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MULTIFUNCTION INDUCTION MOTOR

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ABSTRACT:

In this paper, we implemented the redesign of three phase induction motor such a way that motor can be used as multifunction. Stator winding of induction motor is redesigned and motor is used as phase converter as well as welding transformer.

KEYWORDS: Bell Push Switch, Capacitor, Poly phase Induction Motor.

I. INTRODUCTION:

A three phase induction motor is widely used in industrial purpose. They are simple rugged, and easy to maintain. A three phase induction motor can easily operated because of they run at essentially constant speed from zero to full load. The speed is frequency dependent and consequently, but these motors are not easily adopted to speed control.

A three phase induction motor has different parts but we mentioning here two main parts of motor: a stationary stator and rotating rotor.

The working of three phase induction is based on principle of Faraday's Law of Electromagnetic Induction. In three phase induction motor stator winding are connected to the three phase supply and the rotor circuit is closed, the induced voltages in the rotor winding produces rotor current that current interact with the air gap field to produce torque.

Generally, an induction motor can be acts as a rotating transformer i.e one in which primary winding is stationary and secondary side is free to rotate. An induction motor rotor does not take it's electric power by conduction but by induction due to this energy can be transfer from stator to rotor done by inductively with the help of flux mutually linking with the two. Hence the induction motor essentially acts as transformer with stator forming primary and rotor forming rotating secondary. Exactly same principle we are going to implement to induction motor work as a welding transformer by applying low voltage and high current.

II. MAIN FUNCTIONS

The main functions of our model are listed 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 three phase induction motor operates on a principle of rotating magnetic field this magnetic field is produced by stator winding which is placed in motor. When one of the winding is excited with alternating voltage and rotating field is setup. This field produces an electromagnetic force in the other winding by transformer action which in turn circulates current in the rotor. The current flowing through secondary winding interact with the field produced by the first winding there by producing a torque which is responsible for the rotation of the rotor.

B. ACT AS A WELDING TRANSFORMER

Normally, the welding can be used for joining of two metals. The welding transformer requires low voltage and high current. As we know the induction motor is a generalized rotating transformer, the same principle can be used to operate induction motor as a welding transformer. A step down transformer with open circuit voltage near to 60-70V and having negative voltage characteristic can be used for welding work. Hence for this some design modification can be done in stator winding and we can use induction motor as welding transformer.

C. ACT AS A ROTARY PHASE CONVERTER:

The phase converter is usually used where three phase service from the utility is not available. Three phase service is generally expensive to install so we need phase converter for working different applications.

A three phase converter is a 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 converter and they have changed little since time. Over the years, other technologies have been employed as a phase converter.

There are two common types of phase converter one is static phase converter and second is rotary phase converter.

III. REDESIGN AND DEVELOPMENT:

By the concept we only redesigning the stator winding and rotor is remains as it is.

The main concept of project is to implement the split phase starting winding used for single phase winding. The winding are 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 model generally we use the squirrel cage induction motor and delta connected winding is used. The hardware arrangement of the model along with its working will be discussed under this section.

A. HARDWARE DESIGNING AND WORKING:

In this proposed model we took the induction motor having rating with three phase, 5 HP, 1440 RPM.

No. of pitch = No. of slots / No. of poles ± 1 Therefore, after each 8 or 10 pitch distance the coil passes towards another slot.

For three phase Induction Motor double layer, single conductor is used. The turn per coil of proposed model is 108.

Thereby obtaining actual turns,

Therefore,

Actual turns = No. of turns/ 2

In redesigning we have to connect winding in star,

Therefore,

Turns / phase = Actual turns /Õ3

As the turns are reduce the gauge of wire increases.

For three phase double layer winding is used so, turns per phase being half of that.

Therefore,

Turns/ slot = No. of slot * Half of turns phase.

For single phase,

Total No. of turns = Turns of three phase winding / 3

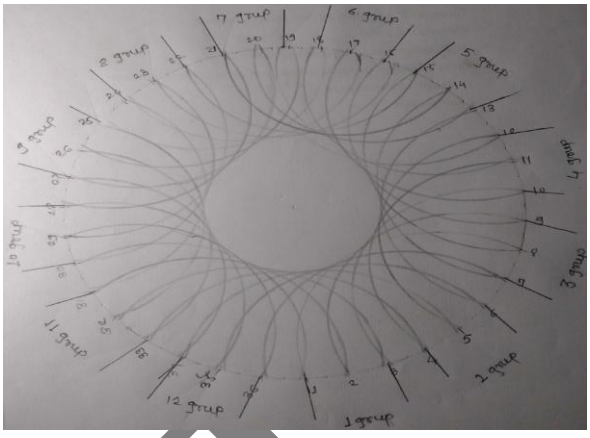

Fig. Combination of both single phase and three phase winding

The stator cores consist of 36 slots. Every slot winding is divided into three parts on the basis of no. of turns. From these three parts of winding first winding is for the three phase induction motor and second and third winding is made for the single phase induction motor and welding transformer.

For redesigning of stator winding we change the gauge of copper wire but turns remains same as that of original three phase induction motor.

Stator Winding used for induction motor is generally lap winding type with a diamond shaped coils.

Class E and class F type of insulation is used and insulation paper used is of nomex.

For three phase winding, the conductor is of double layer single conductor and for single phase, double layer single conductor.

The starting and ending connection of each coil of group is brought out and which connected in series, gives out half of input supply. when connected in parallel, then step down voltage is done and gives low voltage with increase in current which is ideal supply used for electrical spot welding.

For single phase operation, capacitor starts then it will give doubled input supply. Hence the motor gives step up operation. We will use the bell push switch for producing starting torque on single phase induction motor.

IV. ADVANTAGES:

1. Multifunction 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 requires for two machines get reduced.

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

IV. APPLICATIONS:

1. The use of multiple motor used in mega workshops.
2. This motor is also used for traction. Metal cutting workshops.
3. It can be used for heavy fabrication industry and steel industry.

V. RESULTS

1. Three phase induction motor run on single ohase as well as a three phase supply.
2. When single phase supply given to motor then,
   Voltage across three phase terminals = 380 volts.
3. When three phase supply given to motor then,
   Voltage across starting winding = 205 volts.
   Voltage across running winding = 210 volts.
   For welding, Voltage = 60 volts,

   Current = 145 Amp.

VI. CONCLUSION

In our proposed model the one machine performs number of operations which is economically useful as well as suitable at places where less space required. Cost of project machine is half to that of total cost of different machine. Therefore cost is reduced to minimum.

We are getting very useful information related to design and calculation of induction motor. Hence the use of multifunction motor results in lots of advantages and applications convenient to use.

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