

The flying-capacitor-based multilevel converter is one of the well-known breeds of the multilevel power converters. This paper proposes a new flying-capacitor-based multilevel converter to minimize the number of flying capacitors (FCs) and power switches. The advantage of the proposed FC-based multilevel converter in comparison with the conventional flying-capacitor multicell converter is that it needs fewer FCs. Also, in comparison with the stacked multicell converter, the proposed multilevel converter requires fewer semiconductor switches. In order to balance the voltage of the FCs in proposed multilevel converter, a new active voltage balancing method which is fully implemented using logic-form equations is presented. The proposed voltage balancing method measures output current and FC voltages to generate switching states to produce the required output voltage level, as well as balance the FCs voltages at their reference values. The output voltage of the proposed multilevel converter controlled with suggested active voltage balancing method can be modulated with any pulse-width-modulation (PWM) method, such as phase-shifted-carrier PWM or level-shifted-carrier PWM. Simulation results and experimental measurements of proposed FC-based multilevel converter are presented to verify the performance of the proposed converter, and its novel switching and modulation strategy, which is based on the active voltage balancing method.