

Safety Environmental Inspection for Foundry Workshop Based on Physical Parameter

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ABSTRACT: In foundry workshop pollution is most common environment found with smoke, low light and dusty area. These environment can be change by introducing various sensor and rectification methods. Air pollution caused by smoke exhaust by burning of materials which cause fly ash in air inturn it reduced purity of air. These parameter can be monitor by smoke sensor which convert smoke content of air into corresponding electrical value. Like that parameter of foundry can be monitored by light sensor, Temperature sensor and dust sensor. These sensor will send electrical signal to microcontroller through electronic circuit which compare the output with threshold voltage.

The Foundry polluted environment can be changed by introducing more automated exhausted fan, increasing light panel depends on the light value and coolant adding to reduced temperature of the working machine. A microcontroller is used to on and off of the exhaust fans depends on smoke level send by smoke sensor will exhaust smoky air to outside the foundry. A strip of light is on and off depend on light in that working area using a LDR which is connected to controller to get light value in terms of resistance. The environment information will be communicated to monitor station by sending sms through GSM module. Overall by using this system we can come over 80 % of air pollution in foundry workshop and to maintain good working environment to suit worker to work more efficient.

KEYWORDS: GSM-Glopal system for Mobile, LDR-Long Distance Relationship.

I. INTRODUCTION

Air pollution by waste smokes, fumes and dust in a foundry has become a problem of vital importance. On our planet about 2 billion tons of metalliferous and non minerals are processed every year. This is accompanied by the liberation of 200-250 million tons of aerosols and up to 250 million tons of sulfur dioxide besides a large amount of other harmful substances that pollute the atmosphere.

Recycling of the waste gas and a sound waste disposable system can ensure a cleaner environment. It includes a characterization of the industry, an overview of the different process types, a description of emissions, and a description of the technology used to control emissions resulting from Foundries.

1.2 SOURCE OF EMISSIONS AND POLLUTANTS FROM VARIOUS WORK AREAS IN A FOUNDRY

In foundries, various processes are used for molding, melting and casting. These are accompanied by liberation of heat, noise, dust, fumes and gases. The details of various emissions and pollutants from various work areas in a foundry are explained as under:

- Pattern shop
- Sand preparation section
- Molding and core making section

- Metal furnaces
- Knockout section
- Fettleing shop
- Heat treatment furnace

Pattern Shop: In pattern shop where wood working machineries are installed a local exhaust system to capture the sawdust and wooden chips should be provided. Normally, a mechanical type of dust collector like cyclone is sufficient to remove the particulates. The swaps, planers and drills may have built up hoods which require only a dust collection.

Sand Preparation: Section The molding and core sands in foundries are prepared in sand mixtures of various designs. The ingredients mixed are also different at different times. Fly ash, dusty materials, micro-fines metallic and non-metallic oxides are the commonly produced pollutants in this section

Molding and Core Making Section: The pollutants generated in the molding and core sections contain mainly dust. However the amount of dust generated is much less as compared to other sections.

Metal Furnaces: The particulate emissions from a cupola furnace may be of three types. They are metallic oxides, silicon oxides and calcium oxides. The actual amount of each constituents depend on the type of material used, the lining quality and its operating conditions. The gaseous emissions from the cupola furnace are composed of carbon dioxide, which is due to incomplete combustion of carbon. Sulphur is introduced in the exhaust gases as sulphur dioxide, because of its presence in coke and metallic charge. sulphur, and cyanides along with process gases. The amount of these gases depends upon the raw material used and the manufacturing process and the exhaust system for gases.

Knockout Section: In steel foundries, knocking out of the castings out of the mould boxes is most detrimental to the health because of the evolution of the harmful vapors, gases and dust containing approximate 68% of particles of size approximately 2 micrometer in diameter and 32% for 2 to 10 micrometer.

Fettleing Shop: Following the knock out the casting usually requires further cleaning depending upon the type and size of casting involved and this may be done by grinding, abrasive blasting, tumbling barrels, chipping, sawing and cutting. Welding operations for repair of casting should be done under controlled conditions.

Heat Treatment Furnace: The main pollutants in gases from heat treatment furnaces are carbon monoxide and sulphur dioxide.

1.3 CONTROLLING METHODS IN FOUNDRIES FOR AIR EMISSION.

There are two primary collection methods for foundry particulates - wet and dry. Wet scrubbers include low- and high-energy types. Dry collection includes bughouses, mechanical collectors, and electrostatic precipitators. In addition, to control emissions of organic compounds, incineration or afterburners may be required. Air toxics merit special consideration, requiring careful selection of the emission control method.

