

This paper proposes an indirect matrix converter (IMC) topology to supply a five-phase load directly from three-phase ac power sources without bulky electrolytic capacitors and explains its operating principle. Using the emerging topology, which combines the five-leg inverter into the rectifier stage of the conventional IMC, the three-to-five-phase IMC topology reduces the number of power switches and results in a simpler commutation compared with the conventional three-to-five-phase direct matrix converter. In addition, a simple approach to realize the carrier-based pulsewidth modulation (CBPWM) method for a three-to-five-phase IMC is presented, and the proposed CBPWM method is analyzed based on the space-vector approach. As a result, the IMC with the proposed CBPWM method can be more easily implemented compared with IMCs with the space-vector PWM method. A three-to-five-phase IMC control platform is realized by coordinating a TMS320F28335 DSP (Texas Instruments) with an EPM7128SLC84-15 field-programmable gate array (Altera). The simulation and experimental results are provided to verify the effectiveness of the CBPWM strategy.