

MULTISTAGE BELT-TYPE TRANSPORTATION

CENTRALIZED CONTROL DEVICE FOR COAL WASHERY

Technical field

This patent relates to a belt-type transportation centralized control device and in particular to a multistage belt-type transportation centralized control device of a coal washery.

Background technology

The main mode of coal transportation in coal washery is belt-type transportation, which has the characteristics of multistage belt-type transportation. According to the requirements of the coal washing process of a coal washery, the starting and stopping modes of the multistage belt-type transportation are as follows: Under normal circumstances, the process flow of the multistage belt-type transportation is "starting in the direction of the counter coal flow, stopping in the direction of the coal flow"; In the event of an accidental shutdown, if any of the equipment fails, the equipment and each equipment are urgently stopped in the direction of the coal, and then stop the rest of the equipment in accordance with "the direction of the coal flow".

When emergency stop, all equipments in the system are urgently stopped. At the same time, relevant equipment such as the unloaders, iron separators, electro-hydraulic flaps, and electric valves need to be monitored.

The existing belt-type transportation monitoring system is mainly for belt-type transportation. For example, the Chinese patent grant No. CN 201506625 U, "An Intelligent Monitoring Device for Mining Belt-type transportation", uses a single-chip microcomputer to complete the monitoring of the temperature, smoke, coal level, tearing, emergency stopping, deviation, tension and speed of the belt-type transportation. China patent grant No. CN 203450771 U, "Transportation protecting and controlling device for coal mines", uses PLC to realize the monitoring such as tearing, sideslips, emergency stop, smoke, temperature, speed, coal level, and watering of the belt-type transportation.

The above-mentioned belt-type transportation monitoring systems, all lacked the

characteristics of the operation process for the coal washery , did not monitoring the multistage belt-type transportation start, stop sequence and fault handling, and at the same time they did not centralize, integrate and unified monitoring the unloaders, iron separators, electro-hydraulic flaps, electric valves and other equipments in the coal washery.

How to realize the centralized monitoring of related equipment and operation process in the coal washing process of coal washery is a problem to be solved urgently in the monitoring of multistage belt-type transportation in coal washery.

Summary of the invention

In order to solve the above problems, the invention patent fully utilizes the characteristics of the PLC and provides a multistage belt-type transportation centralized control device for a coal washery, which realizes the purpose of integration and centralized monitoring of multistage belt transportation and related equipment of a coal washery.

The technical scheme adopted by the multistage belt transportation centralized control device of the coal washery of the invention is:

Multistage belt-type transportation centralized control device for coal washery, comprises a multistage belt-type transportation monitoring device, which is characterized by:

Also comprising that the controller of the centralized control device is PLC, the start and stop buttons of the unloaders of the belt-type transportation at every stage of the centralized control device are connected to the PLC inputs; the coils of the control relays of the unloaders of the centralized control device are connected to the PLC outputs.

The start and stop buttons of the iron separator of the centralized control device are connected to the PLC inputs; the coil of the control relay of the iron separator of the centralized control device is connected to the PLC output.

The start and stop buttons of the electro-hydraulic flap of the centralized control device are connected to the PLC inputs; the coil of the control relay of the electro-hydraulic flap of the centralized control device is connected to the PLC outputs.

The start and stop buttons of the electric valve of the centralized control device are connected to the PLC inputs; the coil of the control relays of the electric valve of the centralized control device is connected to the PLC output.

The band-type brake detection switches of the belt-type transportation at every stage of the centralized control device are connected to the PLC inputs.

The contact feedback detection switches of the main contactors of the belt-type transportation at every stage of the centralized control device are connected to the PLC inputs.

The protection functions for the band-type brake, smoke, coal stacking, skidding, motor temperature, front roller temperature, rear roller temperature, front sideslip, middle sideslip and rear sideslip can be set by the disabling/enabling.

In the stand-alone manual control mode controlled by the console, it can be set by the instantaneous/self-holding selector switch.

In the multistage belt-type transportation monitoring device, the knob selection switch of the field control/console control in the control mode is connected to the PLC input.

The knob selection switch of the manual operation/automatic operation in the console control operation mode is connected to the PLC input.

The field start and field stop buttons of the belt-type transportation at every stage are connected to the PLC inputs.

The console start and console stop buttons of the belt-type transportation at every stage are connected to the PLC inputs.

The coils of control relays for the motor, watering, fault alarm signal output of the belt-type transportation at every stage are connected to the PLC inputs.

The emergency stop and reset buttons are connected to the PLC inputs.

