



INTEGRAL MANAGEMENT OF HEALTH, SAFETY AND ENVIRONMENT IN INDUSTRIES

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Abstract—Today we all are having concern about our health, safety, and workplace environmental issues. Occupational health and safety is also a management tool that defines the responsibility of an organization which affects the profitability of an industry. This results to adopt a self-regulation mechanism for Health, Safety, and Environment management as in industries, especially in petroleum and gas companies. This happens by continuous monitoring and analyzing the control risk factors and take the control measures at the right time. Thus we can have control over these three (Health, Safety, and Environment) parameters as a single unit. A safe workplace enhances the safety culture of an organization. This paper deals with the efficient development of an HSE system involving the identification of the conditions which cause accidents and losses before happening and its control measures. **Index Terms**— Safety management system, automatic control, single integral unit, compact, cost effective, flexibility.

I. INTRODUCTION

Nowadays in this competitive world, all firms are focused on achieving their goals such as profitability, cost-effective mechanisms, and efficiency along with providing a great deal to reducing the severity of work-related illness and injuries.

Studies show that millions of people died in a year due to work-related injuries. It may directly cause production stoppage, loss of working days, delay in delivery, loss of a

skilled person, etc[2]. This is not only for the organization, the families of employees are getting affected. These issues may be controlled by procuring effective control measures. A healthy workplace needs a disease-free and pollution-free environment.

As the name, HSE implies the three areas 'health', 'safety', and 'environment' integrated into a single system. Several organizations have their own safety policies, but integrating Health, Safety, and Environment management into a unified system fulfills an organization's whole safety management system and thus improves HSE performance.

The developed system will help the industries for improving the safety system and safety practices. Also, it helps to enhance the organization's compliances and employee morale with a good image towards investors, customers as well as public. This system is mainly useful in industries like commercial airlines nuclear facilities[1].

II. PROBLEM ANALYSIS

Unlike the prevailing safety management systems, we offer a unified model here integrated with health, safety, and environment as a single unit. This is the main feature of this system. The effective safety mechanism can be achieved in this system by continuous monitoring of sensors, analyzing the sensor data, and timely action according to the analysis. In the safety part, we are checking the voltage fluctuations in the three-phase supply. If there is any voltage fluctuation found, our system indicates this. For environmental safety and considering health management our proposed

system checks whether the CO₂ level in the atmosphere moisture falls beyond a particular limit, it gives an indication as well as turns off the machines. Thus we can reduce the effect of execution of a high-risk project related to health and safety.

The HSE management system can be applied in both local and international authorities and firms

III. OBJECTIVE

The main objective of this paper is to present an environment management system that integrates Health, Safety, and Environment management as a single unit in industries. Thus we can have a look at all the possible chances of accidents and hazards for preventing loss of life, material, machinery, and permanent disability of employees. From the design of our system, it is clearly visible that how much importance is given to man and material safety.

IV. SCOPE OF WORK

For the minimization of commercial hazards, industrial safety is required. Because all the workers desire to figure in an exceedingly safe and guarded atmosphere. Health and safety is that the key factor for all the industries to market the wellness of both employees and employers[2]. There are separate modules for health, safety, and environment management within the available markets. But incorporating these three factors gives the most important advantage for industries. Because the integration causes its cost to extend a touch high as around 1.5 lakhs, except for the larger industries, by considering the safety of costly and big machines, investing in the current system is way profitable. Employees should be shielded from potential accidents arising from machines and equipment that worked with. Also, our system doesn't require manual processing to manage safety measures.

V. ARCHITECTURE

The sensors sense the signal and are fed to the microcontroller ATMEGA 8A. The Microcontroller is that the brain of the HSE management system where the program is written and sensors are connected as input and actuators as output.

The body of the system has many components such as sensors, microcontrollers and actuators, and other components. The CO₂ sensor helps to measure the CO₂ level in the moisture and is fed to the microcontroller. With the help of programming, if the CO₂ level falls beyond the pre-determined value the system gives an indication as well as automatically machines will turn off. Also, we can monitor the voltage fluctuations in the three-phase supply, if any abnormalities are found it will also give the indication. The three-phase voltage fluctuation can be measured with the help of transformers connected to the system model and step down the voltage and measure whether it is having any fluctuations. In addition to these features, a manual emergency switch is also connected to the system. If any malfunctioning occurs manually we can disconnect the system.

