ABSTRACT

Industrial Automation is a field that requires a vast involvement in the safety and the security aspects. The intensity towards this concept may vary according to the nature of the industry. For industries that involve heavy and sophisticated installations such as that of a chemical plant etc, the security feature must be more intense as compared to less complicated industrial plants. Here we are proposing an idea that well suits the kind of industries formerly mentioned. The system is designed to monitor three very important parameters – the fluid level, the temperature, and the operating voltage. In any chemical plant these three parameters forms the three factors that can define not only the efficient working of the plant, but also the safety of the workers and the installations involved. In the proposed design, if any of these values exceeds beyond a particular limit, then immediately the entire system will be shut down ensuring that any further damages are blocked. The three parameters will be constantly monitored by the microcontroller and each time a check will be carried out to ensure that the threshold limits have not exceeded. For this, the controller will be employing the ADC peripheral. If exceeded, the microcontroller of course will make sure that the system is disabled in no time.
CONTENTS

1. Introduction………………………………………………………4
2. Block Diagram………………………………………………5
Automation is the use of control systems (such as numerical control, programmable logic control, and other industrial control systems), in concert with other applications of information (such as computer-aided technologies [CAD, CAM, CAx]), to control industrial machinery and processes, reducing the need for human intervention. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, automation greatly reduces the need for human sensory and mental requirements as well. Processes and systems can also be automated.

Automation plays an increasingly important role in the world economy and in daily experience. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities.

Many roles for humans in industrial processes presently lie beyond the scope of automation. Human-level pattern recognition, language recognition, and language production ability are well beyond the capabilities of modern mechanical and computer systems. Tasks requiring subjective assessment or synthesis of complex sensory data, such as scents and sounds, as well as high-level tasks such as strategic planning, currently require human expertise. In many cases, the use of humans is more cost-effective than mechanical approaches even where automation of industrial tasks is possible.

Specialized hardened computers, referred to as programmable logic controllers (PLCs), are frequently used to synchronize the flow of inputs from (physical) sensors and events with the flow of outputs to actuators and events. This leads to precisely controlled actions that permit a tight control of almost any industrial process.

Human-machine interfaces (HMI) or computer human interfaces (CHI), formerly known as man-machine interfaces, are usually employed to communicate with PLCs and other computers, such as entering and monitoring temperatures or pressures for further automated control or emergency response. Service personnel who monitor and control these interfaces are often referred to as stationary engineers in boiler houses or central utilities departments. In most industrial process and manufacturing environments, these roles are called operators or variations on this.
BLOCK DIAGRAM DESCRIPTION

Temperature is sensed by lm 35 at port in1 of adc 0808 here the temperature value is obtained and when temp exceeds 48 then the lcd displays too high otherwise normal when the temperature is high relay is on a high at pin 3_6 to disconnect the heater from supply, the next element to be sensed is voltage that is given to pin INO of adc 0808 nad when the voltage falls below 200v the relay is driven to disconnect supply pin 3_5 of mc is used here, next we check the fluid level the input is given to pin 3_3 of mc and when there is voltage or high in the pin it indicates there is liquid in the tank and so the lcd displays fuel is ok and when the pin is low the lcd indicates fuel is empty and the relay is driven through pin 3_7 to reconnect the motor to supply thereby driving it on.
HARDWARE DESCRIPTION

Circuit Diagram
CIRCUIT DESCRIPTION

The difficult part of this project was to create a suitable program to run the required actions. The easy part was designing the hardware circuit.

The circuit operations are controlled by the μc89c51 microcontroller. The temperature sensing is done by LM35. ADC0808 is used for analog to digital conversion. Also an LCD controller is used for the Display purposes. All these sections are explained below. The power section consists of LM7805, diodes and capacitors. All the ICs are powered from the same power supply unit.

LCD MODULE

This is a two line 16 character display and it continuously displays the conditions of temperature, voltage and fluid level. LCD operations are controlled internally by an eight bit data/control registers.

89C51 MICROCONTROLLER

This is the heart of the entire system. It continuously checks the system continuously and the data are processed accordingly. This data’s are converted to meaningful information by this microcontroller and updated formatted data’s are sent to the LCD module.

ADC0808

The ADC0808, ADC0809 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible control logic.

