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ADVANCE CONTROLLING OF INDUCTION MOTOR USING DRIVE, PLC AND SCADA

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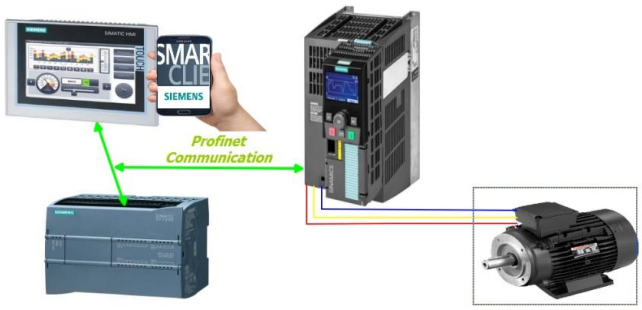
ABSTRACT: Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, boilers and heat-treating ovens, switching in telephone networks, steering and stabilization of ships, aircraft and other applications with minimal or reduced human intervention. Some processes have been completely automated. The motor speed is controlled via the driver as an open loop control. To make a more precise closed loop control of motor speed we will use a tachometer to measure the speed and feed it back to the PLC, which compares to the desired value and take a control action, then the signal is transferred to the motor – via driver – to increase / decrease the speed. We will measure the speed of the motor using an incremental rotary encoder by adjusting parameters (PLC, driver) and also we need to reduce the overall cost of the system. Our control system will be held using the available Siemens PLC. In addition, we will monitor motor parameters via SCADA system

KEYWORD: Automation, Drive, PLC, SCADA, HMI, IOT,TIA SOFTWARE

I. INTRODUCTION

In any industry the induction motor plays an important role due to its low cost and simplicity. By implementing a monitoring and control system for the speed of motor, the induction motor can be used in high performance variable-speed applications. To control the speed of these motor, a motor drive and control system with different methods can be used. An induction motor's speed enables affected by the supply frequency, change the number of motor stators, adjust the power input. In an induction motor, there is no electrical connection to the rotor, but currents are induced in the rotor circuit. The rotor conductors carry current in the stator magnetic field and thereby have a force exerted upon them tending to move them at right angles to the field. When the stator winding of a three phase AC supply, a rotating magnetic field is established and rotates at synchronous speed. The direction of rotation of the field can be reversed by interchanging the connection to the supply of any two leads of a three phase induction motor. [1] The control of equipment has been performed through the use of computers. Most equipment's use programmable logic controllers (PLC) to connect with computers to monitor each load and electricity consuming devices. A PLC interacts with the external world through its inputs and outputs. Especially in manufacturing companies, an automaton network concept developed under the name of Totally Integrated Automation (TIA). TIA includes actuator sensor level, field level, cellular level and process level control, which makes use of actuator-sensor Interface, PROFIBUS and industrial Ethernet respectively. Through TIA, it is possible to view or control all the levels all the way to the actuators from process control level.



BLOCK DIAGRAM

Motor
3- phase
A.C Induction motor
Drive
Efficient in feed
5.5kW to 75kW
VFD Control
Control module:CU250S-2-PN Vector- 4.7
PLC
SINAMICS S7 1200
DI - 14
DO -10
AI - 2
SINAMICS S7 300
DI -24
DO – 16
AI-4+1 (restister)
AO -2

