

Speed control methods of 3 phase induction motor pdf

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three phase induction engine: simulation and control of the speed of motor units control of the applied voltage | article original shambulingana gouda.* in journal of advances and scholarly researchs in allied education | multidisciplinary academic research of admin - 9 January 2017 in this post we see what are the various methods to control the speed of induction motor. we know that the speed of the induction engine is given by, from the above equation, the speed of the engine can be controlled by changing the power frequency and changing the number of poles in the stator. control by stator side: changing the power frequency by changing the number of poles of the stator by changing the power control from rotor side: inserting the resistance in the rotor circuit with various modes of connection cascade by injecting emf into the rotor circuit. speed control for frequency change: varying the power frequency (on small amount,) we can vary the speed. but a decrease in the supply frequency decreases the speed and increases the flow, core losses leading to heating and low efficiency, the increase in frequency increases the speed and reduces the torque. A separate cost auxiliary is required to provide a variable frequency, therefore this method is not oato in practice. speed control from pole change: change of number of poles is made having two or more completely independent winding stator in the same slots. each winding gives a different number of poles, so we will get different speeds. due to cost and complex switching systems, it is not practical to provide more than two arrangements of poles (i.e., two normal speeds.) this method is only applicable to the induction engine of the squirrel cage. is not practically applicable with the wound rotor. speed control by varying power voltage: the induction engine speed can be varied by changing power voltage. the couple developed in this method is proportional to the square of the power voltage. t . v2 this is the cheapest and simplest method, but is rarely used due to the underlying reasons. a small change of speed requires a great change of tension. this great change of tension will cause a great change in the density of the flow. speed control varying rotor resistance: This method is only applicable to the three-phase induction engine. with the introduction of external resistance in the rotor circuit, the speed of the engine can be reduced. the change of speed depends both on the resistance of the rotor circuit and the load. Due to the loss of power in resistance, this method is used where speed changes are necessary only for a short period. This method is similar to speed control by injected EMF: Instead of applying the resistance in the engine rotor circuit, the speed can be varied by applying EMF in the circuit. These EMF are applied to the rotor by a suitable source whose frequency should be equal to the slip frequency. Inserting the EMF in phase with the rotor rotorEMF is equivalent to decreasing rotor resistance. The insertion of the EMF in phase opposition to the induced rotor EMF is equivalent to increasing its resistance. Thus injecting EMF into the rotor speed can be controlled. Speed control from Cascade Connection: This method needs two engines, one of them is the engine of the wound. The two engines are mechanically coupled together to drive a common load. The start of the induction engine of the sliding ring is connected to the three-phase supply and its rotor is connected to the stator of the other machine. There are four possible speeds can be obtained from this agreement. Where f = power frequency P1 = No of poles in the P2 slide engine = No of poles in other engine Read more: How to control the speed of DC Shunt Motors? How to control the speed of the DC Motor series? How does the fluorescent lamp work? Double Induction Cage Motor - Introduction Difference between Mechanical and Electronic Switch Thanks for reading on Induction Motor Speed Control Methods.... Please leave your comments below... Tags: Induction Motor ...but your activity and behavior on this site made us think you are a bot. A number of things could happen here. If you are trying to access this site using an anonymous Private/Proxy network, please disable this and try to access the site again. Due to previously detected malicious behaviors that come from the network you are using, please ask to unblock the site. Please resolve this CAPTCHA to request the unlocking of the Mon website, Feb 05 from ATO.com How to control the speed of the three-phase induction engine? The speed control method includes: change of the number of poles, control of the voltage of the stator, conversion of the frequency of the stator, control of the speed of the cascade, adjustment of the speed to double advance, hydraulic coupler, clutch of electromagnetic slip, etc. The actual speed of three asynchronous motor phases is given by n=ns(1 - s) = 120f/p(1-s). It can be seen from the formula that the induction engine speed of 3 phases can be changed by means of changing the number of poles of the induction engine "p", the slip "s" and the power frequency "f". Switch speed control As shown in the formula ns=120f/p, it can change the synchronous speed of the motor by changing the number of poles of the winding of the stator, thus changing the speed of execution. The control of the pole exchange rate is mainly used in the induction engine of the squirrel. The control of the gearbox speed has the following characteristics: Harder mechanical features and good stability Without slip loss and high efficiency simple wiring,convenient and low price But can not get a smooth speed adjustment with this method due to its great degree difference. Therefore, it can be used with control of voltage speed and electromagnetic slip clutch, to get a feature of regulation of smooth speed at high efficiency. This method is suitable for production machines without speed control without