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ELECTRIC OVERHEAD CRANE USING PLC

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ABSTRACT

Automation Requires PLC controlled cranes, which are way more advance and state of the art. A crane is a tower or derrick that is equipped with cables and pulleys that are used to lift and lower material. They are commonly used in the construction industry & in the manufacturing of heavy equipment's. The predominant function of the PLC panel is to wire the hard-wired control panels electronically. This otherwise would require more than a thousand relays to be replaced.

Key words- mobile crane, telescopic crane, truck mounted crain, tower crane

Introduction

Electrical overhead cranes are widely used in industries. In Industry Contactor & Relay Controlled Cranes are used. They are operated with push buttons mounted on Huge remotes. These remotes are suspended with wire rope. These type of remotes starts to malfunction over the period due to mechanical parts present in it. Also these are limited in function. These systems are not very user friendly.[3]

It's a good choice for many situations, remote crane controls can prove to be useful for higher risk applications such as Furness and sheet metal industries and multiple hoist operations. Controls on this remote include joystick (Forward/Backward movement), Push buttons (Up/Down of Pulley).

Automation Requires PLC controlled cranes, which are way more advance and state of the art. We can modify the existing crane system with the help of advance PLC's, . These Systems requires less monitoring as they are maintenance free. These systems ensure longer motor life due to use of modern electrical equipment such as PLC & VFD as they remove excess stress from hoist motor.[3]

As overhead crane is at top, we cannot see the exact position of crane with respect to dead ends. To avoid this failure, it is necessary to develop compact controlling system. For that purpose, we had done the design using PLC controllers and push button control for interactive controlling

LITERATURE REVIEW

Motivation of Project

1. Study of PLC's.
2. Eliminate complexity of traditional Control Panels.
3. To provide Advance operation of cranes
4. Study the Traditional overhead cranes.
5. Problem findings in traditional systems.

