MODBUS Based Integrated Industrial Application Monitor & Controlled by SCADA

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Abstract - As it is widely known that PLC, programmable logic controller is back bone of industries. Industries are now a day's becoming automated with help of PLC as well as other industrial tools .The whole plant process can be controlled by PLC itself along with the removal of errors without human integration. Distance being an important factor with medium of communication along. In this paper we led emphasis over the wireless communication between the PLC and PC .The basic theme of this paper is to build the wireless communication of the PLC and PC in order to control and monitor the whole process. The wireless communication is made possible with help of set of MODBUS module. Here PLC section is placed at a point location quite away from the pc monitor section. The transmission and receiving of data is done continuously from both side. The MODBUS module is the industrial standardized tool for this purpose .On the contrary we are simulating this whole process with SCADA so that the whole point to point information is being monitored as well as recorded at the same time. The advantage of using this technology is we are avoiding the bulk cost of long cable used in installation of industries as well as making system reliable .The main component of this project is PLC, PC, MODBUS module, A RS-232 TO RS-485 converter SCADA software KEPS SERVER.

Keywords: MODBUS module, PLC, PC with SCADA software, RS 232 to RS 485 converter.

I. INTRODUCTION

Many industries grow tremendously with aid of new technology. Various automation tools such as PLC, DCS, SCADA plays an important role in making industries more capable in full filling all the human desire. In automation industries the word PLC stands as a heart of the industries. In this paper the full focus is given over the communication method between the PC and the PLC[1]. As earlier the modes of communication is done by long cables. The monitoring panel is placed at one point location and the field section is placed at another point location. It has no issue when the distance between this two points are minimum but when we are talking about large industries which is spread over a wider area SO this long cables creates some complexity. The main problem in long cables is installation problem as well as long cables installation needs large amount of money investment. Another issue is if there is any faults in installation the errors detection creates a lot of problem. So all this problematic issue is removed by using wireless technology. There is lots of wireless technology such as RF GSM etc. Here I m going to use a set of MODBUS module, PLC (TWIDO SERIES), A RS-232 TO RS-485 CONVERTER, KEPS SERVER (LINK for PLC TO SCADA).[2]

II. RELATED WORKING

In order to communicate between the automation device MEDICON in 1979 devlop MODBUS protocol .It was design for transferring the data over a serial layer , orignally implemented as an application layer protocol[3]. This is a commonly used protocol in several industries because it is simple, reliable ,and also efficent communication a corss a vairety of modem work. Advantage of modbus is that it is used as a supervisory control and data accquistion sysytem used for handling lare PLC application.The architecture of modbus is desined in such a way that it works like request response system .

III. DETAILED STUDY

Programmable logic controller, PLC stands as the backbone for all the industries. This automation tool is a controller based device which is used for automating the industry .By the combination of both PLC and controller we can easily control the equipment in the industries. For a controller external hardware support such as capacitor, resistor, and max232 are required for handling the load properly. While PLC are the device having advantage of complete modular device module .With the help of PLC all the input as well output connection can be made easily and directly to the port given on it.

MODBUs are an application layer messaging protocol positioned at level 7 of OSI model. This is used because it offers a client/ server communication between devices connected on different types of buses over the network. In

simple way it can be describe as a request protocol which offers services as per the specific function codes.[4]

SCADA stands for supervisory control and data acquisition system. This software generally integrated with PLC based system for controlling all the essential action from a distance. The purpose of SCADA in industries is that it creates an animated image of all required hardware which is going to be controlled by the PLC. This makes handling and viewing the whole process easily at a point location in any industries. PLC and SCADA are connected with each other with the help of KEPS-SERVER .The data from both side get transferred from field as well as from PLC.

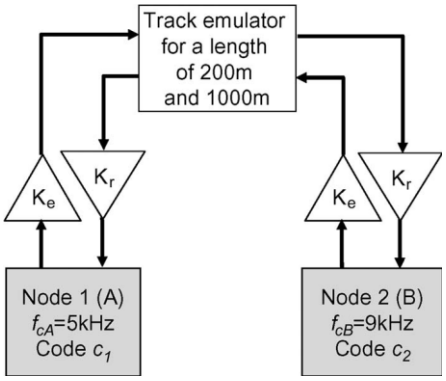

Fig. 2.1 Name of Figure(9pt, Normal)

IV. PROPOSED ARCHITECTURE

In this paper we mainly led emphasis over the wireless communication between PC and PLC. The main components of this prototype are pair of modbus module, Schneider PLC (TWIDO series), and SACAD software installed in computer.PLC acts as the main controlling unit for whole process. It is used to control all the sensors and other inputs which are connected at the input terminal of PLC. The connection between PLC and modbus is done with the help of RS-485 (a RS 485-RS-232 is needed). At the output terminal of PLC various output are connected such as conveyor belt motor, DC motor etc .PC is connected directly to modbus via RS 232 .this modbus will further communicate to another modbus as shown in fig.1. The status is displayed over to the SACAD screen at PC.

