# Innovative Approach of Process Control

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***Abstract*—The objective of this project is to demonstrate the operation of a system that allows monitoring and controlling of process variables (PV) such as Temperature, Flow, and Level using LabVIEW. The main idea of process control is to make a real time fully automated control system using LabVIEW .The graphical system design with LabVIEW is that it offers easy and seamless integration with traditional benchtop and legacy, instruments commonly found in research labs. By using LabVIEW implementation is efficient. The corresponding Process variable values are measured and converted into Digital Signals using NI-DAQ (Data acquisition card) and these are controlled in LabVIEW. The process involves Storage Tank will store water required for the process operation. It will have only a low level sensor to detect whether tank is dry to protect pump from dry operation which may damage the pump. System will be started & stopped from the LabVIEW software .It will indicate in real time temperature and level values. The Control signal is sent back to the process station via Ni-DAQ to the corresponding Controller. The application of Lab VIEW ranges from simple laboratory experiments to large automation application. This process is trying to control proportional mixture of two fluids, temperature, flow and level.**

***Keywords-Temperature-pressure controller, labview ,DAQ card etc.***

## I .INTRODUCTION

Virtual instrumentation combines mainstream commercial technologies, such as the PC, with flexible software and a wide variety of measurement and manage hardware. Engineers use virtual instrumentation to carry the power of flexible software and PC technology to test, control and design applications making precise analog and digital measurements. Engineers and scientists can create user-defined systems that assemble their exact application needs. Industries with automatic processes, such as manufacturing or chemical plants use virtual instrumentation with the motive of enhancing system productivity, reliability, safety, optimization and stability. Virtual instrumentation computer software that is user would employ to develop a computerized test and measurement system for controlling from a computer desktop.

A virtual instrument (VI) is defined as an industry-standard computer set with user-friendly application software, cost-effective hardware and driver software that together perform the functions of conventional instruments and the replicated physical instruments are called virtual instruments. Virtual instrumentation software based on user requirements defines general-purpose measurement and manages hardware functionality. With virtual instrumentation, engineers and scientists reduce improvement time, design higher quality products, and lower their design costs. In test, measurement and
control, engineers have used virtual instrumentation to rationalize automated test equipment (ATE) while experiencing up to a several times increase in productivity gains at a small part of the cost of traditional instrument solutions.

## II. METHODOLOGY

The main work is preparation of DAQ Card. The block diagram of process control using labview is shown in figure 1.

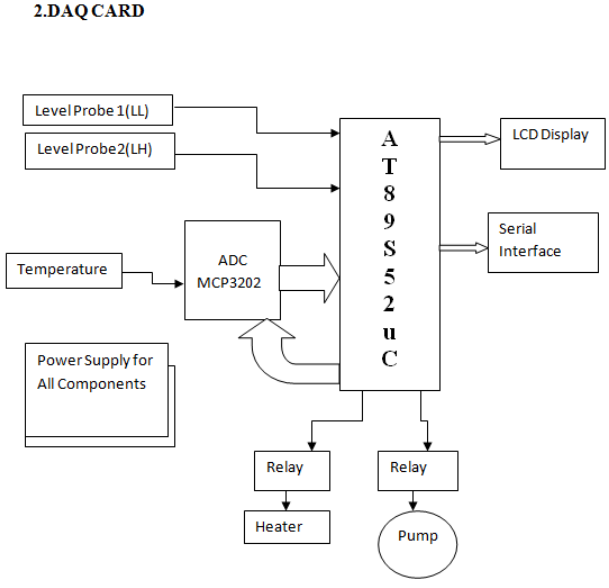


Figure 1.Block Diagram of Process Control System

According to the given diagram proposed system will acquire data through the sensors. Analog signal from sensors will be given to 8 bit or 12 Bit Analog to Digital Converter. Here since there are four signals we require at least 4 channels ADC.ADC used will be 8 channels for future enhancements or if we require more sensors in the system. When in field, it is also required to know ambient conditions at that instant. For this real time data is displayed on LCD (16X2) 16 Character, 2 Lines. Microcontroller selected is Atmega 89C52 based on Intel 8051 Architecture. It has 8K ROM, 256 bytes RAM,3 Timers, Serial interface, 4 I/O Ports which are sufficient for our application. Serial interface is required to interface this DAQ card to PC.PC will display this data in real time .PC will also log data in real time for future analysis. Another function PC serves is to switch ON/OFF water pump and pesticide pump as scheduled or manually.

