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MULTIFUNCTIONAL INDUCTION MOTOR

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Abstract- In this paper, we accomplish a multifunctional induction motor. In general induction motor works only one supply either three phase or single phase. we reconstruct our motor in that manner our motor works on both supply i.e. single phase as well as three phase supply. After rewinding it acts as a phase converter, welding transformer, and three phase induction motor. That's why we called it as a multifunctional induction motor.

Keywords- Induction motor, Phase converter, Rotary welding transformer and general three phase transformer.

1. Introduction: -

As we know ac motors receive electric power by 'mutual induction'. It is exactly same as the secondary winding of transformer receives its power from the primary. That's why such motors are known as induction motors. In fact, an induction motor can be treated as a rotating transformer (one in which primary winding is stationary but the secondary is free to rotate). The transfer of energy from stator to rotor of an induction motor takes place entirely inductively with the help of flux. Hence induction motor is called as 'rotating transformer' with stator forming primary and rotor forming secondary. Like DC motors, AC motors does not receive electric power by 'conduction' but by 'induction' in exactly the same as the secondary of 2-winding transformer receives its power from the primary. That is why such motors are known as induction motors. In fact, an induction motor can be treated as a rotating transformer i.e. One in which primary winding is stationary but the secondary is free to rotate. [4] The transfer of energy from stator to rotor of an induction motor takes place entirely inductively, with the help of a flux mutually linking the two. Hence induction motor is essentially a transformer with stator forming primary and rotor forming (short –circuited) rotating secondary. [2] As the induction motor is nothing but generalized transformer, this same concept can be used to implement the motor as welding transformer. [4] Which require low voltage (50 to 60volts) and high current (upto200A) for joining of two metal parts by electrical arc welding. Some design modifications can be done in stator winding of induction motor. Also the same motor can be implemented for operating on the single phase supply. The running and starting winding of the single phase operation are placed in same slots that are used for the three phase operation. So at a time anyone of them can be used to supply or produce excitation in order to employ rotation of rotor. [2]

While performing single phase operation, the capacitor can be used to produce starting torque then after acceleration starting winding can be disconnected by simple arrangement. Now, when supply is given for three phase, the emf is also induced in winding used for single phase operation.

2. OBJECTIVES: -

- 3-phase Induction Motor
- Phase Convertor (1-phase to 3-phase & 3-phase to 1-phase)
- Welding Transformer.

3.LITERATURE REVIEW:

The purpose of this machine is that it can work in multiple operations, such as at the same time it can act as single phase induction motor or three phase induction motor. It also works as phase converter like three phases to single phase. Also it acts as a welding transformer too.

4. MAIN FUNCTION: -

The main functions of our model are listen under these sections. A general description of each function is followed by their working in our model.

A) **Act as a poly phase induction motor:** The rotating magnetic field cuts the rotor windings and produces an induced voltage in the rotor winding due to the fact that the rotor winding is short circuited, for both squirrel cage and wound rotor motor and torque is produced as a result of the interaction of these two magnetic fields. Where wound rotor induced current flows in the rotor windings, the rotor current produces another magnetic torque that is the induced torque also BR and BS magnetic flux densities of the rotor and the stator respectively. If rotor runs at the synchronous speed, which is the same speed of the rotating magnetic field, then the rotor will appear stationary to the rotating magnetic field and rotating magnetic field will not cut the rotor. So, no induced current will flow in the rotor and no rotor magnetic flux will be produced so no torque is generated and the rotor speed will fall below the synchronous speed. When the speed falls, the rotating magnetic field will cut the rotor windings and a torque is produced, so, the induction motor will always run at a speed lower than the synchronous speed.

B) **Act as a welding transformer**: A step down transformer with open circuit voltage of about 70 volts and having negative voltage characteristic can be used for welding work. To get the negative voltage characteristics a choke is used i.e. an inductive reactance is concern with secondary circuit. Another definition is a step down transformer having choke with taps or movable core in between primary control the arc current and to give it stability comprises a ‘welding transformer’.

C) **Act as a rotary phase converter**: A phase converter is device that produces three phase electrical power from a single phase source, thus allowing the operation of three phase equipment at a site that only has single phase electrical service. These were static phase converters, and they have changed little since that time. Over the years, other technologies have been employed as

phase converters and hundreds of companies, large and small, manufacture phase converters.

D) **Single phase induction motor:** The single phase motors are simple in construction, cheap in cost, reliable and easy to repair and maintain. Due to all these advantages, the single phase motor finds its application in vacuum cleaners, fans, washing machines, centrifugal pumps, blowers, washing machines, etc.

5. METHADOLOGY: -

BLOCK DIAGRAM

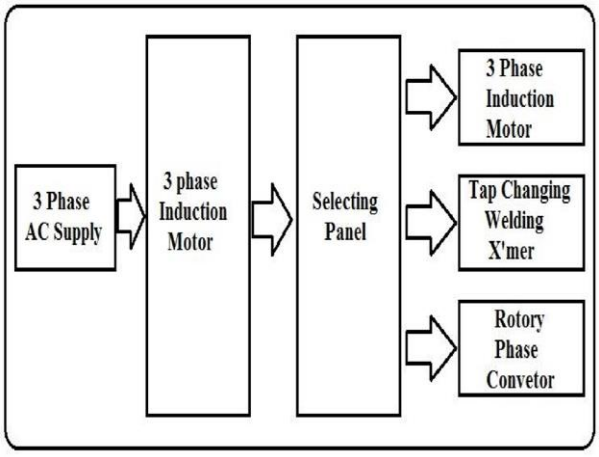

Fig Block diagram of multifunctional induction motor

The concept of project is nothing but the implementation of the split phase starting winding used for single phase winding. The winding is in space quadrature the main winding is supplied with current displaced in time from the current in main winding by as nearly 90 degree as possible. The requisite phase displacement between the current in main, running, starting winding is obtained by connecting suitable capacitance in series with them. With this split phase motor, the starting winding is cut out from the main supply, usually by bell push switch, after the motor has picked up about 75 percent of full load speed. For this concept we use the squirrel cage induction motor which has a delta winding. The hardware arrangement of the model along with its working will be discussed under this section.

