INTERFACING OF STEPPER MOTOR WITH PROGRAMABLE LOGIC CONTROLLER USING HUMAN MACHINARY INTERFACE

UNDER THE GUIDANCE OF DR. D S BANKAR AND PROFESSOR SWAPNIL NAMEKAR
Department of Electrical Engineering, BVDUCOEP
1. DARPAN CHAWLA
2.VEDPAL SINDHU
3.SAURABH JHA
4.DHRUV SHARMA
5.ROSHAN SINGH

Abstract— This paper presents a cheapest method to control the step of stepper motor via PLC and to provide information required to understand the control of stepper motor using PLC, It's main hardware component and how it manages the size, direction and size of the scenario. This paper includes working, designing and controlling of stepper motor interfacing with PLC (programmable logic circuit). The purpose of this paper is to enlighten the use of PLC with stepper motor. The paper provides a method for programming and controlling the stepper motor as a controller in the form of a controller.

Keywords— PLC

I. INTRODUCTION

Earlier in industries heavy machines are controlled by mechanical means and there used to be complex relay wire system. Before the introduction of PLC in industry there is heave complex relay and switch wire system. The PLC designed to be rugged. The advantage of PLC over personal computers are that they can withstand vibration, shock, elevation in temperatures, and electrical noise to which manufacturing equipment is exposed. The use of stepper motor for precise control in construction, printing, robotics and printers in the industry has increased. The stepper motor is used anywhere a precise position is required. Due to the use of the stepper motor in the industry, its many excellent features also make it expensive. Stepper motor is same as dc motor without commutator. Most steppers as they are additionally known, can be ventured at sound frequencies, enabling them to turn rapidly, and with a fitting controller, they might be begun and halted "on a dime" at controlled introductions.

Some of advantages of PLC are:

- Optimum efficiency
- Low wastage
- Ease in handling
- Greater precision
- Reduction in labour cost
- Increased productivity

Applications:

- Food manufacturing
- Building automation
- Defence
- Parking system
- Pharma
- Beverage
- Dairy

There are different types of PLC-

- Compact PLC- Inbuilt power supply, Input output modules, CPU, communication ports
- Modular PLC- chassis system, separate power supply module, CPU module, Input output modules
- Size wise PLC – Nano, micro and medium are the categories under which the

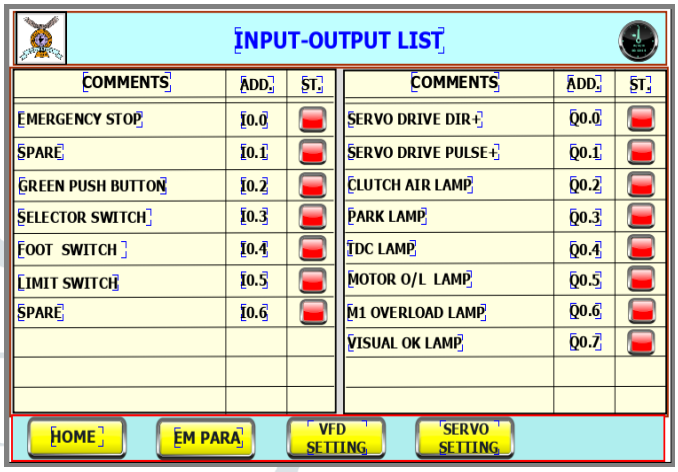
programmable logic controllers are been classified on the basis of size

II. CONCEPT

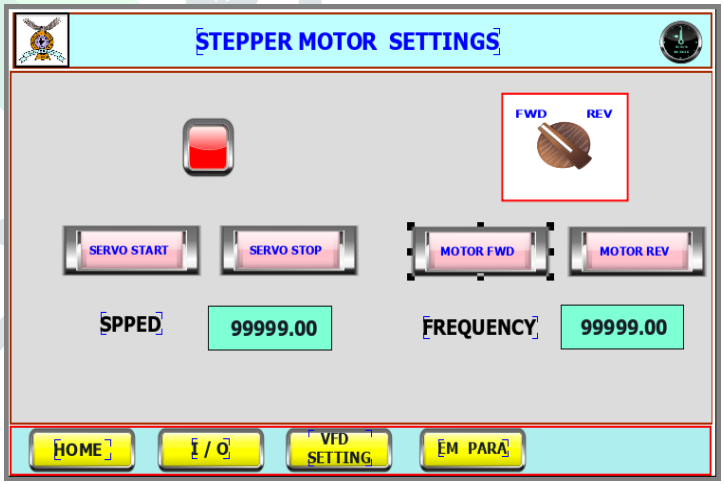
In this we will talk about the working of the stepper motor. Stepper motor is a brushless DC electric motor which partitions the full revolution into various equivalent advances. These motors can be hold at one stage with no sensors. The controller circuit can be microcontroller; stepper motor controller or programmable logic circuit can be used to activate the drive in right order. Servomotors and venturing engines both offer comparative open doors for exact situating, yet they contrast in a few ways. Steppers motors are of two types: permanent magnet and variable reluctance also known as hybrid motors. There are three or sometimes four winding present in variable reluctance motors, on the other hand permanent magnet motors generally, have two independent windings, with or without centre taps. The central sleeve winding is used in unipolar permanent magnet motors. Stepper motors are offered in a wide range of angular resolutions.