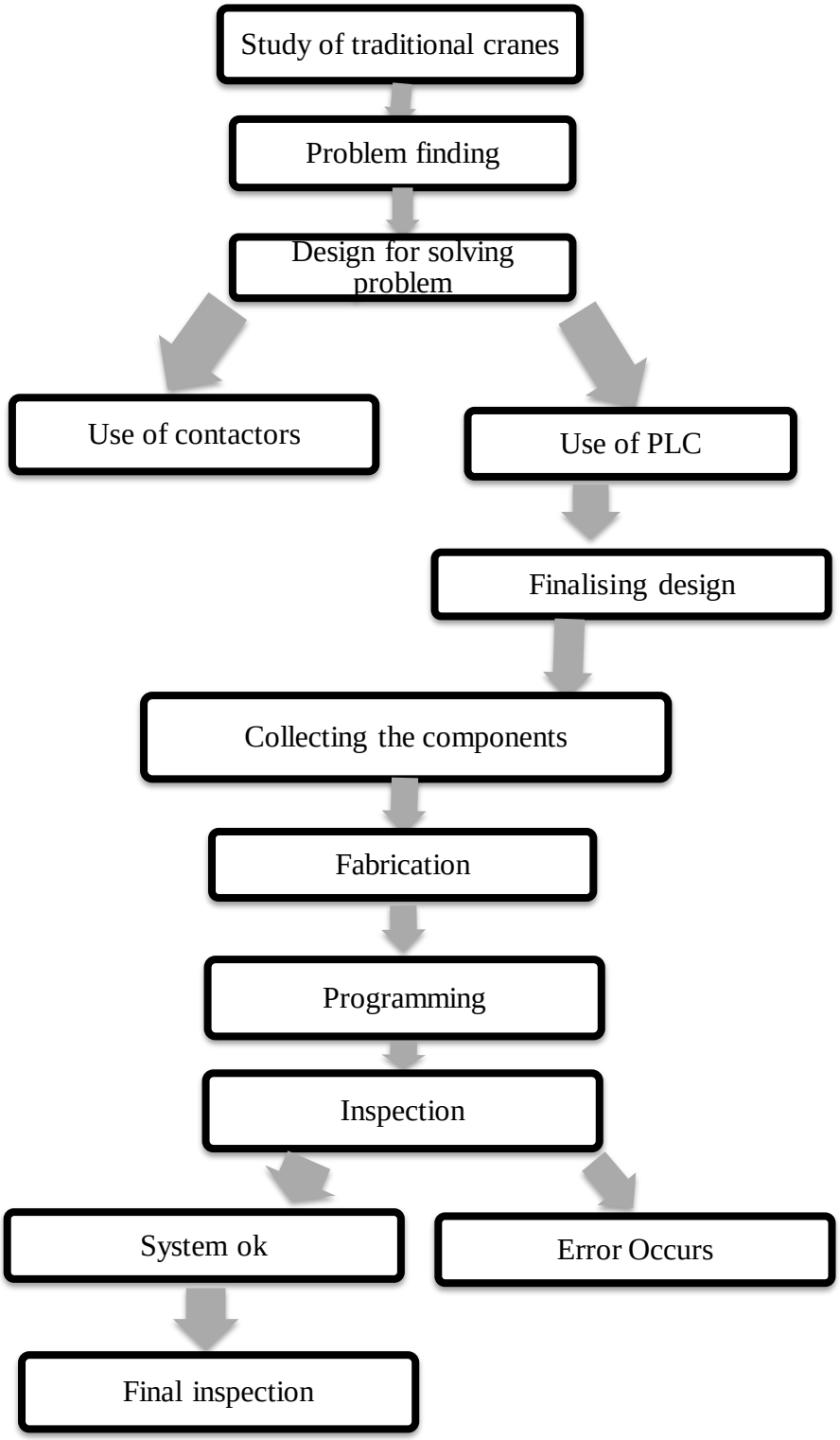
PROBLEM STATEMENT

The traditional cranes have more number of contactors and relays, which creates more complication in control system. Along with this it's maintenance is also big issue. Due to use of multiple components, size of control panel increases and it creates electrical turbulence. This cause error in electronic components and sometime failure may occur.

As overhead crane is at top, we cannot see the exact position of crane with respect to dead ends. Also in case of overload there is no provision to indicate the danger.

To avoid this failure, it is necessary to develop compact controlling system. For that purpose, we had done the design using PLC controllers and Push button control for interactive controlling.

METHODOLOGY


Study of traditional cranes
Problem finding
Design for solving problem
Use of contactors
Use of PLC
Finalising design
Collecting the components
Fabrication
Programming
Inspection
System ok
Error Occurs
Final inspection

TYPES OF CRANE

A crane is a tower or derrick that is equipped with cables and pulleys that are used to lift and lower material. They are commonly used in the construction industry & in the manufacturing of heavy equipment's. Cranes for construction are normally temporary
structures, either fixed to the ground/mounted on a purpose built vehicle.

They can either be controlled from an operator in a cab that travels along with the crane, by a push button pendant control station or by radio type controls. The crane operator is ultimately responsible for the safety of the crews & the crane.

Mobile Cranes:

The most basic type of crane consists of a steel truss or telescopic boom mounted on a mobile platform, which could be a rail, wheeled, or even on a cat truck. The boom is hinged at the bottom and can be either raised or lowered by cables or hydraulic cylinders. [Fig 4.1]

MOBILE CRANE

Telescopic Crane:

This type of crane offers a boom that consists of a number of tubes fitted one inside of the other as shown in fig 4.2. A hydraulic mechanism extends or retracts the tubes to increase or decrease the length of the boom.

TELESCOPIC CRANE

Tower Crane:

The tower crane is a modern form of a balance crane. When fixed to the ground the tower cranes will often give the best combination of height and lifting capacity and are also used when constructing tall buildings. It is shown in below fig

TOWER CRANE

Truck Mounted Crane:

Cranes mounted on a rubber tire truck will provide great mobility. It is shown in fig 4.4. Explains that extends vertically or horizontally are used to level and stabilize the crane during hoisting.

