SPEED CONTROL THREE PHASE INDUCTION MOTOR USING MOSFET INVERTER BY V/F METHOD

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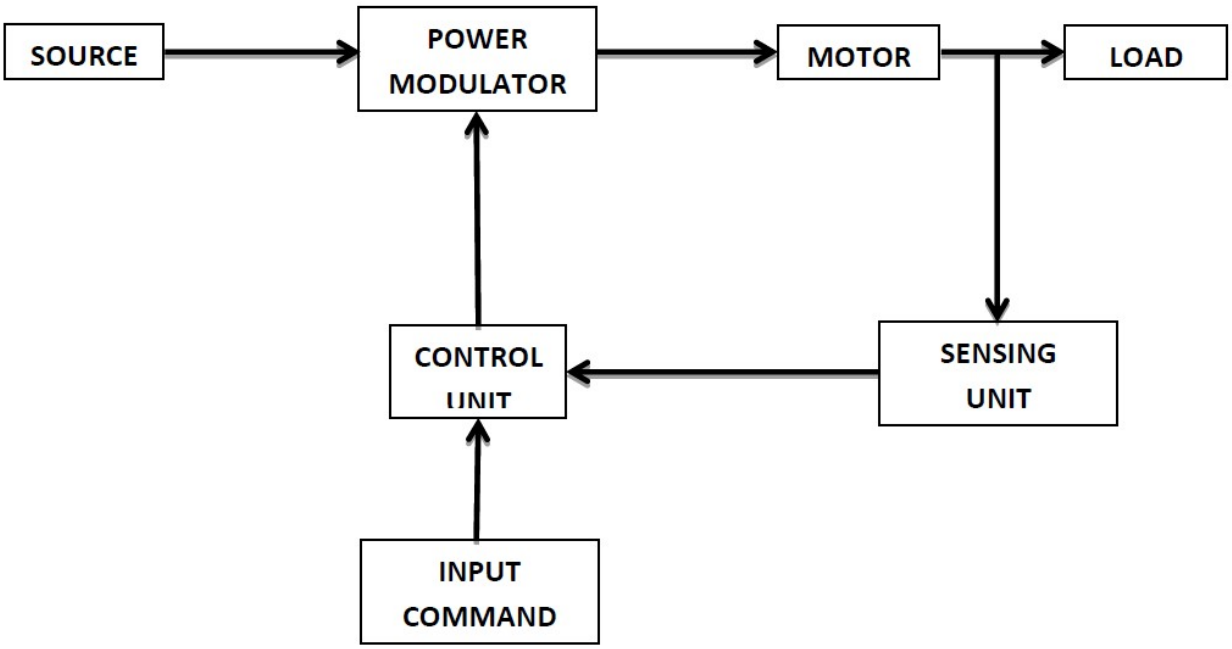
Abstract-The formula for speed for induction motor is Ns=120f/p. from this formula we can conclude that the speed of the motor can be varied in two ways, one is by changing the number of poles and the second method is by changing the frequency. The speed control through the first method is uneconomical and the number of poles can't be varied under running conditions and the size of the machine also becomes bulky. If we keep the v/f ratio constant the flux remains constant and hence there is no change in the rated torque. These problems can be overcome by the second method

KEYWORDS: Space Vector, Pulse Width Modulation, V/f, Three Phase Induction Motor

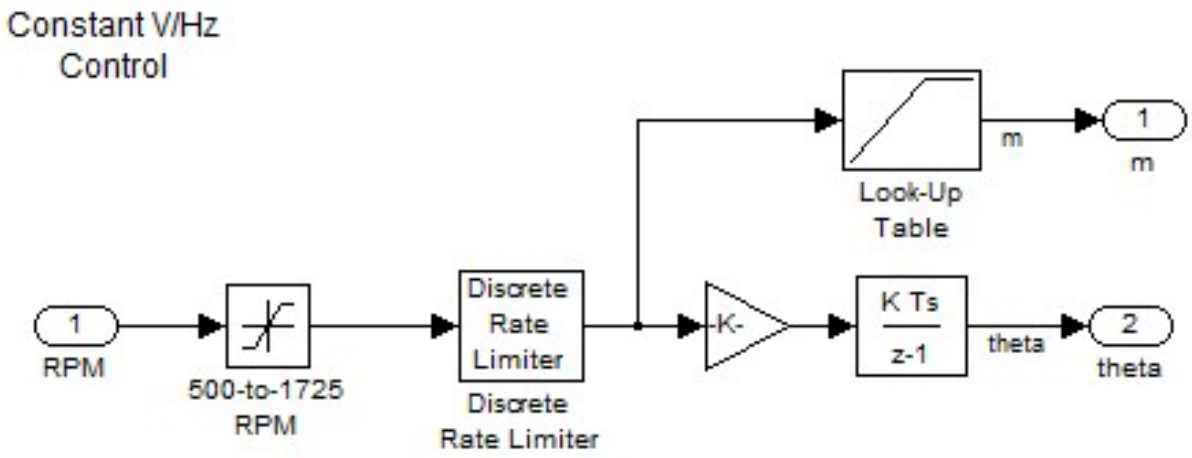
Introduction- Be it domestic application or industry, motion control is required everywhere. The systems that are employed for this purpose are called drives. Such a system, if makes use of electric motors is known as an electrical drive. In electrical drives, use of various sensors and control algorithms is done to control the speed of the motor using suitable speed control methods.

