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Industrial Fuel Control using Cloud Management

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Abstract: Indication, Rectification and Database management are the important parameters should be maintained in the industries. The part of our project is to satisfy the above parameters in the domain of fuel distribution system in the industries. The proposed system continuously senses the fuel leakages in the distribution line. The use of cloud computing applications makes the monitoring a valid concern. Due to the multiple failure points that will be raised in both hardware and software, monitoring in cloud computing has become difficult. So, we choose cloud management technology over this area to solve the issue using the modules that had been mentioned in our proposed system. Whenever fuel leaks, our system will find out and stop the distribution of fuel by closing the valves automatically and further sends alert to the safety team in terms of visual and hearing indication. With these operations, we create the database of the leakage incidents and will be stored in the internet by means of IoT using Cloud Management.

Index Term: Database management, cloud computing, Rectification, Fuel leakage and control

I. INTRODUCTION

Maintenance costs in the industrial plants are considered as the major part of the total operation costs for functioning. The maintenance cost increase when the performance cost of the system decreases and vice versa, then cloud management is required such that every Industrial plant has its predictive maintenance programs where they monitor the machine's condition and implement with a correct decision over the spot time at the failure point.Cloud Monitoring is the system in which both the agent based and centralized monitoring modes are supported accordingly. Cloud Monitoring is also said as Multi- threaded and Self-adjusting Monitoring server. Users can add custom monitors and agents, as CM allows it. The concept here is that the monitor reacts and action is taken such that when it reaches the particular point of value. In case of failure, actions of this kind allow cloud application to heal. Although, some of the actions might require manual intervention of user or client.

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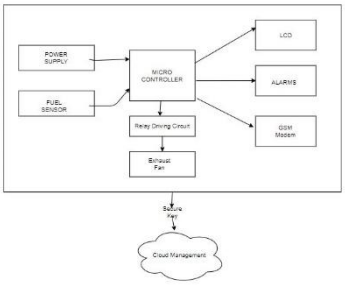
In these cases, an action is just considered as a notification. This mechanism of monitoring is used to manage the information from service availability, trace exceptional events and user privacy. In practice, not always the monitoring targets information are accessible that is the reason we use Cloud Management in our proposed system. While the abundance of advanced Cloud monitoring mechanisms had been proposed, these mechanisms are not allowed to grasp the situation where some monitoring information are inaccessible. As of now, the classical monitoring systems are designed in such a way that the target parameters or services are accessible. In reality, this is considered as non-realistic in Cloud scenarios where privacy protection, limited technical access to intrusive monitor ability or even access controls. In order to point out and overcome this type of problems alternative monitoring approaches are made.In real time, monitoring path is considered to be difficult for several issues. Firstly, it is tough to gather a monitoring data for target specific path of monitoring. As security monitors continuously collects the information of monitored paths that which are used for performing indirect monitoring events. Due to which an effective technique of useful data selection is required from which the collected database of the monitored data set. So, we create a controllable operation using Cloud Management Mechanism where the monitored paths are under our control where cloud plays an important role over here.The vision of our proposed system is to bring out the complete solution for the above issue of Gas or Fuel leakages in the industrial plants with the usage of Cloud Management Technology as a suitable application in the Industrial plants in order to determine the condition of the machines and analyze the problems parenthetically from the history of malfunctioned or damages occurred in the plant and control the modules before the malfunctioning or the damages occur.

II. SYSTEM ARCHITECTURE



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The above described architecture diagram is the proposed system for the industrial fuel control using cloud management.