1.4 WET SCRUBBERS

For particulate collection, the mechanisms used in a wet-type collector are inertial impaction and direct interception. These are used either separately or in combination. In studying wet collector performance, independent investigators developed the contact power theory, which states that, for a well-designed wet-scrubber, collection efficiency is a function of the energy consumed in the air-to-water contact process and is independent of the collector design. On this basis, well-designed collectors operating at or near the same pressure drop can be expected to exhibit comparable performance.

1.5 DRY COLLECTORS

The most frequently encountered equipment for the removal of solid particulate matter from an air stream or gas stream is the fabric dust collector or baghouse.

With a mass median size of 0.5 μm , a collection efficiency of 98-99+% can be expected. As the filter medium becomes coated in a fabric collector, the collection efficiency rises. Free moisture and acid dew point are the worst enemies of all fabric collectors the following design information in order to select the proper fabric and the quantity of bags required:

- Gas flow rate
- Temperature and dew point
- Acid dew point
- Particle size and distribution
- Concentration of solids

- Chemical and physical properties of solids

Teflon-coated, woven glass-fiber bags have been used on a large majority of cupola installations because of their high temperature resistance. If fluorspar is used, Named bags, which are acid-resistant, but combustible, are generally installed. The temperature of the gases entering the bughouse then must be reduced to a maximum of 400°F (204°C) corrosion hazard because of the acid dew point problem.

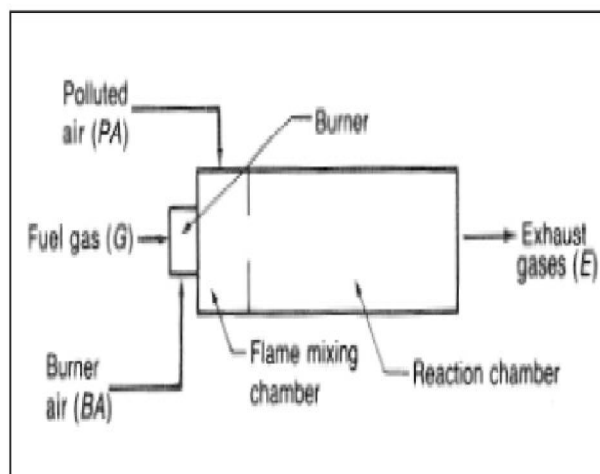


fig 1.1

For reverse-air and mechanical shake collectors, air-to-cloth ratios range from 1.5- 2.5:1. Pulse-jet and cartridge collectors also can be used to collect pollutants from sand systems and casting cleaning operations. significant and cause system failure.

1.6 ADSORPTION

Charcoal adsorption has been used in conjunction with other control devices for VOC control.

➤ FILTER

Filters serve for removing the particulate matter from gas or air streams by retaining it in or on the porous structure through which gas flows. The porous structure is usually a woven fabric. The filter must be continuously or periodically cleaned or replaced. Filters are commonly employed in pattern shops on various wood working machines.

➤ CYCLONES

The cyclone works on the principle of centrifugal separation in which a vortex motion of the particulate matter is created within the collector. This motion provides, they may either deposit the matter in a hopper or concentrate it into a stream of gas that flows to another separator for ultimate collection shown in figure 2

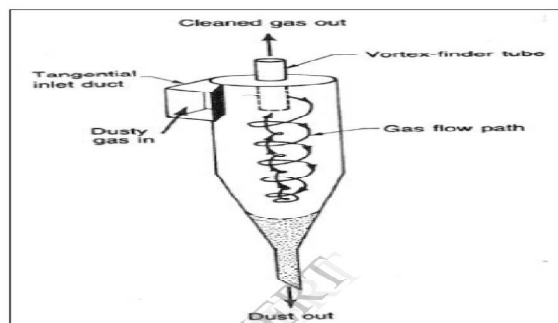


fig 2 cyclones

fig 1.2

1.7 COMBINATION DEVICES

Some devices combine features of the above mentioned equipments, so dust and fumes are controlled most economically and with a minimum pressure drop.

There are cyclones in which liquid is sprayed and scrubbers in which cyclonic actions are used. Packed bed filters and scrubbers are similar to each other the only difference being that the equipment designed to separate particulate matter is called a “FILTER”, and the same when designed to separate gaseous contaminants is called as a “SCRUBBER” . .