LM35

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.
POWER SUPPLY

This generates the power supply required for the working of all separate modules. In this project we are using IC-7805 in series with a filter for producing regulated +5V output dc.
89C51 MICROCONTROLLER

Features

• Compatible with MCS-51™ Products
• 4K Bytes of In-System Reprogrammable Flash Memory
  – Endurance: 1,000 Write/Erase Cycles
• Fully Static Operation: 0 Hz to 24 MHz
• Three-level Program Memory Lock
• 128 x 8-bit Internal RAM
• 32 Programmable I/O Lines
• Two 16-bit Timer/Counters
• Six Interrupt Sources
• Programmable Serial Channel
• Low-power Idle and Power-down Modes

Description

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K Bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel’s high-density nonvolatile memory technology and is Compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications
ADC 0808

Features
- Easy interface to all microprocessors
- Operates ratiometrically or with 5 V$_{dc}$ or analog span adjusted voltage reference
- No zero or full-scale adjust required
- 8-channel multiplexer with address logic
- 0V to V$_{CC}$ input range
- Outputs meet TTL voltage level specifications
- ADC0808 equivalent to MM74C949
- ADC0809 equivalent to MM74C949-1

Description
The ADC0808, ADC0809 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible control logic. The 8-bit A/D converter uses successive approximation as the conversion technique. The converter features a high impedance chopper stabilized comparator, a 256R voltage divider with analog switch tree and a successive approximation register. The 8-channel multiplexer can directly access any of 8-single-ended analog signals.

The device eliminates the need for external zero and full-scale adjustments. Easy interfacing to microprocessors is provided by the latched and decoded multiplexer address inputs and latched TTL TRI-STATE outputs.

The design of the ADC0808, ADC0809 has been optimized by incorporating the most desirable aspects of several A/D conversion techniques. The ADC0808, ADC0809 offers high speed, high accuracy, minimal temperature dependence, excellent long-term accuracy and repeatability, and consumes minimal power. These features make this device ideally suited to applications from process and machine control to consumer and automotive applications. For 16-channel multiplexer with common output (sample/hold port) see ADC0816 data sheet.
LM35

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1/4°C at room temperature and ±3/4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

Features
- Calibrated directly in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor
- 0.5°C accuracy guaranteeable (at +25°C)
- Rated for full −55° to +150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 μA current drain
- Low self-heating, 0.08°C in still air
- Nonlinearity only ±1/4°C typical
- Low impedance output, 0.1 W for 1 mA load
LIQUID CRYSTAL DISPLAY CONTROLLER/DRIVER

The HD44780U dot-matrix liquid crystal display controller and driver LSI displays alphanumeric, Japanese kana characters, and symbols. It can be configured to drive a dot-matrix liquid crystal display under the control of a 4- or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal system can be interfaced with this controller/driver.

The HD44780U standard requires three control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used, the LCD will require a total of seven data lines (3 control lines plus 4 lines for data bus). If an 8-bit data bus is used, the LCD will require a total of 11 data lines (3 control lines plus 8 lines for the data bus). The three control lines are referred to as EN, RS and RW.

The EN line is called "Enable". This control line is used to tell the LCD that you are sending it data. To send data to the LCD, your program should first set this line high (1) and then set the other two control lines and/or put data on the data bus. When the other lines are completely ready, bring EN low (0) again.

The 1-0 transition tells the 44780 to take the data currently found on the other control lines and on the data bus and to treat it as a command.

The RS line is the "Register Select" line. When RS is low (0), the data is to be treated as a command or special instruction (such as clear screen, position cursor, etc.). When RS is high (!), the data being sent is text data which should be displayed on the screen. For example to display the letter "T" on the screen you would set RS high.

The RW line is the "Read Write" control line. When RW is low (0), the information on the data bus is being written to the LCD. When RW is high (1), the program is effectively querying (or reading) the LCD. Only one instruction ("Get LCD status") is a read command. All others are write commands – so RW will almost always be low.