From the above architecture the modules used in the implantation are taken as such for experimenting purpose with respect to the facing problem or issue. The modules mentioned are as follows: Power supply unit, Fuel Sensor, Micro Controller, Relay Driving Circuit, Exhaust Fan (Optional), LCD(16x2),
Alert Alarms, GSM Modem and then we integrate this whole unit and use it with the cloud management technology where the modules can be controlled using cloud control and the data retrieved from these modules is stored in the data base using cloud computing technology. And the main functioning of the cloud technology is effectively taken by cloud monitoring over the monitoring path of Industrial fuel pipe lines such that, if any gas leakage or fuel leakage occurs the leakage path is responded using cloud monitoring technology and controlled by cloud management

III. SYSTEM MODULES

A. GAS SENSOR:

Gas Sensor (MQ2) module [1] is the most efficient sensor used for detecting gas leakages in homes and industries. It detects some of the gases like H2, CH4, Alcohol, Propane or Smoke, LPG, CO Etc;. It measures quickly due to its fast response time and high sensitivity. Potentiometer is used for adjusting the sensitivity of the sensor.This sensor can even operate without a microcontroller as this is designed with a Digital pin and that can be handled when we are trying to detect only one gas in particular. Analog pin has to be used when we measure the gas in ppm. And this analog pin works on 5V and is also TTL Driven. Hence can be used with most common microcontrollers.The main advantage of MQ2 Sensor is such that we can detect the gas very easily and also we can either use digital pin or the analog pin. With the start of this system now power up the module with 5V such that the LED on the board should glow and when such no gas has been detected the LED should be turned off. Firstly, these sensors should be kept for pre-heating before the working or detection is started accordingly. After all this process is done, we can introduce any gas that which can be sensed by the sensor such that if it exceeds the limited value, we should observe the LED Glowing. If the LED doesn't glow brighter, we can make use of potentiometer. In this way, if the sensor gets introduced to the known gases that is measurable by the sensor (MQ2) the digital pin will go high (5V) else will remain low (0V).To get the same, we will be making use of analog pin. And we will use microcontroller to read 0-5V analog values. To which the value of this is directly proportional to the concentration of gas.

B. MICROCONTROLLER (PIC16LF1526):

Now a days, Micro-Controller is used in most of the system. These are used in automatically controlled devices and products. Automatically controlled devices and products may be of this kind such as follows automobile engines control systems, remote controls, power tools and some other embedded systems. Use of this makes us economically comfortable by reducing the size and cost. In Our proposed system, we make use of the PIC16LF1526 Micro controller in order to meet specific requirements of the project based on the concept mentioned through the cloud management domain for the proposed system.Microchip PIC 16LF1526 controller is RISC CPU with high performance. This supports 8,16- and 32-bit microcontrollers with a powerful and flexible storage technologies and architectures with extensive easy-to-use development tools.[2]

The advantages of the Microchip microcontroller solutions are quite clear as follows:

- Easily switches between 8,16and 32-bit families.
- Low- risk product development.
- Low overall system costs.

C. SPDT RELAY:

Single Pole Double Throw Relay is the enlarged form for SPDT Relay [3]. The terminals in the relay are 3 types, they are common terminal and the other is closed terminal and another is normally open terminal. The normal open and the closed terminal have continuity, when the status of the coil is energized. The coil of the relay is rated till 12V and the contact is rated up to 5A (@250VAC, 5A VDC). We use it to control high current devices.

D. LCD DISPLAY:

LCD (Liquid Crystal Display) screen[4] that has been used here is 16x2. It is electronic device used to display the data of gas leakage in the system. It is a most basic module which is used commonly for various circuits and devices.We all know that these are prepared over seven segments and other multi segments of LED's.
This LCD has two registers, namely, Command and Data. The reason we use this LED is that it dispays 16 Character in a line and such that displays 2 lines of data which more or enough comfortable for the system we desgined.
As said in the above phrase, A command register stores the commands given by the users to the LCD to do a predefined task like we do it CLI programs to clear screen, controlling display, setting the cursor in the right position. The data the will be displayed on LCD is the ASCII value of the character.

E. GSM Modem:

GSM is know as Global system for mobile communication(GSM). This module is used for mobile communication. This technology is useful for sending notifications in the form of SMS, mobile voice calls and data services.This module has been developed as a digital system using time division multiple access (TDMA) technique for communicational purpose. The use of GSM reduces the data by breaking them into modules and send them through the channel with 2 differents streams of client data. GSM has various cell sizes namely macro, micro, pico and umbrella cells. These cells are varied as per the domain implementation. Sizes may differ and the area of coverage of each cell differs according to the environment of work done. There are different types of GSM modem to make use of according to the plan of execution towards the work done. The GSM Modem provides any software with a secure gateway to GSM Network with certain limitations as per the requirement of the work.