The coil of the control relay that activates the sound and light alarm is connected to the PLC output.

The smoke alarm switches of the belt-type transportation at every stage are connected to the PLC inputs.

The coal stacking alarm switches of the belt-type transportation at every stage are connected to the PLC inputs.

The controller is PLC and a programmable logic controller-PLC is selected as the main control core.

The start and stop buttons of the unloaders of the belt-type transportation at every stage are connected to the PLC inputs; the coils of the control relays of the unloaders of the

belt-type transportation at every stage are connected to the PLC outputs.

Through the start and stop buttons of the unloader on the field control box of the belt-type transportation at every stage, the unloader of the belt-type transportation at every stage are controlled to start or stop and the raw materials of the belt-type transportation at every stage can be removed.

The start and stop buttons of the iron separator of the centralized control device are connected to the PLC inputs; the coil of the control relay of the iron separator of the centralized control device is connected to the PLC output.

Through the start and stop buttons of the iron separator on the field control box of the belt-type transportation, the iron separator of the belt-type transportation is controlled to start or stop, and the iron material in the raw material at every stage can be sucked.

The start and stop buttons of the electro-hydraulic flap of the centralized control device are connected to the PLC inputs; the coil of the control relay of the electro-hydraulic flap of the centralized control device is connected to the PLC outputs.

Through the start and stop buttons of the electro-hydraulic flap on the field control box of the belt-type transportation, the electro-hydraulic flap of the belt-type transportation is controlled to start or stop, raw material delivery on the belt-type transportation can be switched on or off.

The start and stop buttons of the electric valve of the centralized control device are connected to the PLC inputs; the coil of the control relays of the electric valve of the centralized control device is connected to the PLC output.

Through the start and stop buttons of the electric valve on the field control box of the belt-type transportation, the electric valve of the belt-type transportation is controlled to start or stop, the size of the opening of the electric valve on the belt-type transportation can be controlled to control the flow of the raw material.

The band-type brake detection switches of the belt-type transportation at every stage of the centralized control device are connected to the PLC inputs.

A band-type brake detection switch is installed at the brake mechanism of the belt-type transportation at every stage, when the motor of the transportation is started, if the brake mechanism is not released, the band-type brake detection switch at the PLC input is turned on and a band-type brake alarm signal is issued, at the same time the belt stops

automatically.

The contact feedback detection switches of the main contactors of the belt-type transportation at every stage of the centralized control device are connected to the PLC inputs.

The normally closed contacts of the main contactor for controlling every stage motor of the belt-type transportation at every stage are used as the contact feedback detection switches, when the equipment is started, if the main contacts of the main contactor do not disconnect properly, the sticking phenomenon occurs, then the contact feedback detection switch at the PLC input is turned on, and the alarm signal that the main contactor does not suck is issued, and at the same time, the belt operation is automatically stopped.

The protection functions for the band-type brake, smoke, coal stacking, skidding, motor temperature, front roller temperature, rear roller temperature, front sideslip, middle sideslip and rear sideslip can be set by the disabling/enabling.

Through the touch screen or the configuration software on the upper computer, each protection function is set to be put into use, or a certain protection function is temporarily shielded, and the production continues to operate without affecting the security.

In the stand-alone manual control mode controlled by the console, it can be set by the instantaneous/self-holding selector switch.

In the stand-alone manual control operation mode controlled by the console, the manual operation control mode can be set to be instantaneous or self- holding operation mode through the touch screen or configuration software on an upper computer.

In the multistage belt-type transportation monitoring device, the knob selection switch of the field control/console control in the control mode is connected to the PLC input.

There are two kinds of control methods in the multistage belt-type transportation monitoring device, one is the field control and the other is the console control, the choice of two control modes can be determined which control mode to be uses by the knob selection switch.

The knob selection switch of the manual operation/automatic operation in the console control operation mode is connected to the PLC input.

There are two kinds of console control operation modes in the multistage belt-type transportation monitoring device. One is manual operation, and the other is automatic

operation, the choice of two operation modes can be determined through the knob selection switch to determine which operating mode to be used.

The field start and field stop buttons of the belt-type transportation at every stage are connected to the PLC inputs.

In the manual operation mode of the console control in the multistage belt-type transportation monitoring device, the start and stop of the belt-type transportation at every stage is controlled through the start and stop buttons on the console.

The console start and console stop buttons of the belt-type transportation at every stage are connected to the PLC inputs.

