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Industrial Utility Control by Using UC & Thyristor Circuit

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Abstract: *In this paper, we propose a Industrial Utility control by using UC & thyristor Circuit As well as we are showing the fully automation of industrial process related to utility and easy troubleshooting of the Circuit by using GSM module ,in addition of all these process and related parameter showing & control on SCADA , This SCADA we also made by using processing software & uC, There are not be use of PLC , HMI, DCS & SCADA logic. We made this system by using basic electronic component.*

Keyword: *thyristor , Microcontroller, GSM module, 16*2 LCD, Temperature sensor, Relay , Limit/Level switch, solenoid valve, pump, Water control system,*

I. Introduction:

The utilities sector is a category of stocks for utilities such as water ,gas, and power etc. The sector contains companies such as electric, gas and water firms, and integrated providers. Because utilities require significant infrastructure, these firms often carry large amounts of debt; with a high debt load, utilities companies become sensitive to changes in the interest rate. As a industrial utility level controller by thyristor, is an automatic device used to controlled a particular level of chilling & hot water (for example in an overhead tank) and restrict it from exceeding the limit.The simple circuit design for such a controller shown here may be easily built and installed and may relieve you from the headache of manually operating the water pump in time Automatic utility level controller circuit Is a simple engineering project. It can automatically switch ON and OFF the domestic water pump set depending on the tank level. The main advantage of this circuit is that it automatically controls the whole process without any user interaction Automation is the technology by which a process or procedure is performed with minimum human assistance.[1] Automation [2] 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 on telephone networks, steering and stabilization of ships, aircraft and other applications and vehicles with minimal or reduced human intervention. Some processes have been completely automated.Automation covers applications ranging from a household thermostat controlling a boiler, to a large industrial control system with tens of thousands of input measurements and output control signals. In control complexity it can range from simple on-off control to multi-variable high level algorithms.In the simplest type of an automatic control loop, a controller compares a measured value of a process with a desired set value, and processes the resulting error signal to change some input to the process, in such a way that the process stays at its set point despite disturbances. This closed-loop control is an application of negative feedback to a system. The mathematical basis of control theory was begun in the 18th century, and advanced rapidly in the 20th.Automation has been achieved by various means including mechanical, hydraulic, pneumatic, electrical, electronic devices and computers, usually in combination. Complicated systems, such as modern factories, airplanes and ships typically use all these combined techniques. The benefit of automation include labor savings, savings in electricity costs, savings in material costs, and improvements to quality, accuracy and precision.

Table 1: List of component that been used for industrial utility

Component	Diagram	Working
Level switch		Used to detect the level of liquid.
Triac		Used for controlling the current
Electric pump		Converts electric energy to mechanical energy to provide required pressure to the water
Relay		Use To turn on &turn off a circuit by a low power signal
Electrical contactor		Used for switching the power.
Industrial panel lamp		Designed for a specific equipment arrangement.
Solenoid eneumatic valve		Use to Control the flow of liquid and gases.
GSM module		Used to establish communication.
Microcontroller		IC chip that executes programs for controlling other devices or machine.
LCD		It's a flat panel display.
RTD(resistance temperature detector)		Used to determine the temperature by measuring resistance of electric pure
SYNTAX tank		Container for storing water.

Block Diagram:

Level sensors are used to monitor and regulate levels of a particular free-flowing substance within a contained space. These substances are usually liquid, however **level sensor send the signal at the particular** level to uC, A **Microcontroller** is a IC chip that executes programs for controlling other devices or machines. It is a micro (small size as its a Integrated Circuit chip) device which is used for control of other devices , its also interface with SCR circuit by I/O ports, The thyristor start conduction when it is forward biased. For this purpose the cathode is kept at negative and anode at positive. ... When we apply a clock pulse at the gate terminal , the junction J2 become forward bias and the Silicon Control Rectifier **SCR** start conduction.

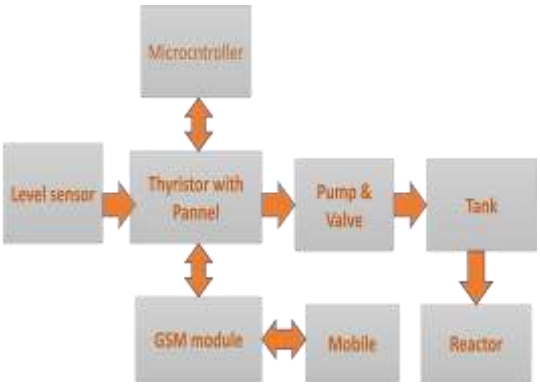

Figure 2:Block diagram

When the SCR conduct then its active to the PUMP or Valve as per process signal and after fill the tank with the reference of level sensor and water flow from tank to reactor as per process requirement. GSM is an open and digital cellular technology used for transmitting mobile data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz **frequency** bands. There GSM is use for fault detection of the circuit if any issue in the circuit then GSM module send data on mobile of particular fault

