

# “MULTIFUNCTIONAL INDUCTION MOTOR”

Mr. Satyawan S. Bahir<sup>1</sup>, Ms. Mrunali K. Dhole<sup>2</sup>, Mr. Vipul S. Chaudhari<sup>3</sup>, Mr. Bhushan S. Jagdeo<sup>4</sup>,

Ms. Dipali V. Patil<sup>5</sup>

<sup>1,2,3,4</sup>Scholar, Electrical Engineering, GHRIEM, Jalgaon, Maharashtra, India,

<sup>5</sup>Assistant Professor, Electrical Engineering, GHRIEM, Jalgaon, Maharashtra, India,

\*\*\*

**ABSTRACT:** In this paper, we have executed three phase induction motor reconstructing/ restructuring in such way that the motor can be used as (multifunctional) or different function. The stator winding of the induction motor is restructured/ reconstructed and the motor is used as a phase converter as well as winding transformer. As we know that induction motor is nothing but the generalized transformer, these same concept can be use as execute the motor as rotary welding transformer.

**Keywords:** Induction motor, Phase converter, Rotary welding transformer and General three phase transformer.

## 1. INTRODUCTION

The universal adoption of A.C. system almost of distribution of electrical energy for light and power, the sector of application of A.C. motors has widened considerably during recent years. As a result, motor manufactures have tried, over the previous couple of decades, to perfect various sorts of A.C motors suitable for all classes of commercial drives and for both single and three phase supply. Like D.C motors, A.C motors doesn't receive electrical power by 'conduction' but by 'induction' in just an equivalent because the secondary of 2-winding transformer receives its power from the first. That is why such motors are referred to as induction motors. In fact, induction motors are often treated as a rotating transformer i.e. one during which primary coil is stationary but the secondary is liberal to rotate. 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. As the induction motor is nothing but generalized transformer, this same concept are often wont to implement the motor as welding transformer. 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.

## 2. OBJECTIVE

Normally, induction machine is used as a motor in industrial and agricultural application even though it is cheaper, its use is limited for the driving loads only.

Generally for welding purpose a special purpose transformer is designed which can be used only for welding purpose. in many applications, phase conversion from single phase to three phase required.

Hence to fulfill these requirements it is proposed to make the induction motor multifunctional. With the help of rewinding the induction motor, it can be used as welding transformer. Also it is used to drive the load but half of the rated output.

This induction machine can also run as single phase induction motor at the same time it is used as a phase converter and when this machine runs as a three phase induction motor, it can be used also as a welding transformer. Hence it shows that our project is "MULTIPURPOSE MACHINE". If compare this machine with other present machine available in market this might be the first machine for multipurpose.

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 in such a case any of them can be used at the time of stimulation to work on the rotation of the rotor. When performing single phase operation, the capacitor can be used to generate start torque, then after acceleration, the starting turn can be disconnected by a simple arrangement

Now, when supply is given for three phase, the emits also induced in winding used for single phase operation. Here the starting and ending of each coil group is brought out. Which when connected in series, gives out half of input supply (i.e.200V approx. ) hence step down of voltage is done and when connected in parallel, gives (50V approx.) with high current(up to 200A) which is ideal supply used for 'Electric Arc Welding' hence another application i.e. Electric arc welding.

Opposite to above concept, when supply is used to operate motor for single phase operation, after capacitor starting, we get double of input supply i.e.(400V approx.) across open circuit phases of three phase winding terminals. Hence, motor gives step up operation as well.

## 3. LIERATURE REVIEW

In today's world, in industries an induction motor and the welding transformers are frequently utilized in the industries for his or her own applications. To satisfy their

requirement they're used separately within the industries which increases the installation cost of the industry. To overcome this difficulty we are getting to implement our proposed model to work three functions on an equivalent induction motor. the utilization of multipurpose motors is extremely convenient for utilized in mega workshops. Hence the value require for 2 machine gets reduces. Motor gives good performance for multiple operations.

#### 4. MAIN FUNCTION

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 works on the principle of rotating magnetic field this magnetic field is created by the stator winding which is placed in the motor. When one of the winding is excited with alternating voltage and rotating field is setup. This field generates electromagnetic force in other turns through the transformer action which rotates the electric current in the rotor. The electric current flowing through the secondary winding interacts with the area created by the first winding there by producing the torque responsible for the rotation of the rotor.