In the manual operation mode of the console control in the multistage belt-type transportation monitoring device, the start and stop of the belt-type transportation at every stage is controlled through the start and stop buttons on the console.

The coils of control relays for the motor, watering, fault alarm signal output of the belt-type transportation at every stage are connected to the PLC inputs.

The PLC outputs control the on/off of the coils of the control relays of the motor, watering, and fault alarm signal of the belt-type transportation at every stage, and then the on/off of the motor, the watering of the watering device, and the fault alarm signal output of the belt-type transportation of the control stage, the fault alarm signal includes sound and flash alarm signal.

Through the start and stop buttons of the electric valve on the field control box of the belt-type transportation, the electric valve of the belt-type transportation is controlled to start or stop, the size of the opening of the electric valve on the belt-type transportation can be controlled to control the flow of the raw material.

The emergency stop and reset buttons are connected to the PLC inputs.

When an emergency occurs, press the emergency stop button on the console to emergency stop the various devices of the system. After the emergency stop button is pressed, the start operation of the used equipment is invalid. Only when the reset button is pressed, the start operation of the used device can be resumed.

The coil of the control relay that activates the sound and light alarm is connected to the PLC output.

Press the start button, the coil of the control relay that activates the sound and light

alarm is turned on, and the PLC sends out the sound and light alarm signal to the devices along the line first, if the field does not send the prohibition start signal, the control start signal will be sent after the delay, the equipment completes the reverse coal flow start in order according to the interlocking relationship.

The smoke alarm switches of the belt-type transportation at every stage are connected to the PLC inputs.

A smoke sensor is installed near the drive position of the belt-type transportation at every stage, when the smoke around the smoke sensor exceeds the standard, the smoke alarm switch at the PLC input is turned on, a smoke alarm signal is sent, and the automatic watering device is activated to perform the fire extinction.

The coal stacking alarm switches of the belt-type transportation at every stage are connected to the PLC inputs.

A coal level sensor is installed at the coal discharge point of the belt-type transportation at every stage, when the coal pile is piled, the coal stack alarm at the PLC input is turned on, a coal stack alarm signal is issued, and the belt-type transportation is automatically stopped.

The beneficial effects of the present invention are: a multistage belt-type transportation centralized control device for a coal washery, realize the monitoring of multistage belt-type transportation start and stop sequence and fault handling, meanwhile, the unloader, the iron separators, the electro-hydraulic flap and the electric valve device in the coal washery are centralized and integrated, and are monitored in a unified manner. The centralized control device can also provide protection in a case in which the band-type brake and the contact of the main contactor are not closed. Full considering the characteristics of the multistage belt-type transportation system of the coal washery, it has the comprehensive monitoring and protection functions of the multistage belt-type transportation system of the coal washery, which is fully functional and reliable.

Brief Description of the Drawings

The following further describes the present invention with reference to the accompanying drawings and the embodiment.

FIG. 1 is the PLC wiring drawing of the multistage belt-type transportation centralized control device for coal washery.

FIG. 2 is the wiring drawing of the input/output expansion module of the multistage belt-type transportation centralized control device for coal washery.

FIG. 3 is the wiring drawing of the input expansion module 1 of the multistage belt-type transportation centralized control device for coal washery.

FIG. 4 is the wiring drawing of the input expansion module 2 of the multistage belt-type transportation centralized control device for coal washery.

FIG. 5 is the wiring drawing of the analog/digital conversion expansion module of the multistage belt-type transportation centralized control device for coal washery.

FIG. 6 is the wiring drawing of the Ethernet communication extension module of the multistage belt-type transportation centralized control device for coal washery.

FIG. 7 is the main interface of the touch screen monitoring system of the multistage belt-type transportation centralized control device for coal washery.

FIG. 8 is the main console drawing of the input expansion module 2 of the multistage belt-type transportation centralized control device for coal washery.

Specific implementation methods

This embodiment is a four-stage belt-type transportation. The PLC used is a S7-200CN series CPU226 type PLC manufactured by Siemens, and has two communication ports, which are PORT0 and PORT1, respectively. The communication ports of touch screen 1, touch screen 2, CAN board 1, CAN board 2 and CAN board 3 are connected in parallel, and are connected to the communication port PORT0 of the PLC, and PORT1 is connected to the communication port of the upper computer.

The input/output expansion module is Siemens EM223, 16DC/16REL, the input expansion module 1 is EM221, 16DC, the input expansion module 2 is EM221, 16DC, the analog/digital conversion expansion modules EM231, 4AD, and the Ethernet communication expansion module is EM243-1, the touch screen is a MT4404T 10-inch touch screen produced by Shanghai Kinco Automation Co., Ltd.