The display contains 2 internal byte-wide register, one for commands (RS=0) and the second for characters to be displayed (RS=1). It also contains a user programmed RAM area (the character RAM) that can be programmed to generate any desired character that can be formed using a dot matrix. To distinguish between these two data areas, the hex command byte 80 will be used to signify that the display RAM address 00h is chosen.
Port D is used to furnish the command or data byte, and pins RC0, RC1 furnish register select (RS) and read or write (R/W) levels.
WORKING

Temperature is sensed by lm 35 at port in1of adc 0808 here the temperature value is obtained to sense the voltage input voltage is made to the 5v level by using the same circuit as power supply but the transformer used here is 230v/5v and when temp exceeds 48c then the lcd displays too high otherwise normal when the temperature is high relay is on a high at pin 3_6to disconnect the heater from supply ,the next element to be sensed is voltage that is given to pin INO of adc 0808 nad when the voltage falls below 200v the relay is driven to disconnect supply pin 3_5 of mc is used here ,next we check the fluid level the input is given to pin 3_3 of mc and when there is voltage or high in the pin it indicates there is liquid in the tank and so the lcd displays fuel is ok and when the pin is low the lcd indicates fuel is empty and the relay is driven through pin 3_7to reconnect the motor to supply thereby driving it on.
REQUIREMENTS FOR THE PROJECT

HARDWARE REQUIREMENTS

• A sensor to sense the temperature
  ✓ LM35

• An analog to digital converter
  ✓ ADC0808

• A microcontroller which controls the overall working of the device incorporating all these components
  ✓ µC89C51

• A dot- matrix liquid crystal display controller and driver to display the results
  ✓ HD44780U(LCD-II)

• A relay

• Regulated +5V power supply using 7805
PROGRAM

#include <REGX51.H>

#define My_Data P0
bit ___status=0;
#define lcd_delay 400

unsigned char display[]={"INDUSTRIAL AUTO."};

#define LCDPORT P1
sbit _RS=LCDPORT^0;
sbit _RW=LCDPORT^1;
sbit _E =LCDPORT^2;

void Ms_Delay(unsigned int itime);
void System_Init(void);
unsigned int ADC_Value_Read(unsigned char A, unsigned char B, unsigned char C);
void delay(unsigned int j);
void _lcd_init_write(unsigned char a);
void For_LCD_Display(unsigned Lx_Ftr);
void lcd_com(unsigned char a);
void lcd_data(unsigned char a);
void lcd_puts(char *aaa);
void lcd_init(void);

sbit ALE = P2^4;
sbit OE  = P2^5;
sbit SC  = P2^6;
sbit EOC = P2^7;
sbit ADDR_A = P2^0;
sbit ADDR_B = P2^1;
sbit ADDR_C = P2^2;
unsigned int value=0,value_ret_A,value_ret_B;
unsigned char decimal[10],digit=0,temp;
int main()
{
    System_Init();
lcd_init();
lcd_com(15);
lcd_puts(display);
lcd_com(0XC0);
lcd_puts("Loading.....");
Ms_Delay(300);
while(1)
{
    Ms_Delay(100);
value_ret_A=ADC_Value_Read(0,0,0);
if(value_ret_A < 0xE6)
    {
        lcd_com(0xC0);
lcd_puts(" Low Voltage!!! ");
P3_5 = 1;
Ms_Delay(100);
    }
else
    {
        lcd_com(0xC0);
lcd_puts(" Normal Voltage ");
P3_5 = 0;
Ms_Delay(100);
    }
Ms_Delay(100);
value_ret_B=ADC_Value_Read(1,0,0);
lcd_com(0xC0);
lcd_puts("TEMP:");
if(value_ret_B > 0x30)
    {
        lcd_com(0xCA);
lcd_puts("TOO HIGH");
    }
P3_6 = 1;
    //Ms_Delay(100);
}
else
{
    lcd_com(0xCA);
    lcd_puts("NORMAL ");
P3_6 = 0;
    //Ms_Delay(100);
}

value_ret_B = value_ret_B + 12;
For_LCD_Display(value_ret_B);
Ms_Delay(200);
if(P3^3 == 1)
{
    lcd_com(0xC0);
    lcd_puts(" FUEL IS OK ");
P3_7 = 0;
    Ms_Delay(100);
}
else
{
    lcd_com(0xC0);
    lcd_puts("FUEL IS EMPTY!!!");
P3_7 = 1;
    Ms_Delay(100);
}

void Ms_Delay(unsigned int itime)
{
    unsigned int i,j;
    for(i=0;i<itime;i++)
        for(j=0;j<1275;j++);
}

