

**Publisher:** Taylor & Francis & Informa UK Limited, trading as Taylor & Francis Group

**Journal:** *International Journal of Electronics*

**DOI:** 10.1080/00207217.2020.1726484

# New Basic Unit and Cascaded Multilevel Inverters with Reduced Power Electronic Devices

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*Abstract-* In this paper, a new cascade multilevel inverter based on series connection of several basic units is proposed. The basic topology consists of 5 dc voltage sources and 12 switches. The required mathematical analysis consisting of voltage on switches, power losses, and the values of dc voltage sources are provided. To verify the advantages of proposed topology, the suggested structure is compared with other multilevel inverter topologies in terms of used dc voltage sources, switches, voltage on switches, and the number of on-state switches. The proposed structure uses the least numbers of dc voltage sources and switches compared to other multilevel inverters for the same number of levels. Also, voltage rating on the switches in the proposed topology is less than other topologies. These characteristics cause the weight, size and cost of proposed topology to be reduced. The propose inverter is implemented using experimental setup. The experimental results verify the performance of proposed structure.

**Index terms:** Multilevel Inverter; Cascaded Multilevel Inverter; Reduced Power Electronic Devices; Voltage Stress; Power Losses; Total Harmonic Distortion.

## 1. Introduction

Recently, multilevel inverters have been used in high and medium voltage industrial applications due to the lower THD, voltage stress on switches, and power losses. Multilevel inverter can produce a voltage waveform with desired amplitude and frequency using the combination of dc voltage sources. In most applications, the used multiple dc sources are provided using rectified grid voltage, batteries, fuel cell, and PV panels [1]. In general, three types of multilevel inverter have been proposed which are named:

- diode-clamped multilevel inverter