The field control/console control knob selection switch in the control method is connected to the PLC input I0.0 and I0.1; the manual operation/automatic operation knob

selection switch of the console control operation mode is connected to the PLC input I0.2, I0.3; the emergency stop button is connected to the PLC input I0.4, the reset button is connected to the PLC input I0.5.

The field start 1 button of the first stage of the belt-type transportation is connected to the PLC input I1.0, the field stop 1 button is connected to the PLC input I1.1, the console start 1 button is connected to the PLC input I1.2, the console stop 1 button is connected to the PLC input I1.3, the contact feedback 1 switch is connected to the PLC input I1.4, the brake 1 switch connects to the PLC input I1.5, the smoke 1 switch is connected to the PLC input I1.7, coal stack 1 switch is connected to the PLC input I2.0, the unloader start 1 button is connected to the PLC input I2.2, the unloader stop 1 button is connected to the PLC input I2.3.

The control voltage of the used intermediate relay is DC 24V. The control relay for starting the sound and light alarm is connected to the PLC output Q0.0, the intermediate relay coil of the motor 1 of the first stage belt-type transportation is connected to the PLC output Q0.1, the intermediate relay coil of the fault 1 is connected to the PLC output Q0.2, the intermediate relay coil of the sprinkler 1 is connected to the PLC output Q0.3, and the intermediate relay coil of the unloader 1 is connected to the PLC output Q0.4.

The intermediate relay coil of the iron separator of the multistage belt-type transportation control device of the coal washery is connected to the PLC output Q0.5, the intermediate relay coil of the electro-hydraulic flap 1 is connected to the PLC output Q0.6, and the intermediate relay coil of the electric valve 1 is connected to the PLC output Q0.7.

The intermediate relay coil of the motor 2 of the second stage belt-type transportation is connected to the PLC output Q1.1, the intermediate relay coil of the fault 2 is connected to the PLC output Q1.2, the intermediate relay coil of the sprinkler 2 is connected to the PLC output Q1.3, and the intermediate relay coil of the unloader 2 is connected to the PLC output Q1.4.

The field start 2 button of the second stage belt-type transportation is connected to connect to the PLC input I3.0, the field stop 2 button is connected to the PLC input I3.1 of the input/output expansion module, the console start 2 button is connected to the PLC input I3.2 of the input/output expansion module, the console stop 2 button is connected to the PLC input I3.3 of the input/output expansion module, the contact feedback 2 switch is

connected to the PLC input I3.4 of the input/output expansion module, the brake 2 switch is connected to the PLC input I3.5 of the input/output expansion module, the smoke 2 switch is connected to the PLC input I3.7 of the input/output expansion module, the coal stack 2 switch is connected to the PLC input I4.0 of the input/output expansion module, the unloader start 2 button is connected to the PLC input I4.2 of the input/output expansion module, the unloader stop 2 button is connected to the PLC input I4.3 of the input/output expansion module.

The intermediate relay coil of the motor 3 of the third stage belt-type transportation is connected to the PLC output Q2.1 of the input/output expansion module, the intermediate relay coil of the fault 3 is connected to the PLC output Q2.2 of the input/output expansion module, the intermediate relay coil of the sprinkler 3 is connected to the PLC output Q2.3 of the input/output expansion module, and the intermediate relay coil of the unloader 3 is connected to the PLC output Q2.4 of the input/output expansion module.

The intermediate relay coil of the motor 4 of the fourth stage belt-type transportation is connected to the PLC output Q3.1 of the input/output expansion module, the intermediate relay coil of the fault 4 is connected to the PLC output Q3.2 of the input/output expansion module, the intermediate relay coil of the sprinkler 4 is connected to the PLC output Q3.3 of the input/output expansion module, and the intermediate relay coil of the unloader 4 is connected to the PLC output Q3.4 of the input/output expansion module.

The field start 3 button of the third stage of the belt-type transportation is connected to connect to the PLC input I5.0 of the input expansion module 1, the field stop 3 button is connected to the PLC input I5.1 of the input expansion module 1, the console start 3 button is connected to the PLC input I5.2 of the input expansion module 1, the console stop 3 button is connected to the PLC input I5.3 of the input expansion module 1, the contact feedback 3 switch is connected to the PLC input I5.4 of the input expansion module 1, the brake 3 switch is connected to the PLC input I5.5 of the input expansion module 1, the smoke 3 switch is connected to the PLC input I5.7 of the input expansion module 1.

