc valves, and other components.

An inverter is an electrical or electro-mechanical device that converts direct current (DC) to alternating current (AC), the resulting AC can be at any required voltage and frequency with the use of appropriate transformers, switching, and control circuits. Static inverters have no moving parts and are used in a wide range of applications, from small switching power supplies to 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. The electrical inverter is a high-power electronic oscillator. It is so named because early mechanical AC to DC converters was made to work in reverse, and thus was "inverted" to convert DC to AC. The inverter performs the opposite function of a rectifier. The comparison of the software tools are explained in the following sections.

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