1.8 MONITORING OF AIR POLLUTION

In order to monitoring air pollution , sampling of air is done in which representative sample of air is collected and then analyzed to exactly determined the concentration of pollutant to the general body of air . The method used for determining gaseous emissions from a stack or a vent depend on the nature compound and the purpose for making the measurement

1.9 COMPARISION OF AIR EMISSION DATA IN DIFFERENT FOUNDRY

Sr	Source	Pollutant											
		SPM($\mu\text{g}/\text{m}^3$)			NO ₂ ($\mu\text{g}/\text{m}^3$)			SO ₂ ($\mu\text{g}/\text{m}^3$)			CO($\mu\text{g}/\text{m}^3$)		
		F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3
1	Furnace operation	1829.9	1000	600	171.4	1100	800	42.5	35	22	5.87	3.25	1.5
2	Preparation of cores and moulds	3919.4	2012		95.2	70	55	489.5	225	200	2.38	1.02	2.0
3	Casting	1012	800	300	722	450	300	402	250	200	4.03	2.3	1.3
4	Shakout and reclamation	700	450	200	430	300	250	320	200	150	2.12	2	1.6

Table 1.1

1.10 COMPARISION BETWEEN DIFFERENT COLLECTING DEVICES SR NO

SR NO	Point of comparison	Cyclone seperator	Filters	ESP	VENTURI SCRUBBER
1.	Capital cost	Low	High	Very high	moderate
2.	Running cost	Low	High	Very high	moderate
3.	Power consumption	Moderate	moderate	Very high	high
4.	Particulate	$\geq 6.5 \mu\text{m}$	$\approx 0.1 \mu\text{m}$	$\approx 0.001 \mu\text{m}$	$> 2 \mu\text{m}$
5.	Characteristics of particulate matter contaminants	Coarse dust (solid)	Fine particulates (solid+liquid)	Very fine gaseous particulates contaminants	

Table 1.2

1.11 ACTOR INFLUENCING SELECTION OF COLLECTING DEVICE

1. size, shape and density of particulate matters to be collected.
2. Dust load of the flue gas (dust load is expressed in g/m³)
3. Efficiency of the collecting device.

- Flow characteristics of the flue gas(gas flow rates and its fluctuation).

1.12 PROBLEM IDENTIFICATION

- The waste released by the metal casting industry in the process of producing the products and the effect of these waste to the atmosphere. The best source of comparative pollutant release information is the Toxic Release Inventory (TRI). Pursuant to the Emergency Planning and Community Right-to-Know Act, TRI includes self-reported facility release and transfer data for over 600 toxic chemicals.

1.13 PROPOSED DESIGN

In proposed system , the inside of the Foundry area always monitored various sensor like that pollution and Lighting effect and ventilation . If it is exceed the prescribed limit the sysetm the safety system will be work automatically.

II. POWER SUPPLY

The power supply most important for electronic circuits, which is provide the required power to microcontroller and other electronics devices.

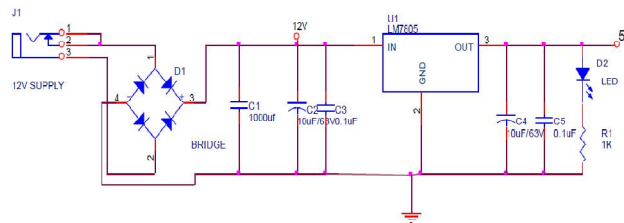


Fig 2.1

2.2 LCD DISPLAY

Liquid crystal cell displays (LCDs) are used in similar applications where LEDs are used. These applications are display of numeric and alphanumeric characters in dot matrix and segment displays.

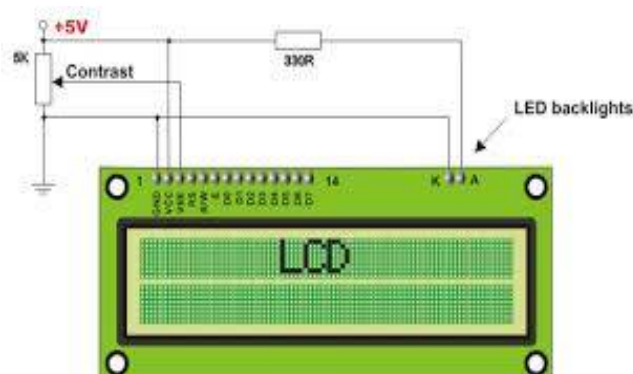


Fig 2.2

2.3 ALARM:

A **buzzer** or **beeper** is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows.

It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and Initially this device was based on an electromechanical system

which was identical to an electric bell without the metal gong (which makes the ringing noise).

