# Speed Control of Induction Motor using VFD and PLC

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**ABSTRACT:-**

The Induction motors are widely used in various industrial areas due to their simple, robust and reliable operation. Hence, to get the proper output and efficiency continuous monitoring and controlling is necessary .The speed of induction motor cannot be control, it works on full speed, hence it causes various issues when less speed is required. The speed of induction motor can be varied by using VFD. As sometimes the condition like over voltage, under voltage, overloading, overheating, over speed etc. may give rises to unwanted conditions for the motors. Therefore as soon as such condition arises the motor should be turned off automatically. There are various methods for controlling the induction motor such as online fault detection, stator monitoring techniques, systems based upon microcontrollers. In this project we will control the motor using VFD and PLC.

**Keywords:ALLEN-BRADLEY MICROLOGICSX 1200, VFD POWER FLEX 4 SERIES , INDUCTION MOTOR , Photo Sensors, Releys**

## I.INTRODUCTION:-

An induction motor is an AC electrical motor, in which the electromagnetic induction from the magnetic field of the stator winding is responsible for producing the electric current in the rotor. Induction motor powered with AC Mains has various limitations like it works in full speed, speed cannot be controlled, VFD along with PLC is used for automation and controlling various losses. Induction Motor rotates at full RPM when power is applied, So there are few parameters to control the speed of motor, such as speed control using frequency, changing no. of poles. An AC motor's speed is the rotation rate of Ns=2 i.e. stators magnetic field. (Ns=2*frequency/poles) where Ns is the synchronous speed of the machine. We control the frequency using Variable frequency drive (VFD) as V is directly proportional to F.

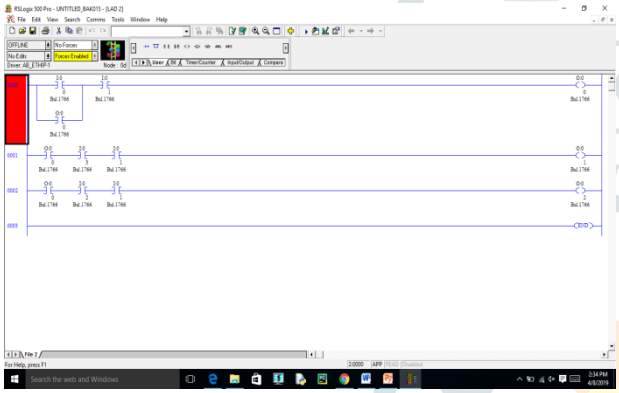
## II. METHODOLOGY

| SR.NO | NAME | OUTLOOK |
|---|---|---|
| 1 | Allen-Bradley MicroLogix 1200 |  |
| 2 | VFD Power Flex 4 |   |
| 3 | Relay |  |
| 4 | Photo Sensor |  |
| 5 | 3-Phase induction Motor |  |
| 6 | Push Button |  |

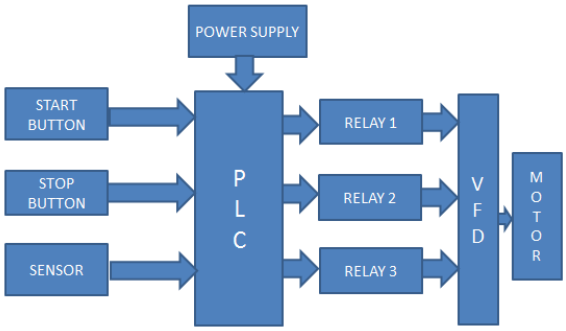
**Table1. Basic components**

The system of Speed control of Induction Motor using VFD and PLC will be made in the following steps:

1) The layout of whole system will be represented in the form of a block diagram.
2) Push Buttons and photo sensors are connected to the input side of Micrologix 1200 PLC.
3) The motor will start rotating as soon as we press the Start button.
4) The speed of motor varies as soon as the photosensor detects the load.
5) Relays are connected to the output side of PLC to provide the control signals to VFD.
6) PLC will process the signals which are present at the input, and will drive the relays at the output.
7) Relays provide the control signals to the VFD, according to that VFD will control the speed of motor.



## III. HARDWARE FRAMEWORK




### 1) Micrologix 1200 PLC

The PLC is used for controlling purpose. We have chosen PLC because it is more reliable, flexible and fast. Interfacing with PLC is very easy. Troubleshooting of PLC system is user friendly and it can easily adapt changes. It can also handle severe conditions like dust, humidity etc.

### 2) Variable Frequency Drive (VFD)

Speed of Induction Motor is controlled by using VFD. It is used for applications where speed control is very important. Traditional methods have their own drawbacks like energy losses, low power factor etc. These issues are minimized using VFD.

### 3) Relay

They are used to provide the control signals to VFD. It takes the input from PLC and gives the output to VFD.

### 4) Photo-sensors

Photo-sensors are used to sense the object. It will give the signals to VFD and the speed of motor will change accordingly. We have used two photosensors; the range is 10nm and 300nm.

### 5) Induction Motor

It is a 3 Phase 0.5Hp Motor connected in delta configuration. The Ambient temperature is 50° C, The max operating frequency is 50 Hz and the RPM is 2820. The speed of induction motor varies according to the controlling system.

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## V. CONCLUSION

In this project we will control the speed of Induction Motor using VFD and PLC. VFD is used to control the frequency and PLC is used for automation purpose. The project is in Automation domain. We can rotate the motor in both Clockwise and Anticlockwise at a preset frequency. (Which can be set by either the company or user)? We have also used photo-sensors which can change the speed of motor based on the load detected. The use of PLC has made the system user friendly and reliable. It also made system up-gradation and controlling very easy.

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