HMI
TP 700COMFORT
IOT

II. IMPLIMENTATION MOTOR

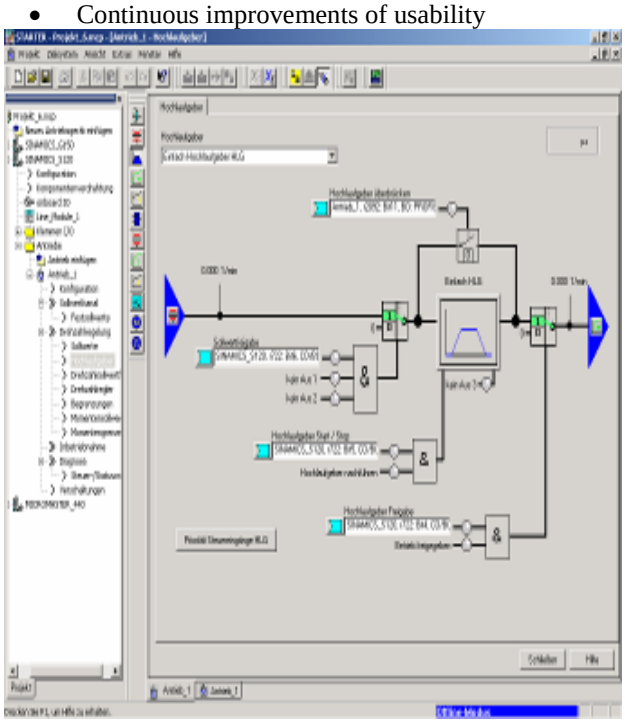
Induction motors are the most common motors used for various equipment in the industry. Their popularity is due to their simple design, they are inexpensive and easy to maintain, and can be directly connected to an AC power

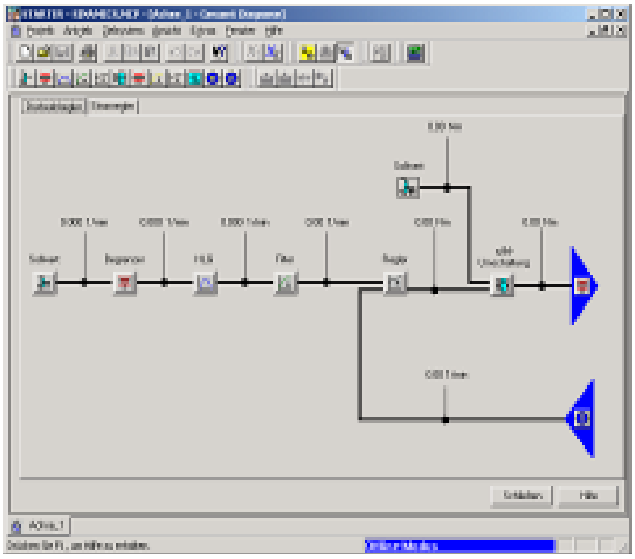
source. An induction motor has two main electrical component :

- Rotor (Squirrel-cage rotor and Wound rotor)
- Stator.

DRIVE

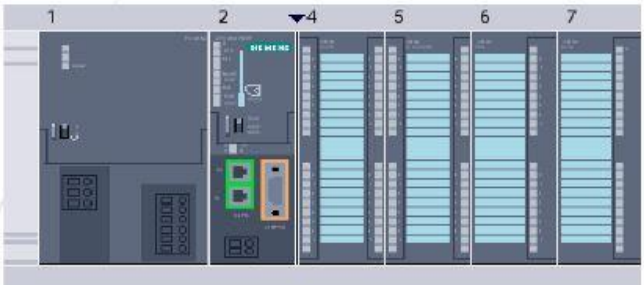
- Analog I/P=2 , Analog O/P=2
- Digital I/P=4,Digital O/P=4,Digital I/P and O/P=4
- Drive Control Of Motors by V/F Methods
- Macro :Standard I/P Analog set point
- Types Of Power Modules is PM250
- SINAMICS drives are commissioned using STARTER.
- The project can be configured using the electronic type plates of the various drive components.
- STARTER offers prompted/navigated commissioning using Wizards and graphic screen forms for standard applications.
- The expert list is used for fine tuning.
- Test and diagnostic functions are provided for support.
- Continuous improvements of usability





PLC (Programmable Logic Controller)
SINAMICS S7 300(314C-2PN1DP)

