

The Design and Research of the Operation Status Detector for Marine Engine Room Power Plant Based on Noise

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Abstract. Designed in this paper, based on the noise of ship engine room power plant running status of detector, is mainly used in the operation of the power plant of acoustic shell size to determine when the machine running state, this device is composed of signal disposal and alarm display adjustment part of two parts. Detector that can show the size of the voice, if exceed the set limit alarm value, the detector can sound an alarm, to remind staff equipment fails, it shall timely inspection maintenance, improve the safety of the operation of the ship.

1 Introduction

In the most important part of the detector is the part of signal conditioning, signal conditioning circuit module at present widely used in industrial control, instrumentation, etc of sensor signal detection and processing applications. It is A sensor and A/D converter device such as A follow-up of the interface. It is the sensor output very weak and low level signal is amplified by A variety of noise interference, processing, noise elimination and unified format, making it suitable for A/D converter device such as A subsequent request signal. For different object to be tested and used by many different kinds of sensors, the signal conditioning circuit is put forward different requirements. The follow-up device such as A/D converter combining with technical indicators to design A good performance of signal conditioning circuit has become the key content of system design. With noise sensor as an example, this paper discusses the design method of the corresponding signal conditioning circuit. [1]

Strong interference resistance, noise in a device measuring the noise decibels are vulnerable to the surrounding noise sound, this would require the receiver noise has voice recognition function, but it is not so, according to the design is too complicated, actually this problem with a low resolution microphone microphones can solve, economical and practical to do so.

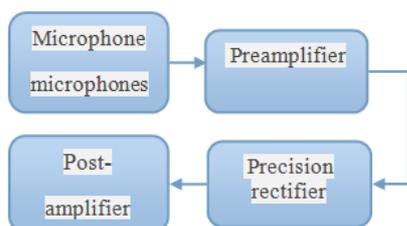


Figure 1. The principle diagram of the device

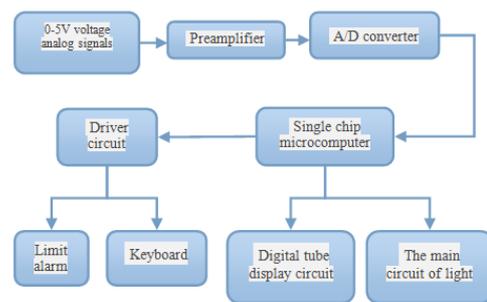


Figure 2. The principle diagram of the alarm display control part

2 The basic working principle

Introduction of the principle:

Noise in front of the microphone microphones will environment into a faint millivolt level analog voltage signals, the voltage signal through the front part stage amplifier amplification, enlarged by precision rectifier circuit, the AC voltage signal is converted into DC signal, the signal again after the amplifier section, zoom into 0 to 5V analog voltage signal, and then sending the signal to alarm display part adjustment. Can display the alarm display section size, if more than upper limit alarm value can sound an alarm, to remind staff equipment failure, should be timely check the maintenance, the range and the zero point can be adjusted through the potentiometer.[2]

3 Unit analysis

3.1 Signal conditioning part

This part by stage amplifier, precision rectifier part before and after the amplifier components. Detector receiver

through the SCM displayed on the digital tube display, which shows the size of the displayed the voice of the environment, that part of the range and alarm value can be set through key artificially, depending on the equipment we can by setting the corresponding value to monitoring equipment, when sound is more than the alarm value set, will sound an alarm, to remind staff, equipment failure, should be lifted. [5]

That part of the physical diagram as shown in Fig. 6 and Fig. 7.

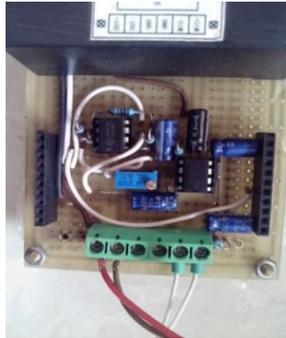


Figure 6. Former stage amplifier and Accurate rectifier physical diagram



Figure 7. After stage amplifier physical diagram

5 Experimental data

In the experiments, the collected Marine auxiliaries a audio noise, the parameters for quantitative figures for 6000Hz, 16 (resolution), or long for 5s (about thirty thousand sampling points), it is the time domain waveform (see Fig. 8 time domain noise figure), obviously can not see the signal from the relevant characteristics or parameters. In view of the signal processing is shown in Fig. 8, get the waveform Fig. 9 after signal processing, including the original signal in black, a red signal after conditioning, obviously, it can be seen from the figure that the cycle of the original signal characteristics are not obvious, but after the signal has the obvious cyclical and smoothness.

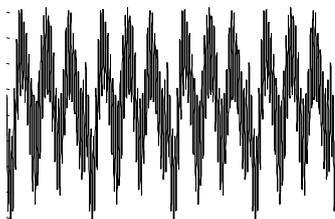


Figure 8. Time domain noise figure

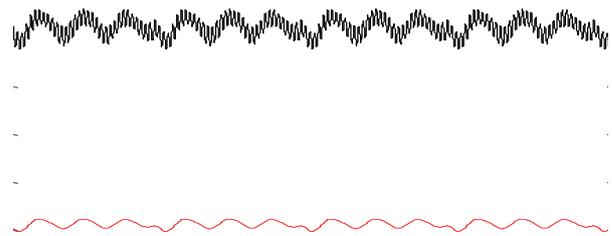


Figure 9. After the signal processing of waveform figure

In the above the noise of the cases, the noise of the detector set in the range of 0-120dB to get the following results: does not appear within the range set alarm, as shown in figure, the noise detector to 50, numerical display normally, does not appear alarm, when numerical more than set range, for example in number 150, detector alarm, remind engineer equipment that there might be a failure, should be handled in a timely manner.

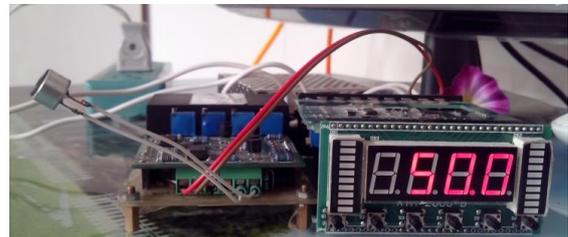


Figure 10. Normal condition



Figure 11. Alarm condition

6 Conclusion

Noise analysis is presented in this paper, on the basis of ship engine room are discussed in detail the design of the utility equipment running status detector circuit, points out the structure and the parts of the circuit components selection, gives the experiment result after testing. Experiment showed that this detector has stable performance, high reliability, strong flexibility and programmable advantages, can set the range of detector and alarm of the upper and lower limits, and abnormal sound when equipment failure, and sound an alarm, to remind staff to repair in time, ensure the safe operation of the equipment, and improve the safety of the operation of the ship.

Mechanical equipment fault diagnosis technology based on the noise signal processing, relative to other diagnostic techniques have signal collection and more convenient, to adapt to a wider frequency range, more suitable for online monitoring, etc, the key lies in how to extract the characteristics of the signal, the more obvious of periodic signal, the signal conditioning unit for the signal to noise amplification, rectifier, filter and post-processing, such as: some components of the signal

attenuation or inhibit, weak signal extraction, etc. This analysis is accomplished through regulating part processing work. In practice, if with other analysis tools, such as Fourier transform, combining can also further speed up the troubleshooting, improve the analysis accuracy. [6]

References

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