

Research on Centralized Monitoring System of LiMnO₂ Button Cells Automatic Assembly Line

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Abstract. According to the production site, a three-level network monitoring system ,which is consist a host computer, the master and slave nodes ,is built to transmit the data from 10 automatic assembly ,to achieve field data collection, to control the site and on-site operation simulation. The monitoring software is developed based on configuration software and with the help of Access database to realize the storage and monitoring of certain function, such as real-time operation of production line, alarm condition, alarm record, maintenance and production of production line. The historical production information and fault information can also be queried according to the database. Finally, with the Web publishing technology, the production site data can be published to the Internet to achieve remote monitoring.

Introduction

With the development of industry and the improvement of people's living standard, LiMnO₂ button cells are more widely used. There are many factories in this cell production in China , to this end, we developed the automated assembly equipment, many manufacturers use several or dozens of such automated assembly line. In order to facilitate the production and equipment management, better play equipment efficiency, it is necessary to built a number of centralized monitoring and management system.

Introduction of LiMnO₂ button cell automatic assembly production line

LiMnO₂ button cell is covered by the positive and negative shell, lithium sheet separator paper, manganese dioxide-based cathode and an electrolyte composed piece, the battery assembly sequence is: First, cut the ribbon to bring lithium negative shell and squeeze into a round sheet, then cut into the bowl separator paper, inject electrolyte, add positive piece, cover the positive electrode cap, and finally sealed, LiMnO₂ button cell can be formed.

So a cell production line is mainly included by cutting sodium tablets step process ,pressure lithium tablets process , paper cutting process, the electrolyte injection process, plus manganese sheet process, the lid cover several positive step process and the sealing process and other components. According to the production process, the LiMnO₂ button battery automatic assembly production line can be divided into continuous series of six modules, that is cut lithium-chip module, pressure lithium-chip module, paper cutting module, plus manganese-chip module, cover the positive electrode cap module and forming module, production line assembly process is shown in Figure 1.