F.Relay Driver (ULN2003):

Relay driver logic controller that are used to control mechanical or solid-state relays in alternate current and direct current in power systems.When the first relay is used in long distance circuits as an amplifier they are repeated as a signal coming from circuit and are again transmitted in a nother circuitML(magnetic latching) relay supports the latching where the permant magnets are imbibed in it such that the relay operations are carried on where power supply occurs with the attachment of the magnets in it. The useful application of ML relay is when the coil is interrupted the power can not be transitioned to the contacts. Inside the relay driver a small cradle is often used in electronics to provide current through the circuit. When the electric current is passed through the coil it will generate a magnetic field that start the current from the armature and the continues movement of the movement contact either makes or breaks the connection with a constructed contact. The four versions[5] interface to all common logic families are as followsand the maximum ratings for the PIN Out module of the relay driver (ULN2003) can be seen through the mentioned table.

IV. HELPFUL HINTS

A. *Figures*

Fig [1]:MQ2 Gas Senor Module

Fig [2]:Micro Controller PIC16LF1526

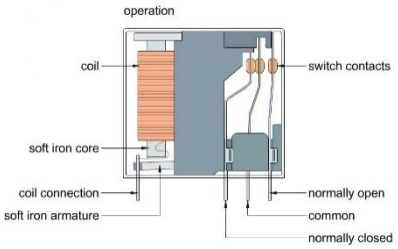

Fig [3]:Internal Structure of SPDT Relay

Fig [4]: LCD (16x2) Display Unit

B. *Tables*

Tab 1: Max. Ratings [6]

ABSOLUTE MAXIMUM RATINGS			
Symbol	Parameter	Value	Unit
V_O	Output Voltage	50	V
V_{in}	Input Voltage	30	V
I_C	Continuous Collector Current	500	mA
I_O	Continuous Base Current	25	mA
T_{amb}	Operating Ambient Temperature Range	-20 to 85	^{0}C
T_{stg}	Storage Temperature Range	-55 to 150	^{0}C
T_j	Junction Temperature	150	^{0}C

Tab 2:Four versions interface[5]

ULN2001A	General Purpose, DTL, TTL, PMOS, CMOS
ULN2002A	14-25V PMOS
ULN2003A	5V TTL, CMOS
ULN2004A	6-15V CMOS,PMOS

V. RESULT ANALYSIS

The overall outcome of the work done is framed in words as follows, the power is supplied to the module where the LCD and the programmed gas sensor starts working such that the gas sensor standardizes first before pre heating the working model and then gas or fuel is produced on to the programmed sensor such that the readings are produced on the LCD Display accordingly. Once it exceeds the threshold value the notification is sent through the GSM Modem such that the application of cloud management is used here to monitor and control the path of leakage by closing the valves of pipelines automatically. The pipelines in our work are represented by the relay valves. And the leakage data parameters are automatically entered into the database.

VI. CONCLUSION AND FUTURE WORK

The conclusion of this proposed system is to satisfy the parameters such as Indication, Rectification, Database Management that are to be maintained in the Industry levels using Cloud Management Technology which is Advanced level of safety measures to ensure the fuel leakages in the industrial modules. This system is different from the existing system not only by controlling the fuel leakage but also to save the above-mentioned parameters in the database which could be useful for the safety officers to get an idea about the regular malfunctioning module.

A. Future Enhancement

The main problem that has been observed is the fuel leakage with manual data entry of malfunctioned module. To overcome the observed problem, we use the cloud management technology to store the data of leakage module with specifications automatically as programmed and control the module (Open or Close/On or Off) at the point of damage using IoT as the part of cloud management through which we can reduce the cost of maintenance. By which the main motive of our work is achieved. This was the future enhancement observed from the work.

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