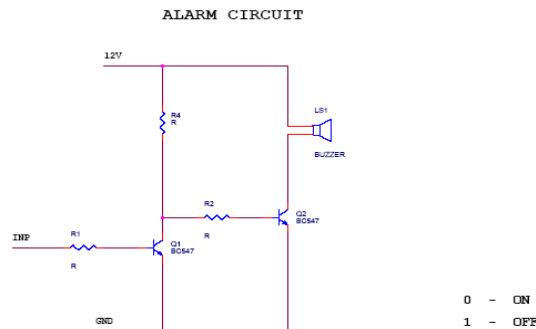


Fig 2.3

2.4 HUMIDITY SENSOR

Humidity is a term for the amount of water vapor in the air, and can refer to any one of several measurements of humidity. Formally, humid air is not "moist air" but a mixture of water vapor and other constituents of air, and humidity is defined in terms of the water content of this mixture, called the Absolute humidity;

LIGHT DEPENDENT RESISTOR

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1,000,000 ohms, but when they are illuminated with light, the resistance drops dramatically. Thus in this project, LDR plays an important role in controlling the electrical appliances based on the intensity of light.

Fire sensor:

The sensor is used to detect any trace of fire and it will give interrupt signal as soon as it detects Fire in underground regions. The sensor works on the principle of IR rays or Heat radiation detection.

Temperature Sensor (LM35):

In the proposed system we use LM35 which is a precision IC temperature sensor with an output voltage linearly proportional to Centigrade temperature.

Features

- Resolution 8bits
- Input Range is 0v to vcc
- Conversion time is 100microseconds
- Operates ratio metrically, the input which is converted to digital form can be selected by using three address lines.

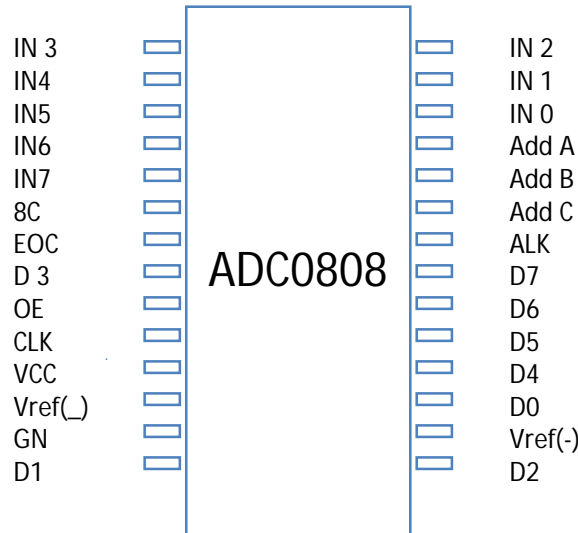
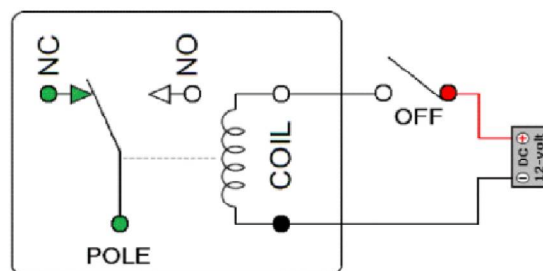


Fig 2.4 Analog todigitalconveter.

2.5 NEW APPROACHES:

Neither of these approaches proved to be the long-term solution as cellular technology needed to be more efficient. With the experience gained from the NMT system, showing that it was possible to develop a system across national boundaries, and with the political situation in Europe lending itself to international cooperation it was decided to develop a new Pan-European System. Furthermore it was realized that economies of scale would bring significant benefits. This was the beginnings of the GSM system. To achieve the basic definition of a new system a meeting was held in 1982 under the auspices of the Conference of European Posts and Telegraphs (CEPT). They formed a study group called the Group Special Mobile (GSM) to study and develop a pan-European public land mobile system. the use of digital circuitry would allow for higher levels of integration in the circuitry. This in turn would result in cheaper handsets with more features. Nevertheless significant hurdles still needed to be overcome. For example, many of the methods for encoding the speech within a sufficiently narrow bandwidth needed to be developed, and this posed a significant risk to the project. Nevertheless the GSM system had been started.



RELAY:

A Relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts, the coil current can be on or off so relays have two switch positions and most have double throw (changeover) switch contacts.

