

Research on Environmental Protection Testing Device for Harmful Gases such as Dust and Formaldehyde in Power Plants

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Abstract. Nowadays, rationalization of resources, environmental, the healthy way of production and life have been gradually taken seriously. With the rapid development of the economy, air pollution caused by harmful particles and gases such as dust, exhaust gas and formaldehyde is becoming more and more serious. Higher requirements for monitoring and treatment of pollution sources are put forward. This paper studies an environmental protection circuit device combined with high-precision dust exhaust and formaldehyde detection sensor in one. The volume is very small, the hardware resource occupancy rate is very low, and the anti-interference ability is strong. No matter from anti-interference, speed, online programmable characteristics, or from the perspective of operational reliability, it can achieve the desired results.

Introduction

With the continuous attention of the world to environmental protection, ecological environment, people's health and other problems, the increasingly serious problems of environmental dust, industrial waste gas and decoration pollution have been paid more and more attention, and higher requirements for the detection and management of pollution sources are also put forward. This article combines the electronic and control professional knowledge to build an extensible application that can realize the circuit device of dust, industrial waste gas, formaldehyde and other harmful gas detection functions. It has strong practicability and space. After the application of the circuit system and the expansion of some functions, it can form the finished product of the small device. The circuit structure is reduced and the application scope is wide. It can not only be applied to the field of basic industry, but also can be applied to the field of daily life. It has certain practical value and promotion prospect. [1]

Research Significance of Dust and Formaldehyde Detection Technology

As we all know, excessive emissions and industrial dust will not only make the air become cloudy, but also block the sunlight and reduce the amount of solar radiation. According to the observation, in the days of the smog of the larger industrial cities, the light of the sun radiation directly to the ground is nearly forty percent less than the day without smoke. And industrial dust, waste gas pollution of the city, repeated every day, more will lead to people and animals and plants because they can not get enough sunlight and physical development, and is very easy to suffer from pneumoconiosis, respiratory inflammation, cough, arrhythmia and other diseases. The main types of dust and industrial waste gas, such as the organic solvent dust produced by the mill, the bagasse dust, the paper dust, the talc dust, the starch dust, the spray starch dust, the aluminum sulfate dust, and so on. Coal dust, silica dust and cinder dust are mainly produced during the production of coal and coal transportation systems in the power industry. The cement plant mainly produces limestone dust, sandstone dust, clay dust, gypsum dust, cement dust and so on in the links of material crushing, grinding, calcination, storage and transportation, as well as the MAP dust produced by the workers

beside the automatic packing machine in the packing process when they are sacks and seams. Formaldehyde and benzene in household decoration are also very harmful to the human body[2]. The good monitoring and control of industrial dust, waste gas and formaldehyde can provide reliable security for the development of every industry, industry and even in our daily life. The timely and accurate supervision and management of pollution sources will have a great impact on the development of environmental protection work.

Research Background of Dust and Formaldehyde Detection Technology

All kinds of dust and harmful gases represent a variety of dangerous situations. Because of the lack of color and odor, some toxic gases often cause people to be at extremely dangerous concentrations.

Detecting the concentration of dust, benzene, formaldehyde, toxic gas and sulfur dioxide in industrial emissions has a positive effect on environmental protection. Most of them are strongly irritating, colorless, easy to breathe into body fluids and other viscous liquids that are more soluble in human body. Long term effects of toxic gases can lead to many diseases. Therefore, accurate monitoring and monitoring is of great significance.

In most cases, only the gas that enters the testing equipment will be detected, so it is more important to use the front digital electronic technology to place as many sampling points as possible to increase the comprehensiveness of the test results.

Detection is the most effective and economical means for safety monitoring in many factories, mines and living environments, and is of great significance for the safe operation of production. With the development and application of digital sensor technology, it will provide reliable safety guarantee for the development of various industries and life fields.

Introduction of Environmental Testing Device System

Sensor selection. High precision dust and exhaust gas sensors are selected. It has many advantages . such as small volume, low occupancy rate of hardware resources, strong anti-interference ability and strong additional functions. Electrode type electrochemical sensors were selected, including working electrodes and active auxiliary electrodes. The signal emitted by the auxiliary electrode is used for temperature compensation, and the selectivity of the whole sensor can be enhanced. The response value of the sensor is directly proportional to the formaldehyde concentration in the air. To determine the concentration of toxic gases such as formaldehyde. Combined with pattern recognition technology and microprocessor technology, the selectivity and accuracy of gas detection devices are improved [2].