TRUCK MOUNTED CRANE

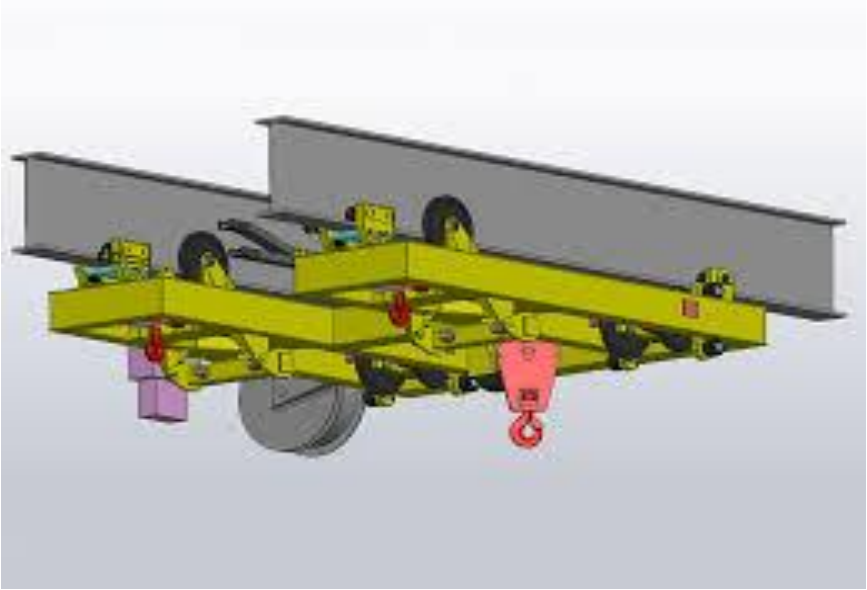
Rough Terrain Crane:

A crane that is mounted on an undercarriage with four rubber tires, designed for operations off road. The outriggers extend vertically & horizontally to level and stabilize the crane when hoisting. These types of cranes are single engine machines where the same engine is used for powering the undercarriage as it is for powering the crane. In these types of cranes, the engine is normally mounted in the undercarriage rather than in the upper portion.[fig 4.5]

ROUGH TERRAIN CRANE

Overhead Crane:

Also referred to as a suspended crane, this type is normally used in a factory, with some of them being able to lift very heavy loads and shown in fig 4.6. The hoist is set on a trolley which will move in one direction along 1 or 2 beams which move at angles to that direction along elevated or ground level tracks & often mounted along the side of an assembly area.



OVERHEAD CRANE

COMPONENTS WITH DETAILED DESCRIPTION

1) POWER SUPPLY: -

PLC has its own individual Isolated power supply connected with the PLC. Because of the isolated power supply there is no hazard from the power supply of the industry. In Industry there may be two types of the I/P's 230v/110v. There is provision of taking both I/P's 230v/110v and converts it into the 24v and 6v for PLC and motors by use of SMPS.

24V SMPS AND 6V SMPS:

This is high quality 24V, 10Amp SMPS intended for industrial use. We use these SMPS for heavy duty robotics applications & they have built in Short circuit, Overload & Over voltage protection & it can withstand input of 1500V AC up to 60 seconds. Output voltage can be adjusted by up to +-10% of the output voltage. [FIG 8.1]

SMPS

Designing and Formation of Mounting Plate:

It is stainless steels plate on which all components are going to be fitted. [Fig 10.1] Firstly according to size sheet is taken. For preventing corrosion, powder coating is done. Then this plate is taken for installation.

FUTURE SCOPE

- We can implement Artificial Intelligence in it.
- We can operate the crane wireless by use of remote control system
- Instead of providing runway, we can use wheeled robots for long travel movement.
- In future we can control by using mobile phones.

CONCLUSION

1. The predominant function of the PLC panel is to wire the hard-wired control panels electronically. This otherwise would require more than a thousand relays to be replaced. [3]
2. The space that they acquire is much less than the relays. This ensures that there will not be any constraints of space and you can utilize this space for other purposes.
3. Electric turbulence generated in control panel is reduced due to less components are used.
4. Controlling of system become easy.

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