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Smart Power Protection using Industry 4.0

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Abstract: The present era employs modernized techniques in manufacturing industries. The present trend is to use OPC server to control electrical machines from a remote platform. Industry 4.0 is the current trend of automation and data exchange in manufacturing technologies. In this paper we use two programming logic controller (DELTA.)PLC and Ardunio to measure the electrical quantities through labview.
Keywords: Multi brand integration, OPC, Industry 4.0, Decentralized, Controller, PLC.

I. INTRODUCTION

Due to the development of modern methods in manufacturing industries, the conventional method of using relays, timer, which were used to control the process of manufacturing, were not up to the accuracy and speed of operation. This was mainly affected for the quality output from the industries. To overcome the above problem we can eliminate the high costs associated with inflexible, relay controlled systems, Minimize the Number of
control Relays in a Process**,** Some of the modern methods used were microcontroller and microprocessor etc. But due to some limitation of the above modern control methods it was complex to operate and process. By the introduction of industry 4.0 gave the best solution to all the problems which were faced by most of manufacturing industries it can be easily interfaced to many control equipment's.

A. Existing v/s proposed systems

Few disadvantages of the existing system are:

1) It can't be interfaced with many devices.
2) Machine to machine interface is not possible.
3) Multi brand integration is difficult.
4) Slow response and low accuracy. The proposed system overcomes the above disadvantages and has the below mentioned merits:
5) Flexible control system design using the software is possibl
6) Predictive and easy contro
7) Machine to machine interface with reliable cost can be achieved.

II. BLOCK DIAGRAM

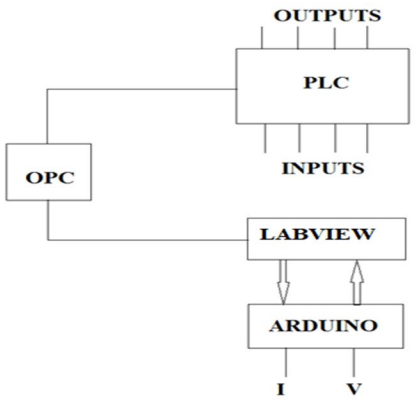


Fig 1: Block diagram of proposed system

A. Hardware Materials

DVP14SS211R

Fig 2: Programming Logic Controller (DELTA)

B. Features

1) Power: 20.4 to 28.8 VDC
2) Digital inputs: 8 inputs, 24 VDC sink or source
3) Digital outputs: 6 relay outputs
4) Output rating: 1.5A each output
5) Program capacity: 8k steps
6) *Arduino:* Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller.

Fig 3: Arduino board

C. Specifications of Arduino

1) Microcontroller: ATmega32
2) Operating Voltage: 5
3) Input Voltage (recommended):7-12V
4) Input Voltage (limits): 620V
5) Digital I/O Pins: 14 (of which 6 provide PWM output)
6) Analog Input Pins: 6
7) DC Current per I/O Pin: 40 mA
8) DC Current for 3.3V Pin: 50 mA
9) Flash Memory: 32 KB (ATmega328)
10) SRAM: 2 KB (ATmega328)
11) EEPROM: 1 KB (ATmega328)

12) Clock Speed: 16 MHz

by opening and closing contacts in another circuit. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized.

Fig 4: Relay

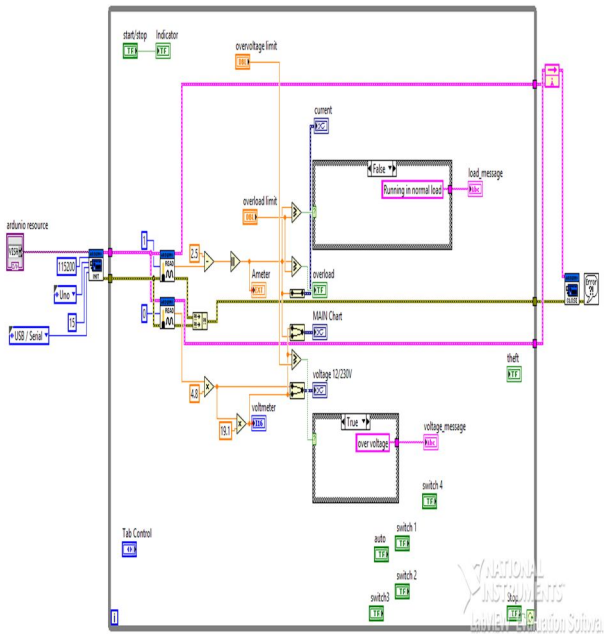
SMPS SMPS stands for switch mode power supply. This converts the 230v single phase AC supply to 24V or 12V DC which is required for the PLC and for some input/output devices.

Fig 5: Switch mode power supply

This unit provides power to the Central Processing Unit, Input Unit and Output Unit. PLCs are powered by standard commercial AC power lines. However, many PLC components such as CPU and memory, utilize 5-24 volts or another level of DC power. The PLC power supply converts AC power into DC power to support those components of the PLC.

D. Software used

1) LabView: LabVIEW, which stands for Laboratory Virtual Instrumentation Engineering Workbench, is a graphical computing environment for instrumentation, system design, and signal processing. It includes extensive support for interfacing to devices, instruments, camera, and other devices. Users interface to hardware by using USB, GPIB or through Serial communication cable. In our project Labview is used to set the current and voltage limit and programming is done if it exceeds the limit it will give the indication and trip signal to the PLC.