Process Diagram:

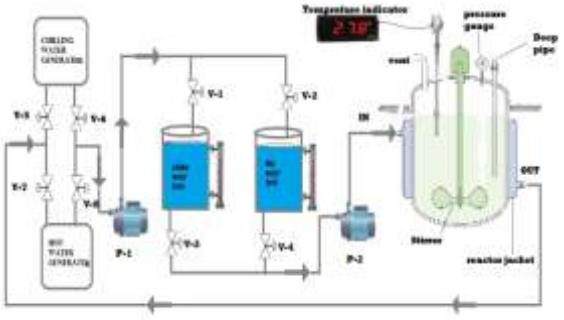

Figure 3: process diagram

System architecture:

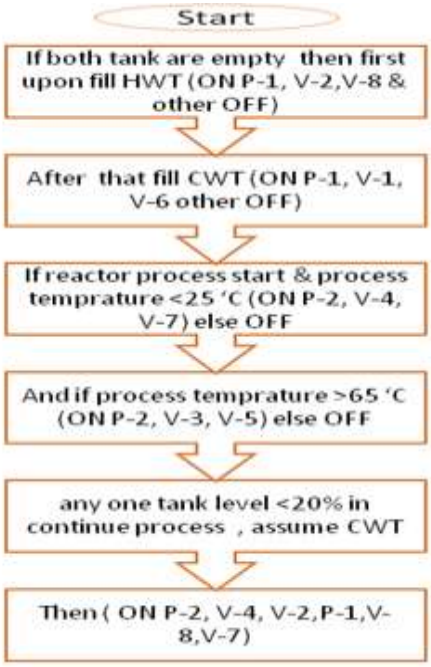

Figure 4: System architecture

Circuit diagram :

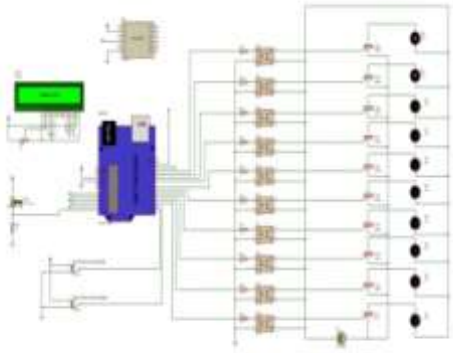

Figure 5: circuit diagram

In which process Controller using Atmega328p Microcontroller will help in automatically controlling the process pump & valve by sensing the water level in a tank. This article explains you how to detect and control the process. This system monitors the process and automatically switches ON/OFF the pump & Valve as per Process requirement. Two limit s/w 'A' and 'B' are inserted inside the pipe at fixed position one 'A' at bottom and the other one 'B' at the top. The liquid level switches work on the float. the movement of the float changes the location of the contact field and the contacts of the switch are closed or opened.sensing can be done by using a set of five wires, one for in & four for out , which are placed at two different tank levels switch. Initially Both The Limit Switch A close and B Are Open position i.e. water level is low, When the button ON of power supply the DC signal complete the loop from S/W A, this signal get uC And release O/p pulse signal to the gate terminal Conduct Thyristor via optocoupler After Getting the prescribed Level in the tank Sense by limit s/w B then Stop the conduction of thyristor Here is the completion of One cycle, this cycle is not Repeated A limit switch pass + 5v DC signal to the uC , uC its also interface with GSM module and thyristor ckt GSM module use for troubleshooting of the circuit , if any contact break in the circuit then its also pass the alarm on mobile of particular issue cooling and hot water tank interlock by relay/contactor and two outlet solenoid valve mounted at node of pump , when the consume water as per production requirement then both tank maintain level automatically as well as level maintain base on process temperature.

II. Conclusion And Future Scope

This paper presents the industrial utility control by using uc and thyrister cicuit. As the name depicts, a industrial utility level controller by thyristor, is an automatic device used to controlled a particular level of chilling & hot water (for example in an overhead tank) and restrict it from exceeding the limit. The simple circuit design for such a controller shown here may be easily built and installed and may relieve you from the headache of manually operating the water pump in time . It can be implemented in domestic area too.

Advantages:

- Save water.
- No required man power.
- Save Electricity.
- Time management.

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