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A revolutionary inverter and a revolutionary control

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Here in this study, a revolutionary inverter technique will be discussed. The goal of this revolutionary technique is to obtain a DC-AC inverter which removes the need for use of known PWM modulation techniques such as multiple PWM, sinusoidal PWM, modified sinusoidal PWM, staircase, stepped, harmonic injected PWM and delta modulated PWM used in the inverter blocks to remove the dominant harmonics and obtain almost harmonic free AC voltage waveforms at the output of the inverters. In the novel technique presented here, the revolutionary inverter is composed of two back-to-back cascaded blocks; one of which is a DC/DC converter and the other is a classical DC/AC inverter. DC/DC converter block is used to obtain the rectified version of the sinusoidal AC voltage waveform desired to be obtained at the output of the inverter and the DC/AC block is used to obtain the desired sinusoidal output voltage waveform from the rectified version of itself formed at the output of the DC/DC converter with only a single loss free switching action in every half cycle of the sinusoidal AC output voltage waveform. In this way, the switching losses associated with the high switching frequencies of classical PWM techniques are eliminated. Besides, the need for classical high valued capacitor utilized in the DC bus to remove the ripples is eliminated because the DC bus voltage waveform is not a ripple free DC bus voltage anymore. In fact, it should be in the form of a rectified sinusoid voltage waveform desired to be obtained at the output of the inverter. Just because of this reason, the DC bus capacitor should actually be valued in small sizes so that it could discharge to zero voltage levels required to form the rectified sinusoid waveform at the output of the DC/DC converter. This means a cost reduction in capacitor sizing. A dynamic duty cycle adjustment is necessary for the control of DC/DC converter to achieve this goal. This dynamic duty cycle control is the most critical part of the revolutionary control, and the second part of the revolutionary control is its requirement for only one loss free switching action due to its zero voltage switching at every half cycle of the desired sinusoidal voltage waveform.

Biography

Irfan Alan received his BSc and MSc degrees from the Istanbul Technical University, Electrical and Electronic Engineering Department in 1983 and 1986 respectively. He won a PhD scholarship to study abroad in the field of Electrical Machines offered by Ministry of National Education, Turkey in 1986. He received his PhD degree from the University of Wisconsin-Madison, Electrical and Computer Engineering Department. He worked as a Faculty Member at Ege University at various capacities for sixteen years. He was and still is Thesis Advisor for many graduate students. He completed many projects including NASA funded, Government Planning Organization funded, Ege University funded, and TUBITAK (Turkish Scientific Technology Research Institute) funded projects. He has many SCI articles. He has refereed many articles published in National and International journals and conferences. He became a Vice Rector at Abdullah Gul University since 2011. He served as an Interim Rector in 2012. He served and still serves as a Dean and Director for different faculties and schools and General Secretary for AGU. His research interests are in the fields of electrical machines, power electronics and drives, energy efficiency, induction heating, wind power electric generation, and energy storage systems.

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