As shown in fig.1 with the help of RS-485 to RS-232 PLC and modbus are connected, while on the other side PC and another modbus module is directly connected at the RS-232 port of it. As the operation gets initiated i.e. input gets high or active this will sends status through modbus wirelessly to another port. The data get transferred from PLC and PC via MUDBUGS module. Also all the plant action s being monitored and displayed over the SCADA screen

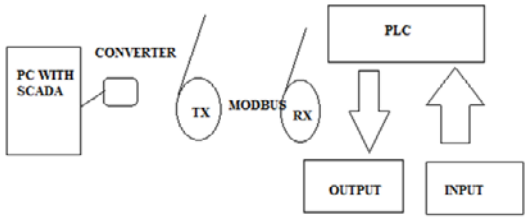

FIG.1. SYSTEM ARCHITECTURE

Fig.2 shows the block dig of the proposed architecture .The singles from the field are going over the PLC input port. Now the data between the PLC and PC is being transmitted by MUDBUGS module in vise versa manner i.e. from PLC to PC and again from PLC to PC. Output from PLC again goes to the field.

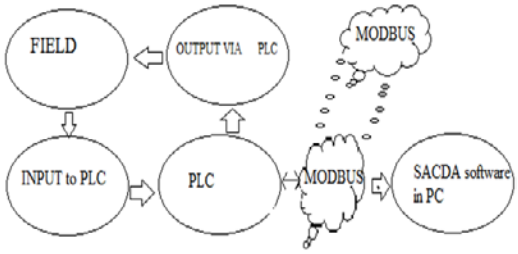

Fig 2. BLOCK DIGRAM

A.RS-485 to RS-232 converter:-In order to synchronies the signals of PC to PLC this converter is required. The purpose of this converter is to synchronies the RS-232 port of the PC to acts like RS -485 ports. An individual power supply is needed to start the conversion of the data as shown in fig.3 connection at port RS-485 are given as one side for power supply ,further two connection are given to ground, and the remaining two connection are given to RS-485A and RS-485B.

FIG.3 converter

B. Schneider PLC: - PLC is used here as the main controlling unit in this prototype.PLC used here is from Schneider This PLC is used here because it gets connected to computer very easily. This PLC comes under TWIDO series having best performance and as well as reliable too. Also the software update and programming software is easily made available on internet. This PLC is also beneficial as per the cost is very effective, having maximum number of inputs to the output.

FIG .4 PLC

C. MODBUS: - In order to setup communication between all the automation tool MEDICON in 1979 develops MODBUS protocol .This is used to transfer data over serial layer originally implemented as application layer protocol. Expanded version of this protocol can be implemented over serial layer TCP/IP, and user datagram protocol (UDP).MODBUS is therefore very reliable, simple and efficient communication across variety of modem network.

Request Response cycle: - The architecture of MUDBUGS resembles to master/slave type protocol. Here the master has full control over all the actions of slave. It can request to any of the slave and wait for its response. Master to slave type architecture us very reliable as it give master full access over the flow of information as well as over the slave device. The request cycle of master is a layered set of data.

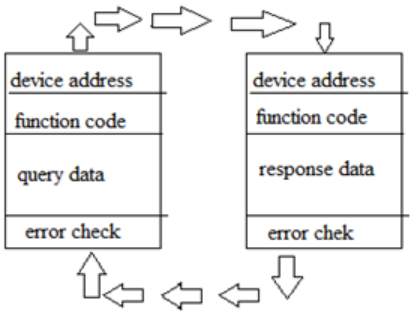

Fig.5 Master Slave response cycle

Application data unit (ADU) refers to be the first layer in this cycle. The core of modbus protocol is protocol data unit (PDU) which is placed within each ADU. All the associate data and functions reside in this PDU. Each function code has a well defined response.

Modbus data model:-The management of data access in modbus is very simple as well as flexible. Only two sorts of data are supported by modbus they are BOOLEAN and UNSIGNED BIT*16.

Memory block	Data type	Master access	Slave access
Coils	BOOLEAN	READ/WRITE	READ/WRITE
Discrete input	BOOLEAN	READ ONLY	READ/WRITE
Holding register	UNSINGED *16	READ/WRITE	READ/WRITE
Input register	UNSINGED *16	READ ONLY	READ/WRITE

MODBUS function: -This shows that how master is able to access and modify the data. Some common function codes are as follow.

Codes	Names
01	read signal status
02	read input status
15	write multiple coil
16	write multiple register
23	read /write multiple Reg.