III. EXPERIMENTAL DESIGN

KEIL SOFTWARE DESCRIPTION

Keil Software is the leading vendor for 8/16-bit development tools (ranked at first position in the 2004 Embedded Market Study of the Embedded Systems and EE Times magazine). Keil Software is represented world-wide in more than 40 countries. Since the market introduction in 1988, the Keil C51 Compiler is the de facto industry standard and supports more than 500 current 8051 device variants. Now, Keil Software offers development tools for ARM. Keil Software makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, and evaluation boards for the 8051, 251, ARM, and XC16x/C16x/ST10 microcontroller families.

- An integrated Software Logic Analyzer that measures I/O signals as well as program variables and helps developers create complex signal processing algorithms.
- An Execution Profiler that measures time spent in each function, source line, and assembler instruction. Now developers can find exactly where programs spend the most time.

"Using nothing more than the provided simulation support and debug scripts, developers can create a high-fidelity simulation of their actual target hardware and environment. No extra hardware or test equipment is required.

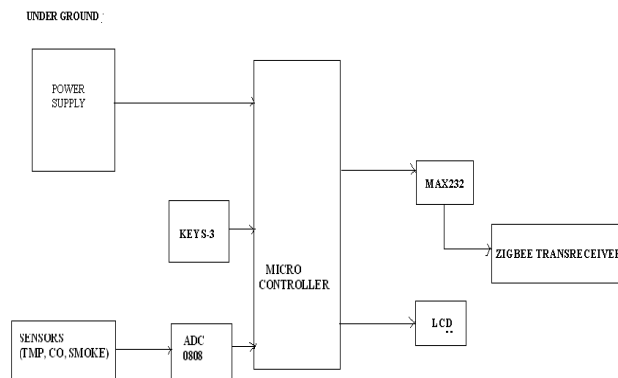


Fig 2.5

3.1 CO SENSOR



Fig 3.1

Carbon monoxide (CO) is an invisible intruder that threatens lives in nearly every home and sends 20,000 people to the ER with CO poisoning each year. Our hardwired CO detectors with RealTest use electrochemical sensors to measure carbon monoxide levels and alert residents with a flashing Temp-4 signal alarm—but that’s not all. System-connected carbon monoxide detectors offer guaranteed 24/7 central station protection, whether residents are home or not. Monitored CO detection is ideal for any home and provides additional peace of mind in situations when children, the elderly, or pets are at risk.

ovens to ranges, a fire-burning fireplace, or a car left running in a closed garage.

3.2 TEMPERATURE SENSOR

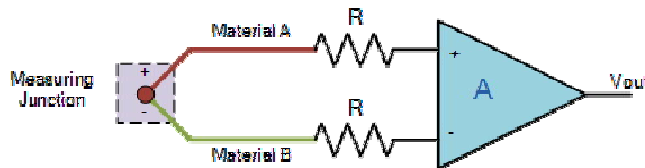
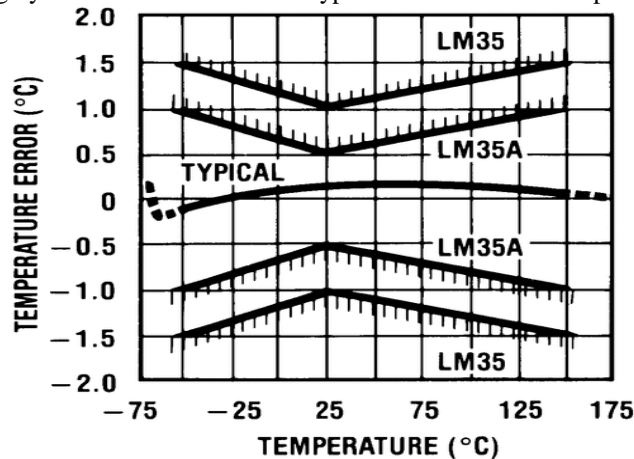


Fig 3.2

These types of temperature sensor vary from simple ON/OFF thermostatic devices which control a domestic hot water heating system to highly sensitive semiconductor types that can control complex process control furnace



plants.

IV. REVIEW OF WORK DONE

The following proposed work has been completed as project. Objective (selection)

- Collection of information
- Study the method and propose a procedure to use the method.
- Sensor and Hardware selection
- Microcontroller programming designing

V. CONCLUSION

This project found to used in the Foundry Workshop in order to avoid pollution in the foundry workshop. Various sensor are used to find the parameter which is related to environment pollution like smoke , light , temperature and dust. Thus various relative measures taken to avoid the pollution in the foundry workshop by switch On the Exhaust fan in order avoid smoke. Likewise various parameter are monitor and relative measures taken to control pollution in foundry workshop

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