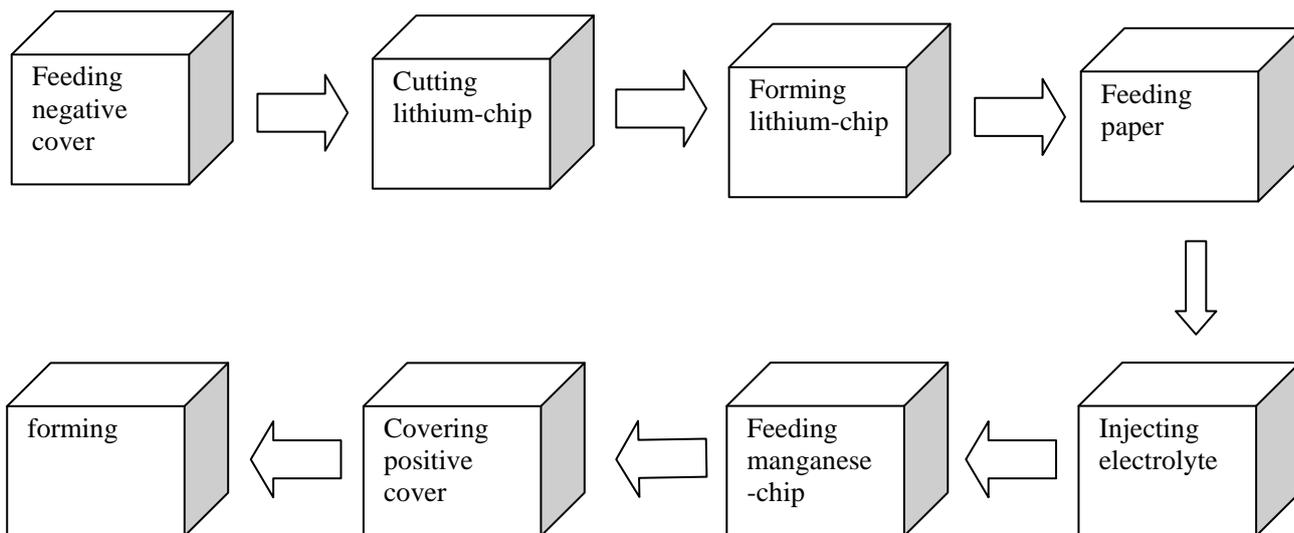


Fig.1. The diagram of the whole production line

Centralized monitoring system based on network

Control system is used in the production line produced by OMRON CJ series PLC, and on-site production line PLC network is built with OMRON's Controller Link network technology.

In this example t,there are 10 automatic assembly line ,which are named line 1, line 2, line 3, line 4, line 5, line 2016, line 1220 , line 9 and line10,etc. According to the needs of the site , two layers of a network ,included Ethernet networks and Controller Link, is built within the PLC of automatically assemble line ,the communication scheme is shown in Figure 2.

The line 1 automatic assembly line PLC in site is set to master, and the remaining nine automatic assembly line are as a slave. The host PC s connected to the main station via Ethernet module and the network cable, building Ethernet network. That master station and slave station , and slave and salve stations is connected by Controller Link communication module, building Controller Link network. Thus a three-layer network monitoring system is formed by a PC ,the master station and slave station. which can be used c for the 10 automatic assembly line data transmission and communication. So the PC will be able to collect data for each production line, grasp site operation and on-site operation simulation.

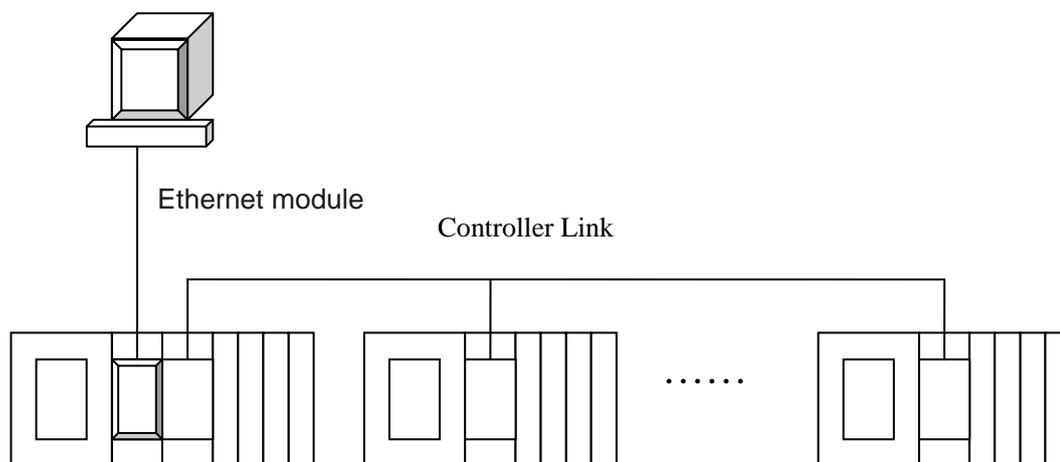


Fig.2. Communication scheme

Development of monitoring system software based on configuration software

In order to get the real time situation and situation over a period of time of the operation on the remote terminal , the monitoring system is required a stable and reliable control system, in addition

to a full humanity, visualization interface system. The development of this monitoring system interface is based on the PC as the hardware support platform, and using the industry configuration software to develop.

The aim of LiMnO₂ button cell production line monitoring system is mainly to achieve the production in real-time operation monitoring, and to achieve production line failures and production line monitoring. After a comparison between the production line to produce failures and production line production, the right operation of a production line over a period of time is assessed, and then use the appropriate measures to improve production efficiency of the cell production line. Its main function is as follows:

(1). Achieving cell production line monitoring of real-time operation.

Monitoring system includes a real-time monitoring function of operation of the production line, so that it will enable the remote monitors to get the operation of the production line, such as whether the line is running, is running at partial or overall operation; whether failure occurs and where; whether in maintenance, repair spent much time after equipment failure; real-time monitoring of production and other production lines.