. The maximum angle of turn per step can be 90 degrees per step and can reach minimum to 0.72 degree per step. With a proper controller, most perpetual magnet and mixture engines can be keep running into equal parts steps, and a few controllers can deal with littler fragmentary advances or smaller scale step. The stepper motor used in this project is a bipolar 4-wire 4-lead motor. There are some set of coils in a stepper motor forming known as phase. If any one of the coil is energised, the motor will make one step, then stays in that place i.e. one step is completed. To complete full evolution stepper motor need to make more steps. To do this, the coil must be activated in the correct order. The pilot used to give the impulse to the engine is "SEA 5045".

III. INPUT DEVICES AND OUTPUT DEVICES



STEPPER MOTOR SETTINGS



IV. MCRO STEP DRIVER

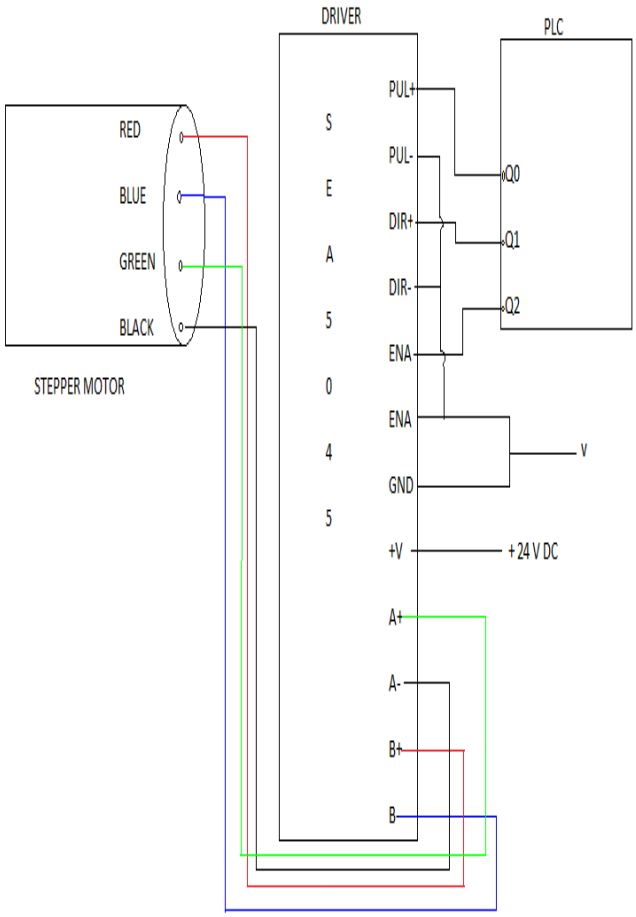
A. Micro step Driver SEA 5045

The 4-lead motor is less flexible but easy to wire. Winding inductance is responsible for control of its speed and torque.

Peak output current= 1.4 × specified phase current

V. Connection diagram

The connection of various hardware is shown in figure below. The red and blue wire are connected to B+ and B- respectively while green and black wire connected to A+ and A- respectively. Q0, Q1, Q2 are the inputs of PLC which are connected to pulse, direction, and enable of driver respectively. ENA must be ahead of DIR by at least 5µs. DIR must be ahead of PUL effectively by 5µs to ensure correct direction. Pulse width not less than 1.5µs. low level width of less than 1.5µs



.

VI. CONCLUSION

Programming and speed controlling of stepper motor is possible through PLC. When PLC contains relays on outputs, the coils of stepper motor can be supplied with different values of voltage and current. The only disadvantage of using PLC over relay as a driver may be high limit of frequency for coil switching. The PLC used for experiments has cycle time between 30 and 3000imilliseconds.It follows that range of speed at stepper motor shaft have large limits.

VII. REFRENCES

- "INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLER" By Garry Dunning