void System_Init(void)
{
    My_Data = 0xFF;
    EOC = 1;
    ALE = 0;
    OE = 0;
    SC = 0;
P3 = 0x0F;
unsigned int ADC_Value_Read(unsigned char A, unsigned char B, unsigned char C) {
    ADDR_A = A;
    ADDR_B = B;
    ADDR_C = C;
    Ms_Delay(1);
    ALE = 1;
    Ms_Delay(1);
    SC = 1;
    Ms_Delay(1);
    ALE = 0;
    SC = 0;
    while(EOC!=0);
    while(EOC!=1);
    OE = 1;
    Ms_Delay(1);
    value = My_Data;
    OE = 0;
    return value;
}
 void delay(unsigned int j){
    unsigned int i=0;
    for(;i<j;i++);
}
 void _lcd_init_write(unsigned char a){
    _RS=0;
    _RW=0;
    LCDPORT=a;
    _E=1;
    delay(lcd_delay);
    _E=0;
}
 void lcd_com(unsigned char a){
}
unsigned char temp;
if(__status){
   __status=0;
   goto ___next123321;
}
_RS=0;
___next123321:
_RW=0;
temp=a;
temp&=0xf0;
LCDPORT&=0x0f;
LCDPORT|=temp;
_E=1;
delay(lcd_delay);
_E=0;
temp=a<<4;
temp&=0xf0;
LCDPORT&=0x0f;
LCDPORT|=temp;
_E=1;
delay(lcd_delay);
_E=0;
}

void lcd_data(unsigned char a){
   __status=1;
   _RS=1;
   lcd_com(a);
}
void lcd_init(void){
delay(lcd_delay);
_lcd_init_write(0x30);
delay(lcd_delay);
_lcd_init_write(0x30);
delay(lcd_delay);
_lcd_init_write(0x30);
delay(lcd_delay);
_lcd_init_write(0x20);
delay(lcd_delay);
lcd_com(0x28);
delay(lcd_delay);
lcd_com(4);
delay(lcd_delay);
lcd_com(0x85);
delay(lcd_delay);
lcd_com(6);
delay(lcd_delay);
lcd_com(1);
delay(lcd_delay);
}

void lcd_puts(char *aaa){
unsigned int i=0;
for(;aaa[i]!=0;i++)lcd_data(aaa[i]);
}

void For_LCD_Display(unsigned Lx_Ftr)
{
    lcd_com(0xC5);
digit=0;
    while(Lx_Ftr!=0)
    {
        decimal[digit] = Lx_Ftr%10;
        Lx_Ftr=Lx_Ftr/10;
        Ms_Delay(3);
digit++;
    }
while(digit>0)
{
    temp=decimal[digit-1]+0x30;
    Ms_Delay(3);
    lcd_data(temp);digit--;
}
lcd_data('^');
lcd_data('C');
APPLICATIONS

Automation has had a notable impact in a wide range of highly visible industries beyond manufacturing. Once-ubiquitous operators have been replaced largely by automated telephone switchboards and answering machines. Medical processes such as primary screening in electrocardiography or radiography and laboratory analysis of human genes, sera, cells, and tissues are carried out at much greater speed and accuracy by automated systems. Automated teller machines have reduced the need for bank visits to obtain cash and carry out transactions. In general, automation has been responsible for the shift in the world economy from agrarian to industrial in the 19th century and from industrial to services in the 20th century.

The widespread impact of industrial automation raises social issues, among them its impact on employment. Historical concerns about the effects of automation date back to the beginning of the industrial revolution, when a social movement of English textile machine operators in the early 1800s known as the Luddites protested against Jacquard's automated weaving looms — often by destroying such textile machines — that they felt threatened their jobs. One author made the following case. When automation was first introduced, it caused widespread fear. It was thought that the displacement of human operators by computerized systems would lead to severe unemployment.

Critics of automation contend that increased industrial automation causes increased unemployment; this was a pressing concern during the 1980s. One argument claims that this has happened invisibly in recent years, as the fact that many manufacturing jobs left the United States during the early 1990s was offset by a one-time massive increase in IT jobs at the same time. Some authors argue that the opposite has often been true, and that automation has led to higher employment. Under this point of view, the freeing up of the labour force has allowed more people to enter higher skilled managerial as well as specialized consultant/contractor jobs (like cryptographers), which are typically higher paying. One odd side effect of this shift is that "unskilled labour" is in higher demand in many first-world nations, because fewer people are available to fill such jobs.
At first glance, automation might appear to devalue labor through its replacement with less-expensive machines; however, the overall effect of this on the workforce as a whole remains unclear. Today automation of the workforce is quite advanced, and continues to advance increasingly more rapidly throughout the world and is encroaching on ever more skilled jobs, yet during the same period the general well-being and quality of life of most people in the world (where political factors have not muddied the picture) have improved dramatically. What role automation has played in these changes has not been well studied.