The field start 4 button of the fourth stage of the belt-type transportation is connected to the PLC input I6.0 of the input expansion module 1, the field stop 4 button is connected to the PLC input I6.1 of the input expansion module 1, the console start 4 button is connected to the PLC input I6.2 of the input expansion module 1, the console stop 4 button is

connected to the PLC input I6.3 of the input expansion module 1, the contact feedback 4 switch is connected to the PLC input I6.4 of the input expansion module 1, the brake 4 switch connects is connected to the PLC input I6.5 of the input expansion module 1, the smoke 4 switch is connected to the PLC input I6.7 of the input expansion module 1.

The coal stack 3 switch of the third stage of the belt-type transportation is connected to the PLC input I7.0 of the input expansion module 2, the unloader start 3 button is connected to the PLC input I7.2 of the input expansion module 2, the unloader stop 3 button is connected to the PLC input I7.3 of the input expansion module 2.

The coal stack 4 switch of the fourth stage of the belt-type transportation is connected to the PLC input I8.0 of the input expansion module 2, the unloader start 4 button is connected to the PLC input I8.2 of the input expansion module 2, the unloader stop 4 button is connected to the PLC input I8.3 of the input expansion module 2.

The start button of the iron separator of the multistage belt transportation control device of the coal washery is connected to the input I7.4 of the input of the expansion module 2, the stop button of the iron separator is connected to the input I7.5 of the input of the expansion module 2, and the start button of the electro-hydraulic flap is connected to the input I7.6 of the expansion module 2, and the stop button of the electro-hydraulic flap is connected to the input I7.7 of the expansion module 2, the start button of the electric valve is connected to the input I8.4 of the expansion module 2, and the stop button of the electric valve is connected to the input I8.5 of the expansion module 2.

The other communication port PORT1 on the PLC is connected to the RS232 serial port of the upper computer through the RS485 to RS232 module.

The above description is only a specific implementation manner of the present invention, but the protection scope of the present invention is not limited thereto, and any skilled personnel in the field can easily think of the change or replacement within the technical scope disclosed by the present invention. All should be covered by the protection scope of the present invention. Therefore, the protection scope of the present invention should be subject to the protection scope defined by the claims.

Claims

1. Multistage belt-type transportation centralized control device for coal washery, comprises a multistage belt-type transportation monitoring device, which is characterized by:

also comprising that the controller of the centralized control device is PLC, the start and stop buttons of the unloaders of the belt-type transportation at every stage of the centralized control device are connected to the PLC inputs; the coils of the control relays of the unloaders of the centralized control device are connected to the PLC outputs;

the start and stop buttons of the iron separator of the centralized control device are connected to the PLC inputs; the coil of the control relay of the iron separator of the centralized control device is connected to the PLC output;

the start and stop buttons of the electro-hydraulic flap of the centralized control device are connected to the PLC inputs; the coil of the control relay of the electro-hydraulic flap of the centralized control device is connected to the PLC outputs;

the start and stop buttons of the electric valve of the centralized control device are connected to the PLC inputs; the coil of the control relays of the electric valve of the centralized control device is connected to the PLC output;

the band-type brake detection switches of the belt-type transportation at every stage of the centralized control device are connected to the PLC inputs;

the contact feedback detection switches of the main contactors of the belt-type transportation at every stage of the centralized control device are connected to the PLC inputs;

the protection functions for the band-type brake, smoke, coal stacking, skidding, motor temperature, front roller temperature, rear roller temperature, front sideslip, middle sideslip and rear sideslip can be set by the disabling/enabling;

in the stand-alone manual control mode controlled by the console, it can be set by the instantaneous/self-holding selector switch;

in the multistage belt-type transportation monitoring device, the knob selection switch of the field control/console control in the control mode is connected to the PLC input;

the knob selection switch of the manual operation/automatic operation in the console control operation mode is connected to the PLC input;

the field start and field stop buttons of the belt-type transportation at every stage are connected to the PLC inputs;

the console start and console stop buttons of the belt-type transportation at every stage are connected to the PLC inputs;

the coils of control relays for the motor, watering, fault alarm signal output of the belt-type transportation at every stage are connected to the PLC inputs;

the emergency stop and reset buttons are connected to the PLC inputs;

the coil of the control relay that activates the sound and light alarm is connected to the PLC output;

the smoke alarm switches of the belt-type transportation at every stage are connected to the PLC inputs;

the coal stacking alarm switches of the belt-type transportation at every stage are connected to the PLC inputs.