##### 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 are 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 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 transformers and they have changed little since then.

Over the years, other technologies have been operating as phase converters, and there are hundreds of companies, large and small, producing phase converters.

##### D. SINGLE PHASE INDUCTION MOTOR

The single phase induction motor is most frequently used motor for refrigerators, washing machine, clocks, drilling, compressors and pumps. Single phase motor not self starting motor in which two winding present namely auxiliary winding and main winding.

## 5. METHODOLOGY

### 5.1 BLOCK DIAGRAM

The system development multifunctional machine should provide separate terminals for the input and output of the multifunctional induction motor. Using a multifunctional induction motor, we operate a 1 phase machine on a 3 phase supply and we also operate a 3 phase machine on a 1 phase supply. We design a single machine to reduce the use of three machines instead of this one so the size of the machine will be reduced. In this multifunctional induction motor we have only the stator winding designed. So it acts as a rotating transformer and it moves forward or Lower the voltage by the law of mutual induction.

Block diagram is basic application pictorial representation of multifunctional induction motor application and user which use according to present case available supply i.e. 3-phase or 1-phase supply.

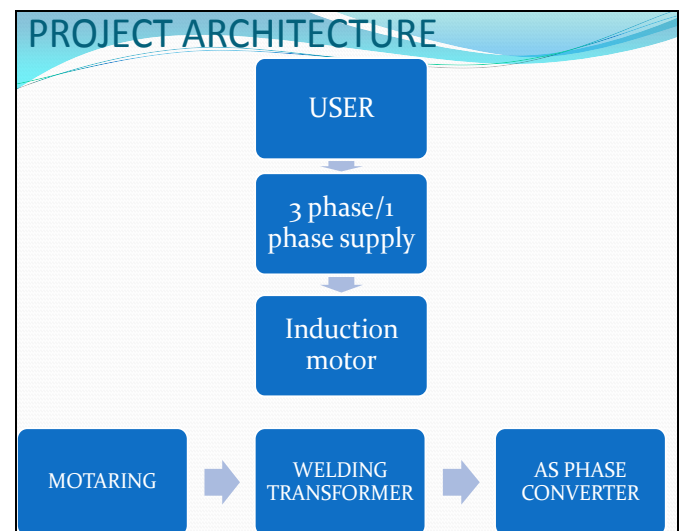


Fig.5.1:- Block Diagram Representation

#### Block 1, 2&3.

Represents the availability of supply and user which connection made according to application required on the motor terminal box.

#### Block 4, 5& 6.

Represents according to application multifunctional motor use for motoring purpose i.e.1-phase or 3-phase. Otherwise it may be used as welding transformer. But care should be taken only one application is run at a time.

## ADVANTAGE

1. A multifunctional induction motor is more convenient than a normal induction motor.
2. Motor requires less space.
3. The motor is capable of performing two functions of motoring and welding.
4. Another advantage is the low weight compared to the separate combination of welding transformer and

induction motor. So the cost of two machines needs to be reduced.

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

## APPLICATION

### Multifunctional induction motor is useful in:

- The use of multipurpose motors are very convenient for used in mega workshops where welding and motoring, both applications are required.
- This type of motors are also useful in electric traction system where
- Metal cutting workshop is another example where multifunctional motor.
- It can also be used in heavy fabrication industry.
- Multifunctional motors are very useful for used in steel industry.

## 5.2 REDESIGN AND DEVELOPMENT

Conceptually we are only redesigning the stator winding and the rotor is the same. The main concept of the project is to implement winding starting split phase. The winding space is quadrilateral the main winding is supplied by as much as 90 degrees in the main winding from the current with the current displaced.

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, after the motor lifts at about 75 percent of the total load speed, the turn starting from the main supply is cut off, usually by a bell push switch.

For this model we usually use a squirrel cage induction motor and a delta connected winding is used. Working with the model's hardware system will be discussed under this section.