## III. INTELLIGENT CONTROL TECHNIQUES

In 1965, the concept of Fuzzy Logic was conceived by Prof. Lotfi Zadeh at the University of California at Berkley. He presented fuzzy set theory as a way of processing data by allowing partial set membership instead of set membership or non-membership. This approach to set theory was not applied to control systems until the small-computer capability prior to 1970. Professor Zadeh reasoned that people do not require precise, numerical information input, and yet they are capable of highly adaptive control. The feedback controllers could be easier to implement and would be much more effective if they are programmed to accept noisy, imprecise input.. The intelligent control techniques like neural networks, genetic algorithms and fuzzy logic have been used in liquid level control for the last twenty years.

In 1997, Seong and Park investigated self-organizing fuzzy logic controller for water level control of steam generators. built a prototype of water level control system implementing both fuzzy logic and neural network control algorithm and embedded the control algorithms into a standalone DSP-based micro controller and compared their performance

## IV. MEASUREMENT OF PROCESS VARIABLE

TEMPERATURE**:** Temperature control is important for reaction processes, and temperature must be maintained within limits to ensure for the safe and reliable operation of process variable. Temperature can be measured by various methods; several of the more usual are described in this topics. The temperature sensor is protected from the process materials to prevent interference with correct sensing and to eliminate harm to the sensor. Thus, some physically strong, barrier exists between the process and sensor; generally, this barrier is termed a sheath especially for thermocouple sensors. An additional advantage of such a barrier is the ability to remove, replace, and calibrate the sensor without disrupting the process operation.

LEVEL: In industry, liquids such as water, chemicals, and solvents are used in various processes. The amount of such liquid stored c a n be found by measuring l e v e l of the liquid in a container or tank. The level affects not only the quantity delivered but also pressure and rate of flow in and out of the container.

PRESSURE**:** A pressure sensor shows pressure typically of gases or liquids state. Pressure is an expression of the force required to stop a fluid from enlarging, and is stated in terms of Force per unit Area. A pressure sensor acts as a transducer by generating a signal as a function of the induced pressure. For the purposes of this article, such a signal is electrical.

FLOW**:** Flow rate is complex and it is difficult to measure the quantity. There is no principle to measure flow directly. The reduction of pressure in a fluid flow is measured by differential pressure transmitter. The differential pressure is find out by extracting the square root of. flow rate. Differential pressure flow meters have two elements: primary and a secondary element. The primary element in the form of flow nozzle, venture, and orifice plate will produce a change in the flow of kinetic energy and this change in kinetic energy will create differential pressure. The aim of the secondary unit is to measure the differential pressure and provide an electrical signal for transmission to a remote process control instrument.

## V. Lab VIEW SOFTWARE

The term virtual instrument owes a lot to the progress of the **L**aboratory **V**irtual **I**nstrument **E**ngineering **W**orkbench (LabVIEW) by National Instruments, Texas, USA. The, National Instruments in 1983 began to look for a way to decrease the time needed to program instrumentation systems. LabVIEW is a very good high level language with an extra advantage of built-in graphical user interface (GUI). It is quite user-friendly software and flexible to give better system performance. Our system will also in real time indicate values of all parameter such as Temperature, light intensity, soil moisture and Humidity. These values can be used to decide at what time water and pesticide has to be sprayed on the plants. In our System we propose to control a pesticide pump and a Water pump through our LabVIEW based system. Date will be transferred to the software through serial interface.

## VI. APPLICATION

Process control applications generally involve handling fluids like Liquids, Air, Slurries, Powders, etc. are industrial in nature and designed to make money.

When you have a simple application like preparing tea you need to execute multiple steps to complete the process like to fill a vessel with cold water and heat it to a specific temperature, then add some specified amount of an ingredient, mix it for a specific time and empty the vessel.

The aim of improving process control is to improve efficiency. When the value of the fluid like gasoline, alcohol, etc. increases, the importance of process control because it means making more cost effective.

## VII.CONCLUSION

The liquid level of tank or plant controlling and monitoring is built and is tested to be working properly. Based on the LabVIEW demo, the controller is implemented and simulated successfully and the results are promising and satisfactory. This Innovative control approach can be used in process controlling and also temperature control applications of nuclear/thermal power plants. As a future scope of this work the FLC can be implemented in a microcontroller with additional set of rules for more accurate control and can be used in various applications in industry and household. The controller can also be tested with periodically varying liquid level tracking applications.

## ACKNOWLEDGEMENT

Our sincere thanks to the technology that allowed us to explore process control with innovative approach using Lab VIEW by providing relevant information from different authors research papers. We would like to thank Hon. Shri Sunil Rane sir for conducting this conference and giving us opportunity to present this. We are thankful to our college Principal Dr. S. P. Kallurkar, Head of Department and Project Guide Prof. Niranjan Samudre, and all staff members of Electronics department who have provided us various facilities and have guided us whenever required. We would like to express my heart-felt gratitude towards our parents and all those who encouraged us to accomplish and supported us in our work.

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