The basic block diagram of an electrical drive is shown below:



Load is usually a machinery designed to accomplish a given task e.g. fans, pumps, robots, washing machines ,machine tools, trains and drills. Usually load requirements can be specified in terms speed and torque demands. A motor having speed-torque characteristics and capabilities compatible to the load requirements is chosen. The variable voltage and variable frequency can be obtained from pulse width modulation method. In this paper wehave discussed about the SVPWM method.

PRINCIPLE OF SPACE VECTOR PULSE WIDTH MODULATION



A there phase inverter must be controlled so that at no time are both switches in the same leg turned on or else the DC supply would be shorted. This requirement may be met by the A- is off and vice versa. This leads to eight possible switching vectors for the inverter, V_0 through V_7 with six active switching vectors and two zero vectors.

Similarly, the resultant line voltage vector of a three-phase system of V_L voltages delivered by the three-phase stator of a generator is also given by Eq. (2). The resolution along the line voltage magnetic axes, produces the instaneous line voltages of the three-phase system.The resultant line voltage vector produced by the three-phase voltage source inverter and representing the vectors , by their instaneous values and the spatial position of the line voltage virtual magnetic axes results are magnitudes and are the respective spatial position of the line voltage virtual magnetic axes of the three-phase system produced by the voltage source inverter. The line and phase voltages virtual magnetic axes of the three=-phase system of voltages, produced by the three-phase inverter.

In this method the frequency can be varied under running conditions also and there is no change in the size of the motor. In this method the frequency changing device is SVPWM Generator which utilizes the space vector pulse width modulation (SVPWM) technique to generate firing pulses to the six switching devices of the converter and hence the frequency of the supply can be varied w.r.t the voltage Induction motor are being used in greater numbers throughout a wide variety of industrial and commercial applications because it provides many benefits and reliable device to convert the electrical energy into mechanical motion. In some applications, it is desired to control the speed of the induction motor. Space Vector Modulation (SVM)Technique has become the most popular and important PWM technique for three phase voltage source inverters for the control of AC Induction, brushless DC, switched reluctance and permanent magnet synchronous motors. This paper proposes implementation of three level inverter using Space Vector Modulation Technique. Using this novel modulation strategy, the changing of switch states cause only one single phase voltage change every time.

SIMULATION RESULT

In this paper we have discussed about speed control of three phase induction using PWM technique, the figure 3 given below shows the rotor speed variation against constant V/f ratio

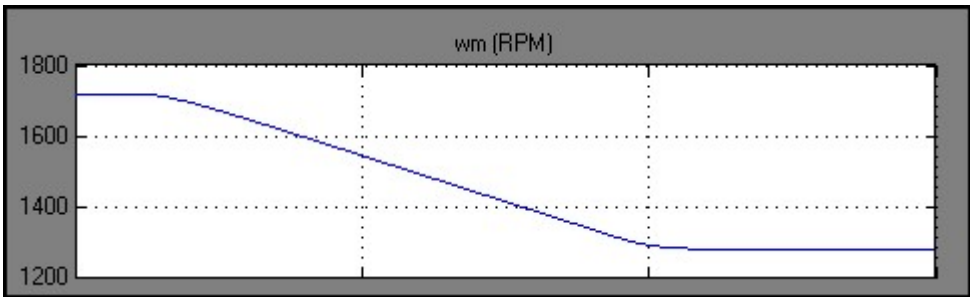


Fig3 rotor speed variation with constant V/f ratio

Figure 4 shows the change in applied voltage and corresponding change in frequency shown in figure 4, both the waveforms describes constant V/f ratio.

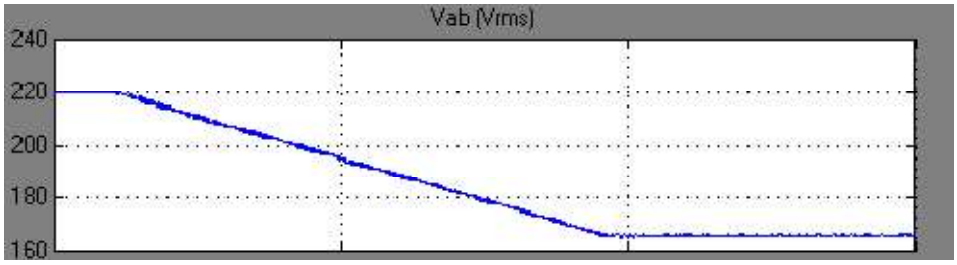


Fig.4 change in voltage

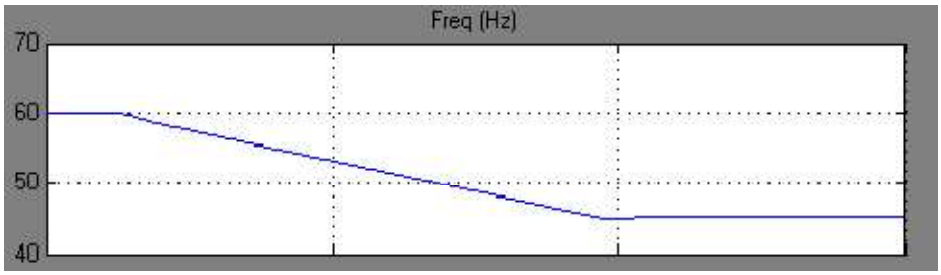


Fig.5 change in freq

CONLUSION

The variation of stator voltage and frequency is done proportionally, such that V/F ratio is constant. From this work and
result analysis, it is observed that speed of an induction motor can be efficiently controlled by using SVPWM. In the
present work, the simulation of speed control of motor by volt/hertz method using SVPWM is simulated and
waveforms are discussed.

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