TOUCH SCREEN BASED INDUSTRIAL CRANE CONTROLLING

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ABSTRACT

These paper present How to control the heavy load crane by touché screen HMI. Here including PLC, HMI, Drive, motor. In most of cement, paper and metal industry the heavy load have to transport by crane. The touch screen allows an operator move freely around the work space and drive the crane with simple graphical user interface. Here the direction of crane should be vertical, horizontal sliding cage crane shaft arrangement with interlink. The advantage of this project to lift the heavy loads by industrial applications. This project should be used terminal method.

Keywords – Touch screen, HMI, Industrial Crane, Plc., AC MOTOR

1. INTRODUCTION

Controlling a crane is often very difficult for human operators due to the slow response of the heavy structures and the lightly-damped payload oscillation. Manipulation tasks are made even harder when the interface between the human and crane is unintuitive. Although there have recently been significant advancements in portable electronic devices, this useful technology has not migrated into crane control applications. Human manipulation of suspended payloads using cranes can be difficult. Cable sway is easily induced into the lightly damped system, which inhibits efficient, safe, and accurate payload manipulation. This problem is compounded when the payload forms a double-pendulum configuration. To aid operators, a touch screen controller was integrated into the control system of industrial bridge crane. This touch screen allows an operator to move freely around the workspace and drive the crane with a simple graphical user interface. The operational effect of the touch screen was compared to that of a standard pendant interface through a series of human operator performance studies. The touch screen provides greater operator mobility while producing comparable manipulation performance. [1]

2. TOUCH SCREEN BASED INDUSTRIAL CRANE CONTROLLING

Controlling of the crane through automation contains HMI (Human Machines Interface), PLC (Programmable Logic Controller), drives and motor.

3. HMI (Human Machine Interface)

HMI is the acronym for Human Machine Interface, and can be designed as just that; an interface between the user and the machine. An HMI is considered an interface; a very broad term that can include MP3 players, industrial computers, household appliances, and office equipment. However, an HMI is much more specific to manufacturing and process control systems. An HMI provides a visual representation of a control system and provides real time data acquisition. An HMI can increase productivity by having a centralized center that is extremely user-friendly.
A Human Machine Interface (HMI) is exactly what the name implies; a graphical interface that allows humans and machines to interact. Human machine interfaces vary widely, from control panels for nuclear power plants. An HMI is the centralized control unit for manufacturing lines, equipped with Data Recipes, event logging, video feed, and event triggering, so that one may access the system at any moment for any purpose. For a manufacturing line to be integrated with an HMI, it must first be working with a Programmable Logic Controller (PLC). It is the PLC that takes the information from the sensors, and transforms it to Boolean algebra, so the HMI can decipher and make decisions.

4. PLC (Programmable Logic Controller)

![Image of PLC diagram]

PLC is microprocessor based electronic device which perform arithmetic and logical operation on any process variable according to programme. Two types of PLCs are available compact and modular. Main Parts of the PLC are Input module, Output Module, Central Processing Unit, Power Supply, Rack and chassis. For hardware implementation Schneider PLC has been used and it has been interfaced with twido suite software.

HMI/PLC Combination

Using just a PLC will not provide any real-time feedback, cannot set off alarms nor modify the system without reprogramming the PLC. The key advantage to an HMI is its functionality; an HMI can be used for simple tasks such as a coffee brewing controller, or a Sophisticated control unit of a nuclear plant. With new HMI designs emerging every day, we are now seeing HMIs that offer remote access, allowing for access of the terminal while away. Another advantage of an HMI is that the user can personally design the user interface, in order to program an HMI to operate a PLC properly, all the registers of the PLC must be known. A good way to learn how to program a PLC via an HMI is to first start working with the PLC and the software it came with. This helps build an understanding of how to operate the PLC without the HMI. That knowledge will easily transfer over when the user is ready to connect the two units together. It has great advantages such as HMI is the user-friendliness of the graphical interface, The graphical interface contains colour coding that allows for easy identification (for example: red for trouble), Pictures and icons allow for fast recognition, easing the problems of illiteracy, HMI can reduce the cost of product manufacturing, and potentially increase profit margins and lower production costs. HMI devices are now extremely innovative and capable of higher capacity and more interactive, elaborate functions than ever before. Some technological advantages the HMI offers are: converting hardware to software, eliminating the need for mouse and keyboard, and allowing kinaesthetic computer/human interaction.

5. IMPLEMENTATION

Drives

An AC drive is a device that is used to control the speed of an electrical motor, either an induction motor or a synchronous motor. AC drives are also known by various other names such as adjustable speed drives (ASD) or adjustable frequency drives (AFD) or variable frequency drives (VFD) or variable speed drives (VSD) or frequency converters (FC). A fixed speed is not suitable for all processes in all circumstances; thus, the need for adjusting the speed according to need. Industrial machinery is often driven by electrical motors that have provisions for speed adjustment. Such motors are simply larger, more powerful versions of those driving familiar appliances such as food blenders or electric drills. These motors normally operate at a fixed speed. The speed is controlled by changing the frequency of the electrical supply to the motor. The 3-phase voltage in the national electrical grid connected to a motor creates a rotating magnetic field in it. The rotor of the electrical motor will follow this rotating magnetic field. An AC drive converts the frequency of the network to anything between 0 to 300 Hz or even higher, and thus controls the speed of motor proportionally to the frequency.

Rectifier unit

The AC drive is supplied by the electrical network via a rectifier. The rectifier unit can be uni-or bidirectional. When unidirectional, the AC drive can accelerate and run the motor by taking energy from the
network. If bidirectional, the AC drive can also take the mechanical rotation energy from the motor and process and feed it back to the electrical network.

**DC circuit**
The DC circuit will store the electrical energy from the rectifier for the inverter to use. In most cases, the energy is stored in high-power capacitors.

**Inverter unit**
The inverter unit takes the electrical energy from the DC circuit and supplies it to the motor. The inverter uses modulation techniques to create the needed 3-phase AC voltage output for the motor. The frequency can be adjusted to match the need of the process. The higher the frequency of the output voltage is, the higher the speed of the motor, and thus, the output of the process.

6. AC MOTOR

The standard definition for an AC Motor is an electric motor that is driven by alternating current. The AC Motor is used in the conversion of electrical energy into mechanical energy. This mechanical energy is made from utilizing the force that is exerted by the rotating magnetic fields produced by the alternating current that flows through its coils. The AC Motor is made up of two major components: the stationary stator that is on the outside and has coils supplied with AC current, and the inside rotor that is attached to the output shaft.

The fundamental operation of an AC Motor relies on the principles of magnetism. The simple AC Motor contains a coil of wire and two fixed magnets surrounding a shaft. When an electric (AC) charge is applied to the coil of wire, it becomes an electromagnet, generating a magnetic field. Simply described, when the magnets interact, the shaft and the coil of wires begin to rotate, operating the AC motor.

**REFERENCES**

[4] Programmable logic controller principal and application by John w. webb and Ronald a.rais