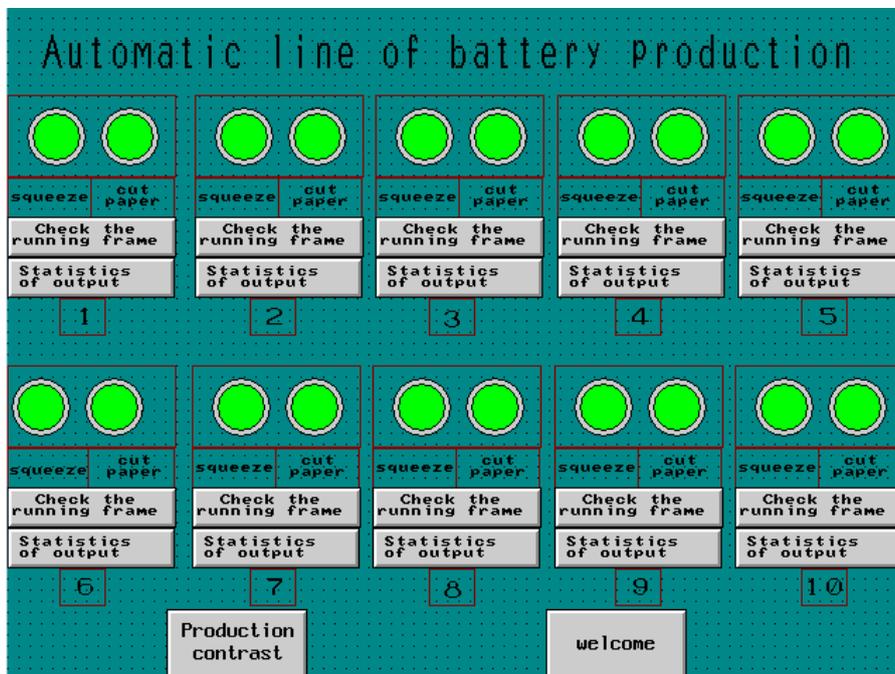


Fig.3. The picture of monitoring system

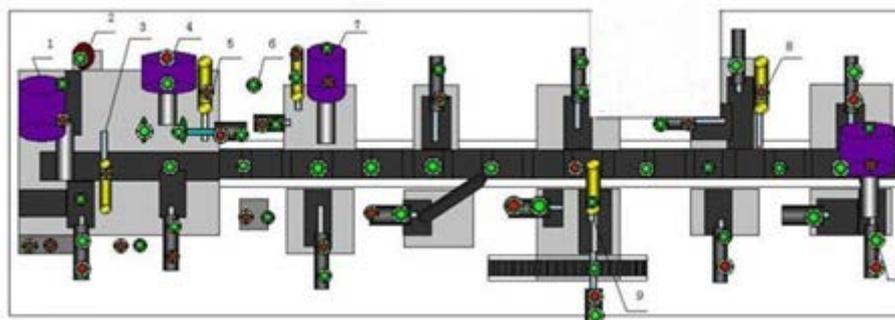


Fig.4. The picture of running simulation

(2)Curve function

Daily/monthly production dynamic curve of each production line; daily downtime curve and curve analysis for each production line.

(3)Reporting capabilities

Alarm and shutdown times and time, yield summary report, etc., output in the form of reports at any time when you need it. Partial screen and function of monitoring system shown in Fig. 3 to 4.

Conclusion

For LiMnO₂ button cell automatic assembly line problems in the course, a centralized monitoring system is developed. This system can provide a convenient, direct help for the production and management; can find problems in management for companies to better improve productivity and improve product quality, can provide a basis of reducing cost, and at the same time ,it can also provide a support of detailed data analysis of the fault lines, improve the performance of the production line. By application in the field for a long time ,the monitoring system has achieved the desired effect .

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