Nonlinearities such as dead time, switching time, delay time, voltage drops on the power switch and the freewheeling diode, parasitic capacitance of the power switch etc. distorts the output voltage of the voltage source inverter (VSI). This output voltage distortion creates low order harmonic components in the output current of the inverter which in turn creates iron and core losses and increases torque ripples. Especially in low speed and low torque applications the control performance and stability of the system will be degraded substantially. The effect of the nonlinearities will be analyzed and investigated for both MOSFET and IGBT based VSI and for various permanent magnet synchronous motors (PMSMs). The proposed compensation method will be software based hence will not require any additional hardware and will not need precise current sampling especially in the zero crossing regions. The method will be integrated to the PMSM drive which is controlled by field oriented control (FOC) algorithm. The effectiveness of the proposed method will be verified by experimental results and spectrum analysis. The waveforms of the phase, id and iq currents will be compared with and without compensation in the steady state and also during the dynamic process.