2) Opc Server: OPC SERVER (KEPWARE)**,** OPC stands for open productivity and connectivity in industrial automation and the enterprise systems that support industry. It is used as communication channel between Labview and PLC in this project. And also it controllers and interface the two controllers (Arduino and PLC).

B. Working of the project

1) Supply which is to be measured is given to Arduino through CT and PT.
2) The current and voltage limit is setted in a Labview.
3) The data from the Arduino is transferred to Labview through the USB cable.
4) Labview and PLC is interfaced by using the OPC software.
5) By switching on the main supply the load can be made on through auto/manual mode.
6) Once the load current and voltage exceeds the pre defiened value the Labview gives the over current and overvoltage message and the LED will glow.
7) If load takes over current of more than 15 sec programming is done to show the theft indication in the system and LED will glow.

III. RESULT

Hence our project is implemented to protect the equipments from over voltage and over current in industries, substations etc. by using the PLC and Arduino controllers.

IV. CONCLUSION

Industry 4.0 will change the entire manufacturing system to promote the digitization and integration of smart system across all points of the manufacturing sector. Industry 4.0 makes the quality of production thus we can obtain the good quality of products from the industries and it makes production faster, more efficient and more flexible.

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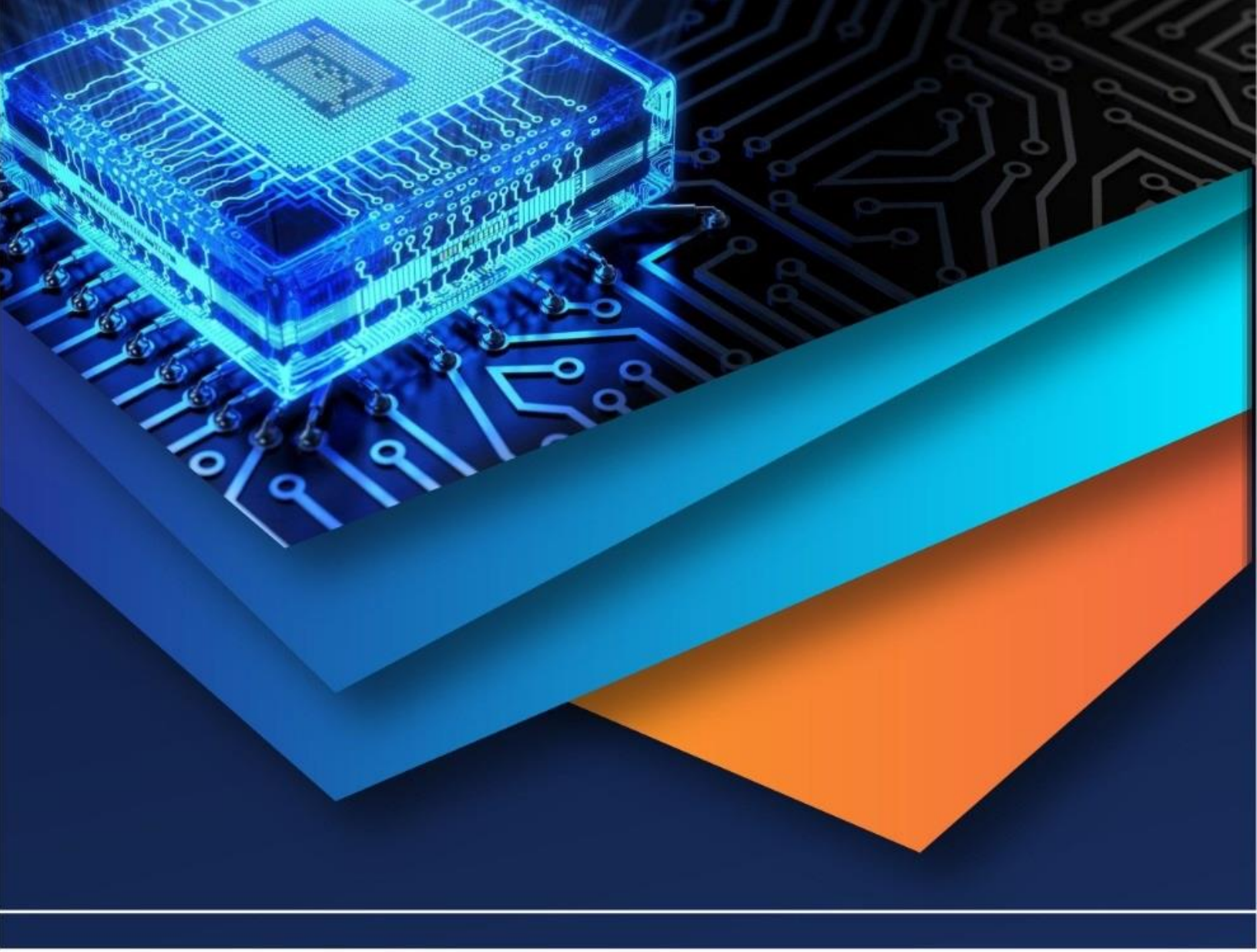

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