9-Level voltage source inverter controlled using selective harmonic elimination

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ABSTRACT
This paper presents an efficient cascaded H-bridge inverter topology that is controlled using an optimized selective harmonic elimination pulse width modulation technique. The switching angles are obtained by solving the nonlinear transcendental equation with the aid of genetic algorithm optimization method. Unlike the usual H-bridge converter topologies that require multiple individual direct current (DC) sources and additional switching components per voltage step, the proposed topology utilizes a single DC source to supply two full-bridge modules. The modified topology employs a cascaded multi-winding transformer that has two independent primary windings and series-connected secondary side with 1:E and 1:3E turn ratios. The converter topology and switching function are proven to be reliable and efficient, as the total harmonic distortion (THD) is quite low when compared with the conventional H-bridge topology controlled by other modulation techniques. This feature makes it attractive to renewable energy systems, distributed generation, and highly sensitive equipment such as those used in medical, aerospace, and military applications. The topology is simulated using a PSIM package. Simulation results show that all the 11- level lower order odd harmonics are eliminated or suppressed in compliance with the SHE elimination theorem of (N-1).

KEYWORDS:
Cascaded h-bridge; Modulation technique; Renewable energy; Multilevel converter; Selective harmonic elimination