

Experimental FFT Analysis of Voltages in Variable Speed Three-phase Induction Motor Drive

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Abstract:

Induction motor drives are widely used in variable speed applications due to their rugged and inherent benefits. Solid state components are used for industrial speed control of Induction motors using sine modulation technique. The advances in semiconductor technology and microcontrollers made the control easier for variable frequency applications. The control system involves generation of sinewave at various frequencies by changing input to the microcontroller. Since the carrier frequency is used in the control system, the output voltage contains in addition to fundamental, the carrier frequency components due to fast switching of inverter devices. Hence, it is necessary to do the Fast Fourier analysis of voltages to identify the amplitude of frequencies that exist in the phase and line voltages. The reason being other than the fundamental, higher order harmonic voltages result in opposite torque. The drive system has been run at frequencies of 30, 40, 50, 60 and 62.5Hz respectively, captured the phase and line voltages at the motor terminal output in bitmap and csv mode with mixed signal oscilloscope. Using the csv data, the Fast Fourier Transform analysis is done through Origin signal analysis software, which gives the results in frequency domain and has been validated from the mixed signal oscilloscope math function Fast Fourier Transform results.

Keywords:

Variable frequency drive, Pulse width modulation, Fast Fourier transform, Induction motor, Comma separated values.