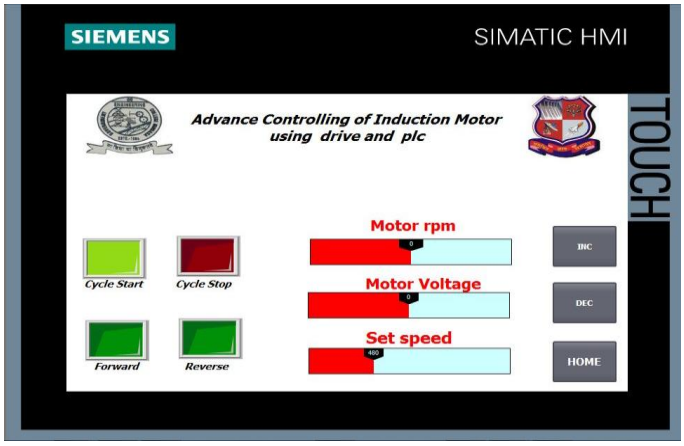
- Work memory 192KB
- 0.6ms/1000 instructions
- DI24/DO16;
- AI5/AO2 integrated; PROFINET interface and 2 Ports; MRP;
- PROFINET TCP/IP transport protocol; combined MPI/DP interface (MPI or DP master or DP slave);
- multi-tier configuration up to 31 modules;
- SIEMENS telegram 352 PZ D6/6



SINAMICS S7 1200(1214C AC/DC/RLY)

Modular compact control system for the low-end performance range
Scaled CPU range
Extensive range of modules
Can be expanded to up to 11 modules (depends on the CPU)
Can be networked with PROFIBUS or PROFINET
HMI(Human machine interface)
7” DISPLAY

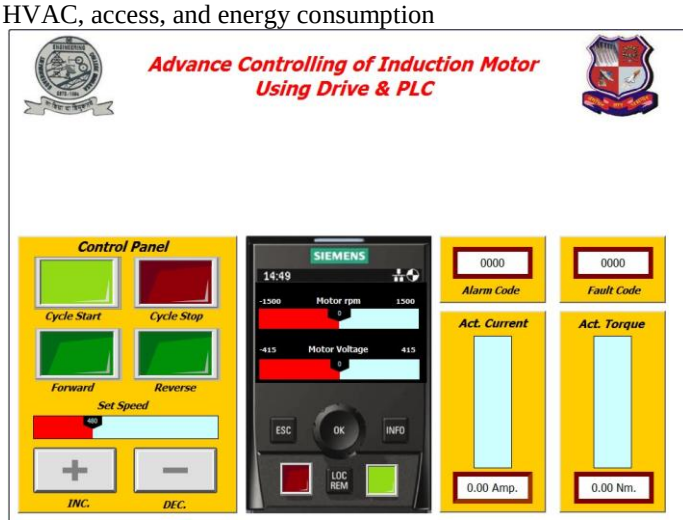
TP 700
6AV2 124-OG
2 PN PORT



- HMI is human and machine interface
- HMI Using for the Communicate with PLC and Drive.
- HMI is Interface with PLC.
- HMI is Visible Data and Parameters of The PLC and Drive.
- All the parameters are controlled and visible on HMI.

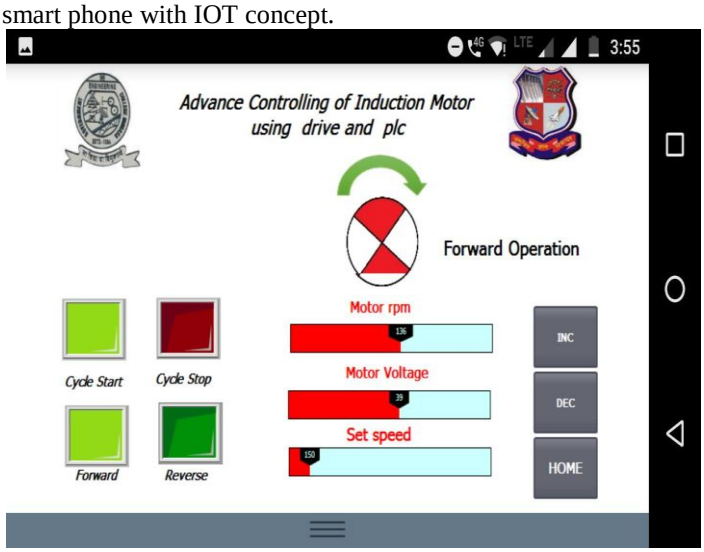
SCADA (supervisory control and data acquisition)