ADVANTAGES: -

1. Multifunctional induction motor is more convenient as compared to the normal induction motor.

2. Motor requires less space.

3. Motor is able to do at time two operations that is motoring and welding.

4. One more advantage is that less weight compared to separate combination of welding transformer and induction motor as well. Hence cost require for two machines get reduced.

5. As per the industrial point of view, it helps to reduce installation cost because multiple operation in same induction motor.

APPLICATIONS: -

1.The use of the multipurpose motor used in mega workshop.

2.This motor is also used for traction.

3.Metal cutting workshop.

4.It can be used for heavy fabrication industry and steel industry.

5.1 REDESIGN AND DEVELOPMENT

In redesigning of motor we just observe the original design of its motor and its specification.

The original winding is divided in 3 parts on the basis of no. of turns. Out of these winding the first winding is with same gauge wire and half of the original no. of turns. Hence, this is a winding of 3-ph induction motor and as number of turns are half the motor is of half capacity i.e. 2.5 HP]. The second and third winding is used for the purpose of welding and is act as tap of welding transformer. As we know the welding application requires high current rating, the triple layer winding is used to improve the current rating.

5.2 HAEDRWARE DESIGNING AND WORKING:

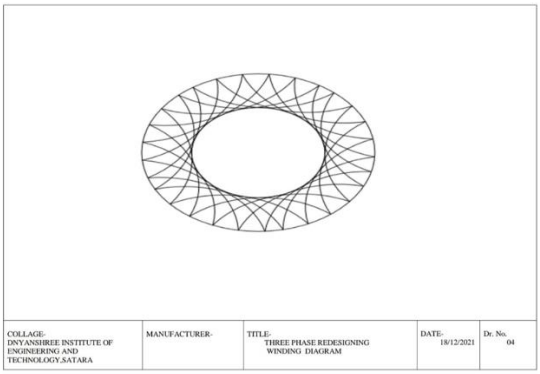

Fig.5.2(a) connection of three phase winding.

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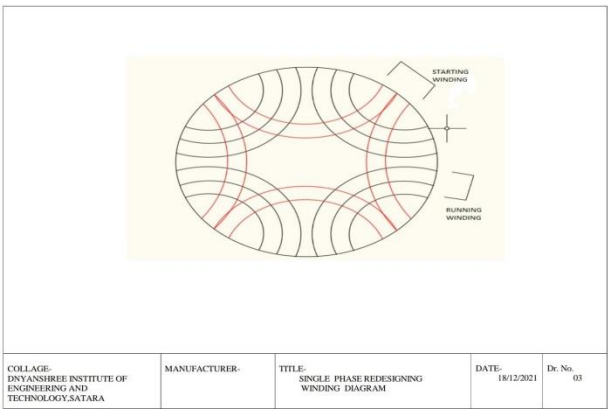

Fig.5.2(b) connection of single phase winding.

The same motor is used for 1-ph induction motor. Hence these winding are also used as starting and running winding of 1-ph induction motor. Winding used for induction motor is generally lap type with diamond shaped coils is used for stators. The modern insulating material for diamond coils belongs to classes E, B and F The slots and phase insulation is polyester foil coated with compressed fiber for class E and plastic foil with polyamide fiber for class F. The insolent in both cases are impregnated with class F insulation. The phases of winding can be connected in star or delta depending upon starting method employed. The squirrel cage motors are usually started by star delta starter and therefore their stators are designed for delta connection and six leads are brought out to connect the starter.

6. CONCLUSION:-

We consider overall performance the machine is very useful in mega workshop where of operation are performed simultaneously. As one machine performs number of it is economically useful and suitable at places where less space is available. We compare the machine with

different devices used for same applications; we found cost of project machine is half to that of total cost of different machines. Therefore, cost is 50-60%. We are getting very useful information about design of induction motor that some further modification can also be done in order to achieve better performance, efficiency and regulation. Hence the use of multifunctional motor results in lots of advantages and convenient to use.

7. RESULT :-

1.Three phase induction motor run on single phase as well as three phase supply.

2.When the motor has single phase supply, the voltage in three phase terminal = 427 volts.

3.When three phase supply given to motor then for welding voltage =48 volts, current = 183 Amp.

Voltage across starting winding = 407 volts.

Voltage across running winding =413 volts.

8. FUTURE SCOPE :-

Three-phase induction motors are widely used as industrial drives because they are self-starting, reliable and economical. Single-phase induction motors are used extensively for smaller loads, such as household appliances like fans. it has been used in constant and variable-speed drive applications that do not cater for fast dynamic processes.

REFRANCES:-

[1] " Advanced Control of a Resistance Spot Welding System".

[2] "Determining the Parameters of a Resistance Spot Welding Transformer Using Differential Evalution".

[3] "Control of the Single-Phase to Three-Phase Four-leg Converter for Constant Frequency Output Voltage".

[4] "The Starting of 3-Phase Induction Motor Connected to a Single –Phase Supply System" .