# Starting of an induction motor

Introduction

There are several ways of starting an induction motor, and the most common one is the star-delta starting.

The stator winding of the induction motor is designed for delta operation, but during starting period the stator winding is connected in the star configuration. When the motor speed increases with time, the connections are changed to delta configuration.
This is shown in the following figure.
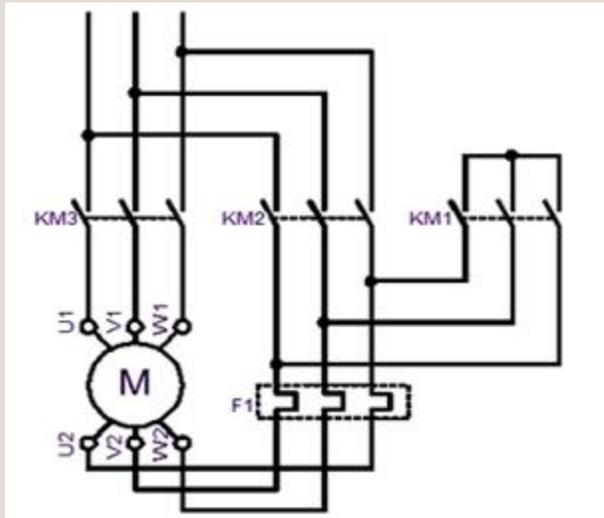
When the power is fed into the circuit, KM3, which is the main contactor, it allows a small current to flow to the motor since it is normally closed. Hence there is no danger of damaging the motor, this current flows into the motor and out to the KM1, which is the star contactor.

After a specified period defined by the clock delay, so that the motor get enough speed, the KM2 (Delta contactor) Closes and KM1 opens to allow the motor to receive the full load current and run at delta.

Problem during my work experience

I have explained the starting of induction motor through star delta configuration just because that I faced a problem during my internship at Premier Sugar Mills & Distillery Company Limited.

The problem was that when the motor started in star configuration, then the ammeter showed a decrease in the rotor current, it's because the relative speed between the rotor conductors and stator rotating flux decreases.

That's why the current also decreases and there in the industry the technician continuously looking into the decrease rate of current and the timer, that after the specified time, the star connected stator winding of motor must be changed to delta connected configuration.

But every time, it didn't happen on the first attempt that for a specified amount of decreased current and specific time interval, the change over switch must be shifted from star to delta, and that's why he has to continuously on and off the motor, so that he get a reasonable ratio of both decreased current at the specified time interval. And then he is finally able to manually convert the motor from star to delta.

Hence the whole process resulted in wastage of power in the starting of the induction motor. They tried a lot to fix the problem, so that on first attempt, the change over switch is shifted from star to delta, but it didn't actually happen.

My suggestions to solve the problem

I suggested them that they should look into the safe side limits of the stator current, and then install an automatic system for it, which will observe the starting current. And if it is in the specified range, then automatically the change over switch will be shifted from star to delta configuration.

Because the technician's observation may get wrong sometime, but if a smart system like microcontroller based system is installed, which will do the whole operation with 100% accuracy, and thus power wastage in the starting of induction motor will be prevented.

Furthermore before the microcontroller based system or any other intelligent system installation and setting, the accurate and precise calculation of stator winding current must be obtained, as the manual of the motor contains all the rated voltage, current and power values. But according to the different loads at different time, the current and voltage values must be determine for the motor at that specific time, and then the intelligent system operation must be made according to that specific values.

The solution

Hence in order to start the induction motor with star delta configuration, there must be an intelligent system installed, which observes the timer and decreases rate of stator current simultaneously during starting period of induction motor. Then at a specific moment, automatically shift the star connected stator to delta connection, thus avoiding extra power dissipation due to continuously turning on and off of the motor.

This is for the purpose of getting a specific moment of shifting star into delta connections at the specific safe side value of stator starting current

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