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一、论文标题

HJD Type Crane PLC transformation in control circuit

HJD型克令吊控制电路的PLC改造

二、摘要与关键词

Abstract:

Background. HJD type crane is widely used in domestic ships. Traditional HJD type crane adopts relays and contacts for secondary circuit control. The coils and contacts are easily burned after long-term use, frequently causing accidents.

Aims and approach. The chief aim of the present work is to provide an available way shifting to PLC control and reduce the use of coils and contacts. PLC, namely, programmable logic controller, is a digital computer used for automation and control. PLC supports multiple analogue and digital inputs and outputs arrangements, with extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. PLC used in this paper is Siemens S7-200.

Conclusion. In this paper, The PLC transformation, including basic protection control process, rose and fall process, brake process, low/medium/high-speed process, has been supplied. There are no failures in experiment after long-term usage.

Key words: HJD, PLC, crane, S7-200, simens.

三、提纲

Outline

Thesis Sentence: The PLC transformations and the method of implementation, including basic protection control process, rose and fall process, brake process, low/medium/high-speed process, list below. Details can be found in the article.

I. Basic protection control process is transformed considering overload, overheat, etc.

A. Overload protection includes fan motor and crane motor

1. Fan motor overload protection is achieved by fan thermal relay FR2.
2. Crane motor overload protection is achieved by crane motor thermal relay FR1.

B. Motor windings overheating protection is achieved by motor temperature controller ST.

C. Missing phase of power and circuit break protection are achieved by zero-voltage relay KA1.

D. Emergency forced running is achieved by the contact SB.

II. Rose and fall process is transformed into rose process and fall process.

A. Rose process is achieved by steering control contact Q0.2.

B. Fall process is achieved by steering control contact Q0.3.

C. DC delay time relay is required in reversing at high speed.

III. Brake process is different depending on the conditions of motor.

A. In normal rise or fall state, parking brake coil pulls in,mechanical parking brake operates.

B. In medium/high gear, DC master switch disconnect, low speed winding connects realizing automatic grade braking.

IV. Reconstruction of low/medium/high-speed process lists below.

A. Reconstruction of low-speed process lists below.

1. The crane will run in operational status by releasing rise or fall contact and the braking contact.
2. The shift from low-speed to medium-speed is achieved by energizing medium-speed winding power.

B. Reconstruction of medium-speed process lists below.

1. Medium speed contact is self-locked and interlocked with low/high speed contact.
2. Braking contact and fan contact make sure that the motor will not run at medium speed.

C. Reconstruction of high-speed process lists below.

1. Motor should not run in high speed when heavy loaded.
   a. The detection of load is achieved by load relay.
   b. The protection of overload is achieved by load contacts.
2. The diagrams of wiring and control logic must upload to PLC.

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五、致谢

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