### HARDWARE DESIGNING AND WORKING:

Capacity of motor reduce half for each 3 phase and 1 phase application Old motor number of conductor per slots is 59 but there is double layer winding.  
 So, per phase conductor =  $59/1.732=34$ .  
 Hence it is double layer so select 20 conductors per coil.  
 Hence for 1430rpm speed 4 pole.  
 Slot pitch=slots/pole= $36/4=9$   
 No. of poles = 4  
 No. of slots =36  
 No. of slot/pole=9

No. of slots/pole/phase=3

Slot pitch=1 to 8.

With wire guage 21 having current carrying capacity 9 amp.

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

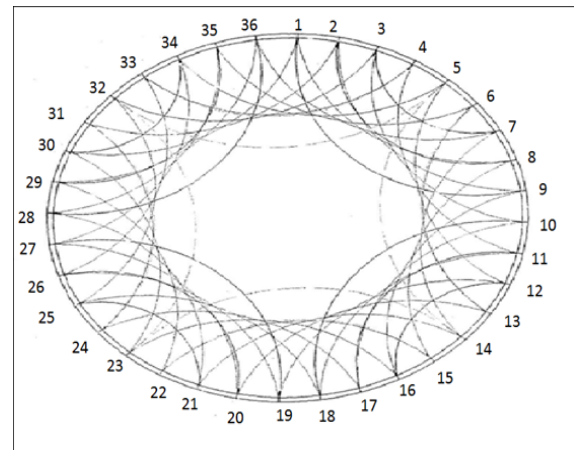


Fig.5.2 a) Combination of both single phase and three phase winding.

For the redesign of the stator winding we change the gauge of the copper wire but the turn is similar to the original three phase induction motor. The stator winding used for induction motors is usually of lap winding type with diamond shaped coils. Class E and Class F insulation types are used and the insulation used is paper name.

For three phase wind, the conductor is a double layer single conductor and for single phase, the double layer is a single conductor. The initial and last connection of each coil of the group is brought out and the one which is connected in series gives half the supply. When parallel is connected, the step down voltage is applied and the ideal supply used for electric spot welding is to increase the low voltage. For single phase operation, there will be a double input supply after the capacitor starts.

So gives the operation step on the motor. We will use a bell push switch to generate starting torque on a single phase induction motor.



Fig.5.2.b) Working model

## 6. CONCLUSION

We design a single machine and multi-function in that machine So it is financially useful Where there is less space It will be needed in such places The cost of the project Machines different machines Will be half of the total cost So the price is 50-60% and That Induction motor has many advantages Very convenient to use.

Three phase induction machine is used for Multifunctional operation It explains the new welding scheme Rocky construction and Due to low need for maintenance repairs For the proposed motor farming as well as for industrial purposes Operative solution predominates Welding transformer and phase converter So optimized for use and The experimental results are given in the article.

## 7. RESULT

1. Three phase induction motor run on single phase as well as a three phase supply.
2. When the motor has a single phase supply, the voltage in three phase terminals = 380 volts.
3. When three phase supply given to motor then, for welding, Voltage = 60 volts, Current = 145 Amp.  
Voltage across starting winding = 205 volts.  
Voltage across running winding = 210 volts.

## 8. FUTURE SCOPE

1. The three phase induction machine finds its application in the industry Loads are constantly changing over time this requires a controller So that it should be very fast it would take less circulation to calculate it to minimize the optimal effect process Future work may be reduced Technique time, mainly in hybrid controllers.

2. Loss model based controller Since performance is based on accuracy Regarding identification of induction motor parameters, The next task may be To calculate converter losses Especially in the developing method And to get more accurate results The magnetic method is required.

## REFERENCES

1. Principal of electrical Machine, V.K. Mehta, Rohit Mehta, S.CHAND Publication.
2. Electrical Machinne, Prithwiraj Purkait, OXFORD Publication
3. Electrical Machine, Fifth Edition, D.P. Kothari, I.J.Nagrath, Mc. Grow Heals Publication.
4. MSBTE Syllabus, A.C. Machine, Techmax Publication.
5. Pallavi Bender, Rohit Lohar, Amrut Pingale, International Journal of Research Publications in Engineering and Technology [IJRPET] ISSN: 2454-7875 VOLUME 3, ISSUE 4, Apr.-2017