Currently, for manufacturing companies, the purpose of automation has shifted from increasing productivity and reducing costs, to broader issues, such as increasing quality and flexibility in the manufacturing process.

The old focus on using automation simply to increase productivity and reduce costs was seen to be short-sighted, because it is also necessary to provide a skilled workforce who can make repairs and manage the machinery. Moreover, the initial costs of automation were high and often could not be recovered by the time entirely new manufacturing processes replaced the old. (Japan's "robot junkyards" were once world famous in the manufacturing industry.)

Automation is now often applied primarily to increase quality in the manufacturing process, where automation can increase quality substantially. For example, automobile and truck pistons used to be installed into engines manually. This is rapidly being transitioned to automated machine installation, because the error rate for manual installment was around 1-1.5%, but has been reduced to 0.00001% with automation. Hazardous operations, such as oil refining, the manufacturing of industrial chemicals, and all forms of metal working, were always early contenders for automation.

A significant technology shift began in the 1980s, to take advantage of digital electronics. Former analogue-based instrumentation was replaced by digital equivalents which can be more accurate and flexible, and offer greater scope for more sophisticated configuration, parameterization and operation. This was accompanied by the field bus revolution which provided a networked (i.e. a
single cable) means of communicating between control systems and field level instrumentation, eliminating hard-wiring. Discrete manufacturing plants adopted these technologies fast. The more conservative process industries with their longer plant life cycles have been slower to adopt and analogue-based measurement and control still dominates. The growing use of Industrial Ethernet on the factory floor is pushing these trends still further, enabling manufacturing plants to be integrated more tightly within the enterprise, via the internet if necessary.

Another major shift in automation is the increased emphasis on flexibility and convertibility in the manufacturing process. Manufacturers are increasingly demanding the ability to easily switch from manufacturing Product A to manufacturing Product B without having to completely rebuild the production lines. Flexibility and distributed processes have led to the introduction of Automated Guided Vehicles with Natural Features Navigation.
ADVANTAGES

The main advantage of automation are:

- Replacing human operators in tasks that involve hard physical or monotonous work.
- Replacing humans in tasks that should be done in dangerous environments (i.e. fire, space, volcanoes, nuclear facilities, underwater, etc)
- Making tasks that are beyond the human capabilities such as handling too heavy loads, too large objects, too hot or too cold substances or the requirement to make things too fast or too slow.
- Economy improvement. Sometimes and some kinds of automation implies improves in economy of enterprises, society or most of humankind. For example, when an enterprise that has invested in automation technology recovers its investment; when a state or country increases its income due to automation like Germany or Japan in the 20th Century or when the humankind can use the internet which in turn use satellites and other automated engines.
DISADVANTAGES

The main disadvantages of automation are:

- Technology limits. Current technology is unable to automate all the desired tasks.
- Unpredictable development costs. The research and development cost of automating a process is difficult to predict accurately beforehand. Since this cost can have a large impact on profitability, it's possible to finish automating a process only to discover that there's no economic advantage in doing so.
- Initial costs are relatively high. The automation of a new product required a huge initial investment in comparison with the unit cost of the product, although the cost of automation is spread in many product batches. The automation of a plant required a great initial investment too, although this cost is spread in the products to be produced.
Controversial factors

- **Unemployment.** It is commonly thought that automation implies unemployment because the work of a human being is replaced in part or completely by a machine. Nevertheless, the unemployment is caused by the economical politics of the administration like dismissing the workers instead of changing their tasks. Since the general economical policies of most of the industrial plants are to dismiss people, nowadays automation implies unemployment. In different scenarios without workers, automation implies more free time instead of unemployment like the case with the automatic washing machine at home. Automation does not imply unemployment when it makes tasks unimaginable without automation such as exploring Mars with the **Sojourner** or when the economy is fully adapted to an automated technology as with the **Telephone switchboard**.

- **Environment.** The costs of automation to the environment are different depending on the technology, product or engine automated. There are automated engines that consume more energy resources from the Earth in comparison with previous engines and those that do the opposite too.