Based on the above advantages, a new method of detecting the basic control system is realized by combining the effective sensor with the core control chip of the online programmable function. It can achieve the ideal effect from the anti-jamming, running speed, online programmable characteristics, or from the angle of operation reliability.

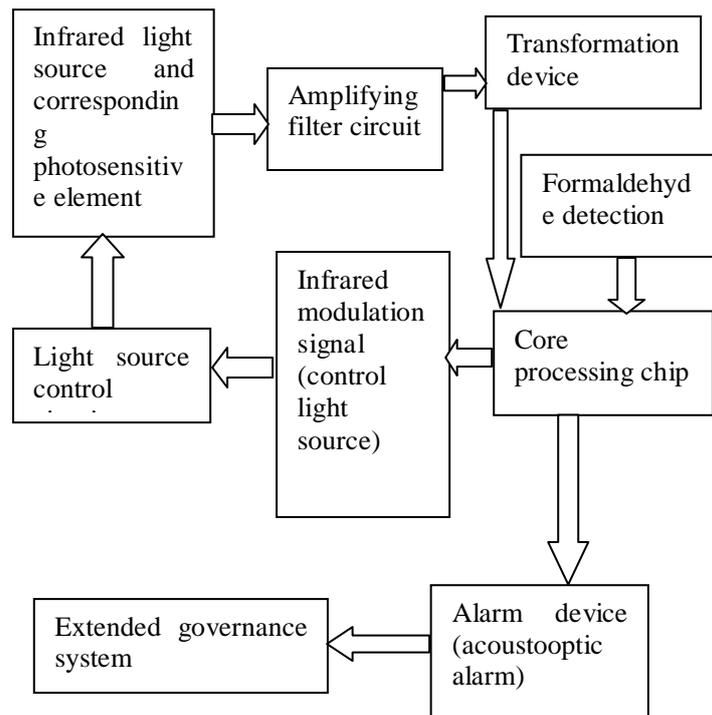


Figure 1 the components of each function circuit

Hardware circuit design: The circuit converts the type of gas to be detected and its concentration related information into electrical signals. According to the strength of these electrical signals, information about the presence of gases in the environment can be obtained. It can detect, monitor and alarm. It can also form an automatic detection, control and alarm system through interface circuit and computer.

The core chip is intended to adopt the EP2C chip of Altera company, which is exposed in class. The two aspects of the chip development environment and sensor gas detection are studied to realize the accurate detection of toxic gases such as toxic gases.

Design of preamplifier circuit

The electrical signal generated by the sensor is extremely weak, and we expect to use the precise amplification circuit with low offset and low drift to amplify the signal. In the design, the temperature sensor is also used to compensate the toxic gas concentration [3].

Design of A/D conversion module: Electrochemical sensors collect weak electrical signals and amplify them through amplifying circuits. It is transferred to the A/D acquisition and conversion module and converted to the desired digital signal. Then stored in the result register for filtering data processing, and then compared with the original data, the concentration of toxic gas is obtained.

Design of alarm and display circuit: At the same time, the concentration of the display module is displayed in real time. When the toxic gas concentration exceeds the set alarm threshold, the alarm circuit is alarms.

Software circuit design: The software design first defines the functions to be realized by each module, and then completes the functions of each module by programming one by one. Finally, the functional programs of each module are connected together [4].

Writing system software HDL language. The program mainly implements real-time data acquisition, digital signal processing, storage, display and test results analysis. In software design, modular structure is the main consideration. The program is divided into many small modules. After debugging each small module program, it will be adjusted again. The purpose is to reduce debugging time, facilitate program modification, inspection and subsequent online modification and upgrading.

Conclusion

The research of the device adopts advanced digital electronic technology to place as many sampling points as possible and increase the comprehensiveness of the test results. The detection of toxic gases such as dust gas and formaldehyde based on digital technology is the most effective and economical means for the safety monitoring of multi industrial enterprises, which is of great significance to the safe operation of production and the improvement of the living environment. With the development and application of digital sensor technology, it is sure to provide reliable security for the development of industry and industry and even the people's life. At the same time, it helps to improve environmental pollution and is very environmentally friendly.

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