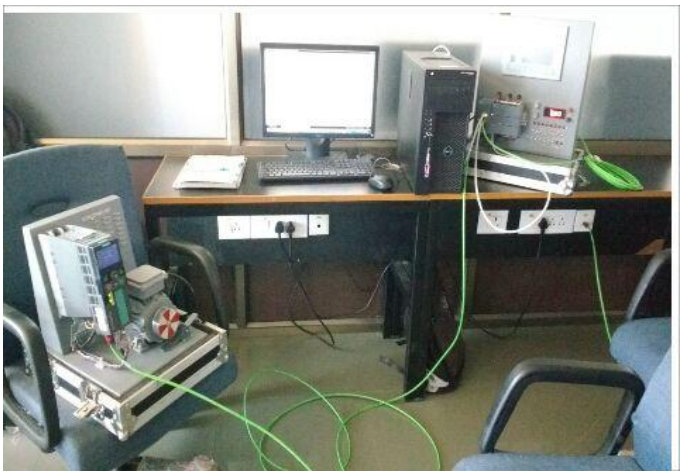
It stands for supervisory control and data acquisition. It generally refers to industrial control systems: computer systems that monitor and control industrial, infrastructure, or facility-based processes, as described below: Industrial processes include those of manufacturing, production, power generation, fabrication, and refining, and may run in continuous, batch, repetitive, or discrete modes. Infrastructure processes may be public or private, and include water treatment and distribution, wastewater collection and treatment, oil and gas pipelines, electrical power transmission and distribution, Wind farms, civil defense siren systems, and large communication systems. Facility processes occur both in public facilities and private ones, including buildings, airports, ships, and space stations. They monitor and control HVAC, access, and energy consumption



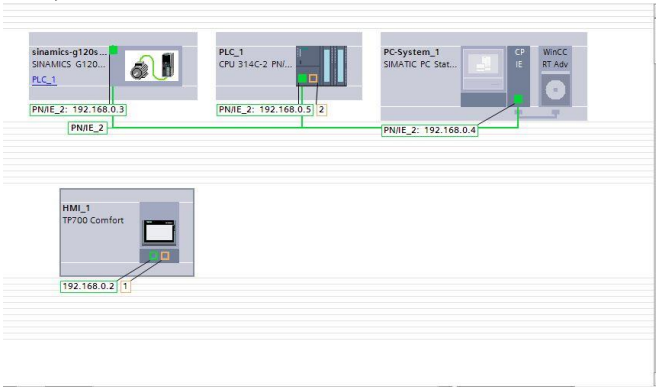
IOT (Internet of things)

Siemens Wincc smart client is the application to access the HMI screen from internet or smear client application in smart phone with IOT concept.





PLC, DRIVE & HMI HARDWARE CONFIGURATION



III. HARDWARE CONFIGURATION WITH IP ADRESS

CONCLUSION

In this paper we learned about the various aspects of interdisciplinary project of two different branches of engineering, Electronics & communication and Instrumentation & control. We learned about the advanced aspect of PLC (Programmable Logic Controller) which is widely used in the industry. Some of the aspects covered

were CAD design, NX Design as well as 3-D printing. The Real time programming on PLC. We also learned about Input output module and its interfacing with the relay as well as other sensors both of 5V and 24V. We learned interfacing and implementation of different types of components such a magnetic flow sensor, Electromagnetic valve, relay Card, capacitive and inductive sensor. The interfacing of a pump along with all the other components is a tedious task. The synchronization of all the components with or without real time clock is also an aspect learned. Here we have successfully done the controlling of motor through different automation devices.

IV. FUTURE WORK

We have done the controlling of induction motor and now we are try to do controlling of multiple motor through plc and drive and also trying to implement server client application of PLC for different motor.

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[7] www.automation.com

