International Research Journal of Engineering and Management Studies (IRJEMS)
Volume: 03 Issue: 03 | March -2019 e-ISSN: 2395-0126

WIRELESS COMMUNICATION OF PROCESS AUTOMATION I/O

Vineela Thonduri[#1], Jaladi Nagarjuna [#2] , Doppalapudi Vamsi Krishna[#3], Addanki Rahul Sankruthayan[#4], A.V.S.S Hanuma Subbarao[#5], Are Rathan Ebenezer[#6], Arekuti Avinash[#7].

[1]Asst. Prof., Dept. of ECE, VVIT, Guntur, Andhra Pradesh, India.
[2]Engineer, Technical Services, Design Tech systems ltd., Andhra Pradesh, India
[3]Student of ECE, VVIT, Guntur, Andhra Pradesh, India.
[4]Student of ECE, VVIT, Guntur, Andhra Pradesh, India.
[5]Student of ECE, VVIT, Guntur, Andhra Pradesh, India.
[6]Student of ECE, VVIT, Guntur, Andhra Pradesh, India.
[7]Student of ECE, VVIT, Guntur, Andhra Pradesh, India.

----------*****----------

Abstract - *In existing industries the communication between process instruments and automation controllers is through hardwires which is complex for error diagnosis and expensive for maintenance. Here in this project we intend to make the same communication wireless with the help of Node MCU's ESP8266.*

For this we initially integrate the input-output communication ports at the process instruments and automation controller to wireless modules and then we establish the communication between these two wireless modules. So that we can reduce the use of hard wires which makes the plant economical.

Key Words : Wireless communication, Automation Controller (PLC), CLS 200, WiFi router.

1. INTRODUCTION

The first industrial revolution began in the 18th century in Great Britain. Now we are in the era of fourth industrial revolution but still most of the industries are operating through hardwired communication which is complex for error diagnosis and costs high for maintenance.

To overcome this issue we came up with an idea to process and control the industry through wireless communication.

We establish a wireless communication by deploying node MCU's in the same network using routers which are integrated to the PLC's and Process instruments.

2. WORKING METHODOLOGY

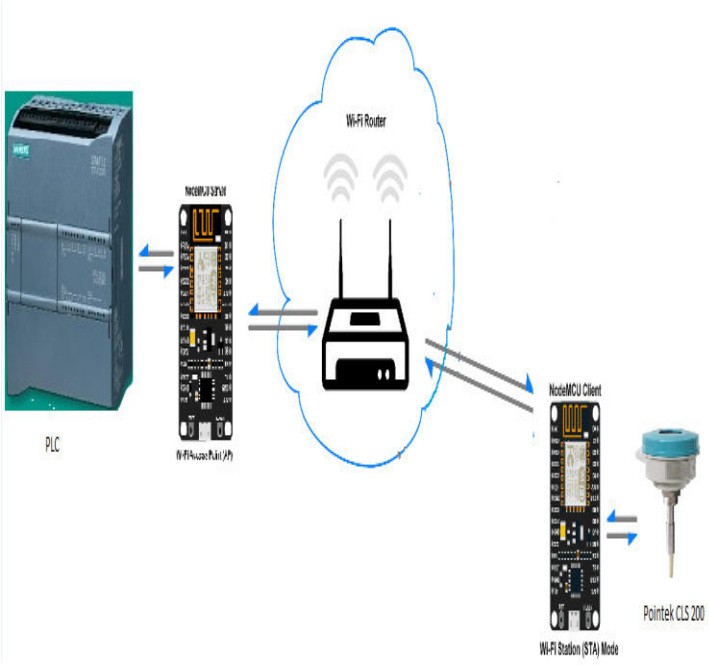

Fig1. Block diagram of wireless communication system.

The processing instrument Pointek Capacitive Level Switch(CLS) 200 is triggered when the level of liquid in tank reaches the threshold level and its output is given as input for Node MCU. Then the Node MCU at pointek CLS 200 transmits the data to other Node MCU which is present at PLC. Node MCU at PLC reproduces the data being received to accomplish this we use relays as Node MCU's work at 5V and PLC's at 24V.

3. COMPONENTS :

3.1 PLC-Programming Logic Controller:

Fig2. Programmable Logic Controller S7 1200

Programmable Logic Controller is an industrial control system that continuously monitors the state of input devices and makes decisions based upon a custom program to control the state of output devices.

Almost any production line, machine function, or process can be greatly enhanced using this type of control system. However, the biggest benefit in using a PLC is the ability to change and replicate the operation while collecting and communicating vital information.

PLC programs are typically written in a special application on a personal computer, then downloaded by a direct-connection cable or over a network to the PLC. More recently, PLCs are programmed using application software on personal computers, which now represent the logic in graphic form instead of character symbols. The computer is connected to the PLC through USB, Ethernet, RS-232, RS-485, or RS-422 cabling. The programming software allows entry and editing of the ladder-style logic. In some software packages, it is also possible to view and edit the program in function block diagrams, sequence flow charts and structure text. The most commonly used programming language is Ladder Diagram (LD).
Here we are using the PLC S7 1200.

Specifications of PLC S7 1200:

Output Voltage (Digital)	:	0-24V
Output Current	:	4-20mA
Digital Inputs	:	16
Digital Outputs	:	16
Analog Inputs	:	5
Analog Outputs	:	2

Advantages:

- One Programmable Logic Controller can easily run many machines..
- Diagnostics are centrally available.
- Easier and faster to make changes.