Table.1 showing function codes

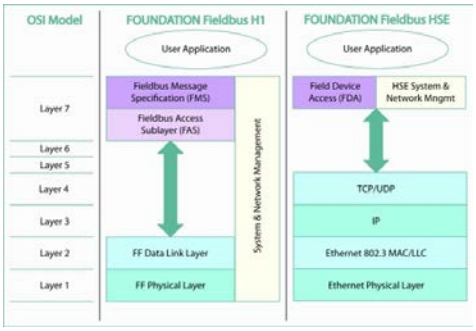

Fig.6 comparison between TCP/IP to MODBUS

Fig7. This picture shows the actual programming part of the whole plant. This picture contains all the used inputs and output of prototype. On the left side it shows all the inputs indicating by two separate lines and the right shows all the outputs' by the means of coils like structure.

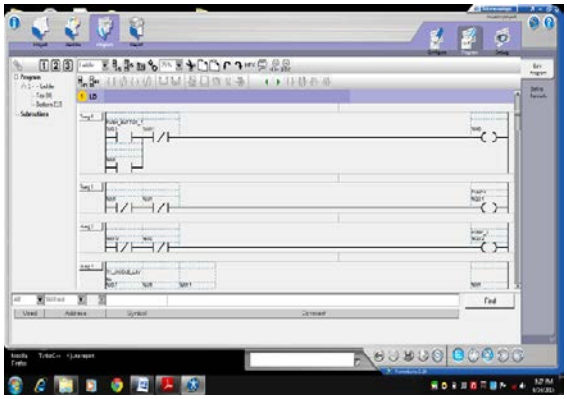

fig 7 programming of the plc

Fig.8 this figures shows the KEPS- SERVER software which is required in linking of PLC and SCADA software. Firstly the device and all the inputs and outputs are configured to the other parameter in the software. Further the required settings are shown in fig.8. As the configuration is done data will transfer from SCADA to KEPS-SEVER. Thus SCADA will communicate in indirect way and the result will be obtained at the computer screen.

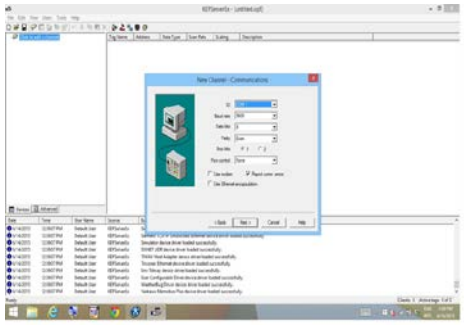

Fig.8 showing the KEPS server connectivity

Fig.9 shows the SCADA screen, which is actually the over view of prototype .Here the animated screen of the whole process is displayed. With the help of this picture one can easily get information about the whole process and the error corrections and fault detection can be easily sort out.

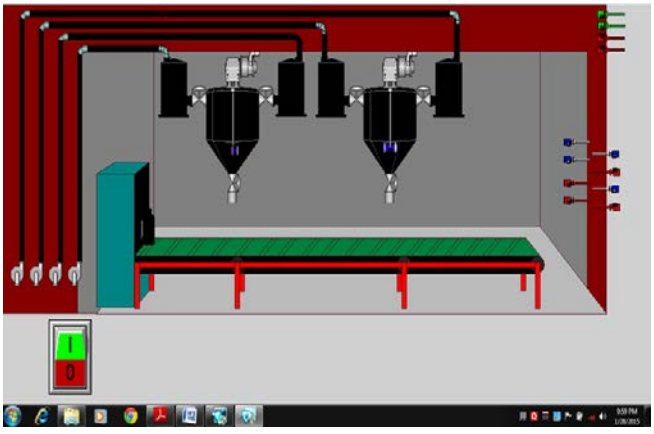

FIG.9 SCADA screen of the process

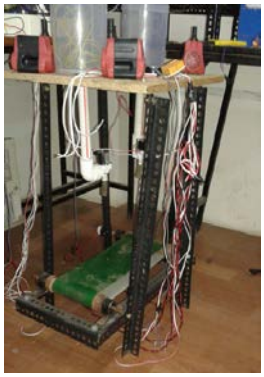

Fig.10 prototype of the process

V. CONCLUSION

After the analysis of this prototype we came on this conclusion that PLC can be easily connected to any of the wireless technology and the wireless communication can be easily gets setup. This is supposed to be a great advantage for small as well as big automation application as MUDBUGS have good performance criteria over other wireless technology. Also the whole process can be monitored on SACAD screen at controlling room over computer.

VI. FUTURE SCOPES

Now a day's PLC is a very reliable and highly compatible device for all the automation processes. Wireless technology can be easily used with PLC to make automation process wireless based. Like ZIGBEE and GSM we can also use RFID technology with PLC to make system based on wireless application.

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