steps, such as metal cutting machines, lifts, cranes, fans, water pumps and so onVariable speed control1. Change the voltage of the stator The pair of an induction engine is proportional to the square of the voltage of the stator. That is, the change of the voltage of the stator can change the mechanical characteristic and the engine torque. This method is not suitable for the normal squirrel-cage engine, because its rotor resistance is very small and the current will rise quickly at low speed. But it can be used for the induction engine of the type of injury by the resistance of the series or frequent varistor in the rotor circuit to reduce the heat of the engine.2. Change rotor resistance This speed adjustment method is only applicable to the winding motor. In the rotor circuit of the induction motor in series with resistance, when the load is fixed, greater the resistance, less the speed of the motor. The smaller the resistance, the higher the speed. This method is simple, easy to control and has a low initial investment. But the power of the slip is consumed on the heat resistance. It also has soft mechanical characteristics.3. Cascade speed control At the moment, cascade speed control uses SCR inverter cascade control circuit, and has the following advantages: getting stronger mechanical characteristics, low voltage drop of the rectifier, small space, no rotating part, low noise, simple maintenance. It is one of the methods of controlling the speed of the engine in the form of wound. He's got his own disadvantage. That is, the rotor circuit is equipped with a filter reactor, so the power factor is low. Variable frequency speed control According to the induction engine speed formula, you can see that when the slip is constant, the speed of the motor n is substantially proportional to the power frequency f. Therefore, changing the frequency f can adjust the speed of the induction motor without hitches. Changing the power frequency is an economic speed adjustment method, and it is also one of the most popular ways of controlling the engine induction speed. The variable frequency speed control is a way to change the engine stator power frequency and then change its synchronous speed. The main equipment of variable frequency speed control system is frequency converter or variable frequency unit (VFD) which provides frequency conversion for power supply. Variable frequency units can be divided into two categories: AC-DC-AC VFD and AC-AC VFD. Nowadays, widely used VFDs use digital technology and tend to miniaturization, high reliability and high precision. In applications, not only has significant performance of energy saving, but also hasperformance: High precision uniform speed control. Full protection function, able to display the fault from self-diagnosis and simple maintenance. Starting directly online, with large torque and small starting current, which reduce the impact on the power grid and equipment, and having the torque lifting function, thus saving the soft start device. High Power Factor and Save Condenser Condenser CompensationTags: Digital electronicsElectronElectronics & Electrical The torque developed by the induction motor is given by,\$\mathrm{\tau} \propto \frac{1}{R_2} \left[\frac{R_2}{s} \right]^2 \frac{1}{R_2} \left[\frac{R_2}{s} \right]^2 \frac{1}{R_2} \left[\frac{R_2}{s} \right]^2 \dots\$ (1) \$ \tau \propto \frac{1}{R_2} \left[\frac{R_2}{s} \right]^2 \frac{1}{R_2} \left[\frac{R_2}{s} \right]^2 \frac{1}{R_2} \left[\frac{R_2}{s} \right]^2 \dots\$ (2) Dove,k = proportionality constant,s = fractionated slip,E20 = for induced phase Erm in rotor at standstill,R2 = resistance of the circuit of the (2) The speed of a three-phase induction motor can be varied by changing the power voltage. Eqn. (1) shows that the torque developed in the engine is proportional to the power voltage square and eqn. (2) shows that the slip corresponding to the maximum torque is independent of the power voltage. In addition, the change of power voltage does not alter the synchronous speed of the engine. The figure shows the characteristics of three-phase induction motor torque-speed for a variable power voltage. The speed control of a three-phase induction motor is achieved by changing the power voltage until the required torque from the load is developed at the desired speed. The torque developed by the induction motor is directly proportional to the square of the power voltage and the current is proportional to the voltage. Therefore, when the power voltage decreased to reduce the speed for the same current, the torque developed by the engine is reduced. Therefore, the voltage control method of the stator is suitable for applications where the load couple decreases with speed, as in the case of a fan load. With the stator voltage control method, the engine speed can be varied within a small range. Since the operation of the voltage motor above the nominal voltage is not admissible, then this method allows the speed control only under the nominal speed of the motor. Speed control through the stator voltage control method is more suitable where the engine intermittent operation is required. This method is also suitable for controlling the speed of induction engines fans or pumps in which the load torque varies as the speed square, since these engines require low torque at low speeds and this can be achieved with a lower applied voltage without excessive motor current. The variable voltage for controlling the induction speed of three stages can be obtained using the voltage regulators of the triistor. Here three pairs of connected rooters are needed, one pair at each stage (see the circuit diagram). Each pair of the rooters controls the voltage of the phase to which it is connected. Motor speed control is achieved by varying the periodof the writers. Important - For low-power rating operations, the pair of rear-back tires at each stage can be replaced by a triac. Published on 28-Aug-2021 14:14:50 14:14:50 14:14:50 14:14:50

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