3.2 Node MCU ESP8266:

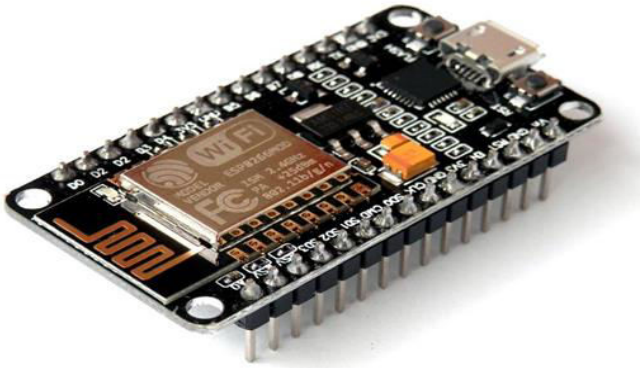

Fig3. NodeMCU ESP8266

The Node MCU (Node Microcontroller Unit) is an open source software and hardware development environment that is built around a inexpensive System on a Chip(SoC) called ESP8266. It includes firmware which runs on the ESP8266 Wi-Fi SoC which is based on the ESP-12 module.
We can program the ESP8266 using Arduino IDE or ESP8266 SDK.
The ESP8266 has 17GPIO pins (0-16), however we can only use 11 of them because 6 pins (GPIO 6-11) are used to connect the flash memory chip.

Specifications:

Operating System	:	XTOS
CPU	:	ESP8266
Memory	:	128KB
Storage	:	4MB
GIOP	:	17
Power Voltage	:	3v, 5v

Pin Discription :

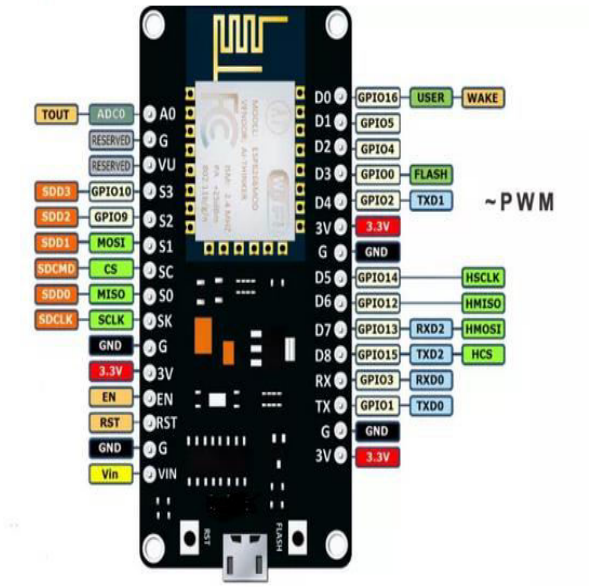

Fig4. NodeMCU pin description.

3.3 Pointek CLS 200:

Fig5. Pointek CLS 200

Pointek CLS 200 is a versatile inverse frequency shift capacitance level switch with optional rod/cable choices and configurable output, ideal for detection of liquids, solids, slurries, foam and interfaces. The digital version (with PROFIBUS PA) includes a display and provides additional diagnostic features.

RESULTS :

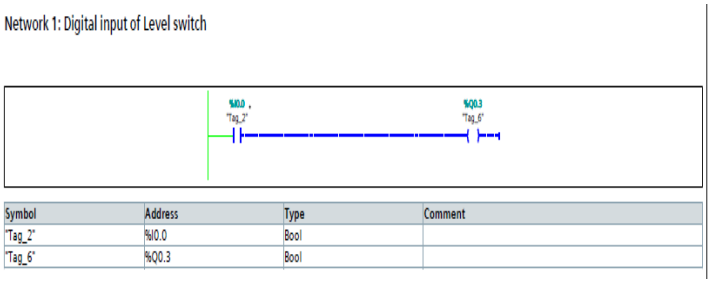

Fig6. When tank is not full.

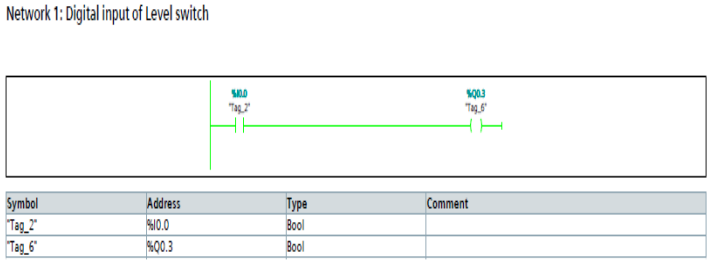

Fig7. When tank is full.

CONCLUSION :

Technology plays an important role in today's world. By making use of wireless communication in between process instruments and PLC's error diagnosis is made simple and becomes cost effective.

ACKNOWLEDGEMENT :

We thank the department of Electronics and Communication Engineering of VVIT (Vasireddy Vekatadri Institute of Technology), Guntur, Andhra Pradesh, India and APSSDC (Andhra Pradesh State Skill Development Corporation) for permitting me use the computational facilities available in the center for Research and development cell.

REFERENCES :

[1] https://ieeexplore.ieee.org/document/5471551
[2] https://circuits4you.com/2018/01/01/esp-to-esp-communication/
[3] https://en.wikipedia.org/wiki/NodeMCU