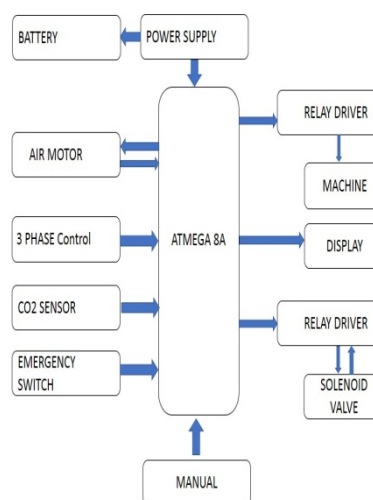


Fig: system architecture

SENSORS:-

A sensor might be a tool that detects the change within the environment and responds to some output on the opposite system. A sensor converts a phenomenon into a measurable analog voltage (or sometimes a digital signal) converted into a human-readable display or transmitted for reading or further processing. A greenhouse emission sensor or CO₂ sensor is an instrument for the measurement of CO₂ gas. The foremost common principles for CO₂ sensors are infrared gas sensors (NDIR) and chemical gas sensors.



Fig : CO2 sensor
AIR MOTOR :-

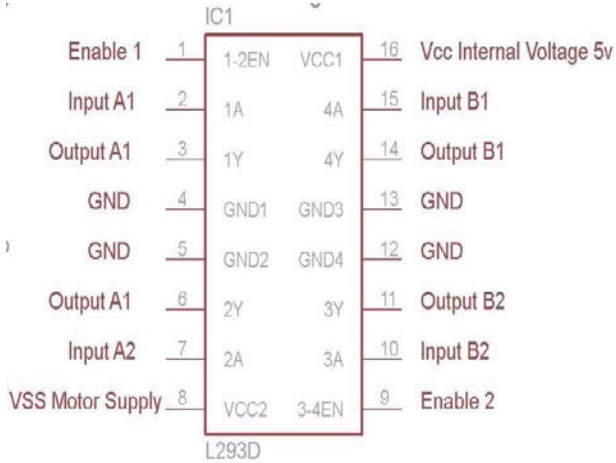


Fig : L293D pin configuration

A pneumatic motor (also called air motor), or compressed air engine, is a type of motor which does mechanical work by expanding compressed air. These motors are generally used to convert compressed air energy to mechanical work through either linear or rotary motion.

RELAY DRIVER:-

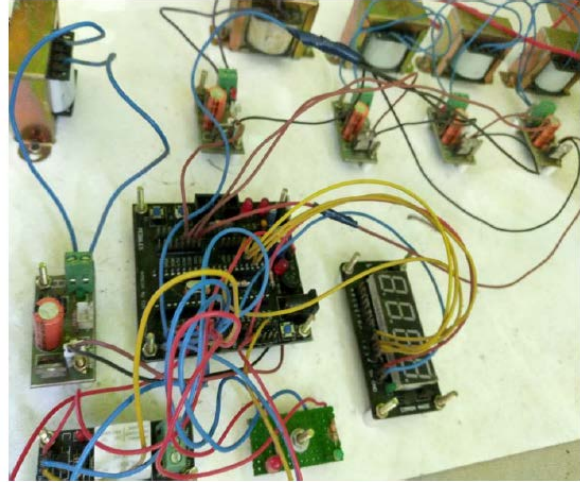
A relay, as we all know is a mechanical device that is employed within the variety of a switch. It's a sort of mechanical Switch which is pulled by an electro-magnet so its resistance is extremely low and thus it can control large power appliances. An electronic circuit will normally need a relay stage to converter its low power DC switching output into a high power mains AC switching output.

SOLENOID VALVE :-s

A solenoid valve is an electromechanically-operated valve. Solenoid valves differ within the characteristics of the electrical current they use, the strength of the sector of force they generate, the mechanism they use to manage the fluid, and so the sort and characteristics of fluid they control. The mechanism varies from

linear action, plunger-type actuators to pivoted-armature actuators and rocker actuators. Solenoid valves are the foremost frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids.

HARDWARE IMPLEMENTATION



VI. RELATED WORKS

The developed safety system is to confirm the safe operation of the equipment, within designed parameters like CO2, voltage fluctuation, etc. And hence preventing fire, explosion, voltage variation, or criticality which can cause loss of fabric and property. This is often achieved by a built-in safety management system incorporated within the design to make sure that operating parameters aren't exceeded beyond safety limits. Action like switching off the power supply, showing indicators should be described.

In this paper, the main focus is to make and program a security management system suitable for industries that contain health, safety, and environmental aspects during a single unit. Thus automatic control mechanism may be achieved by taking off the power supply to the machines when a condition occurs and indicators also placed.

Microcontroller is employed which is supplied with the clock signal (quartz crystal operating at 16 MHz frequency). For Power Supply two separate batteries are used.

VII. CONCLUSION

This developed system discussed multiple industry health, safety, and environment management including safety culture, hazard identification, safety indicators, safety data

collection, analysis and sharing, and emerging technologies that can be embedded in safety management, training, and design. This system plays a major role in preventing irreversible accidents. Our proposed system helps to improve the industry's safety laws and regulations, design for safety, safety activity analysis, safety and productivity, heavy equipment management.

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