# Study Of Industrial Crane Automation & Monitoring Based On PLC & SCADA

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*Abstract*: **In this paper we are using PLC & SCADA to automatically control the crane movement. Automatic Industrial Crane based on PLC & SCADA helps to reduce human efforts, it has a great application in industries as it increases the production efficiency with a great reduction in power consumption and loss. The soft wiring advantage provided by PLC is tremendous. In fact, it is one of the most important features of PLC's.**

*Keywords:* **PLC, SCADA, Soft wiring.**

## 1. INTRODUCTION

In a traditional Crane control system human is the main to control the crane that passes through large drawbacks such as more wiring work, appears large mechanical faults & difficulties in troubleshooting and repair work.

In this setup we are using PLC & SCADA to automatically control the crane movement. Programmable Control Logic (PLC) is a digitally operating electronic apparatus which uses a programming memory for the internal storage of instructions for implementing specific functions such as logic, sequencing, timing, counting and arithmetic to control through digital or analog modules, various types of machines or process.

SCADA stands for Supervisory Control and Data Acquisition. It is a computer system, for gathering and analyzing real time data.

SCADA systems are used to monitor and control a plant or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining and transportation.

Automatic Industrial Crane based on PLC & SCADA helps to reduce human efforts, it has a great application in industries as it increases the production efficiency with a great reduction in power consumption and loss.

The soft wiring advantage provided by PLC is tremendous. In fact, it is one of the most important features of PLCs its soft wiring makes change in the control system easy and cheap. If it wants a device in the PLC system to behave differently or to control in a different process element, all we have to change the control program.

## 2. COMPONENTS USED
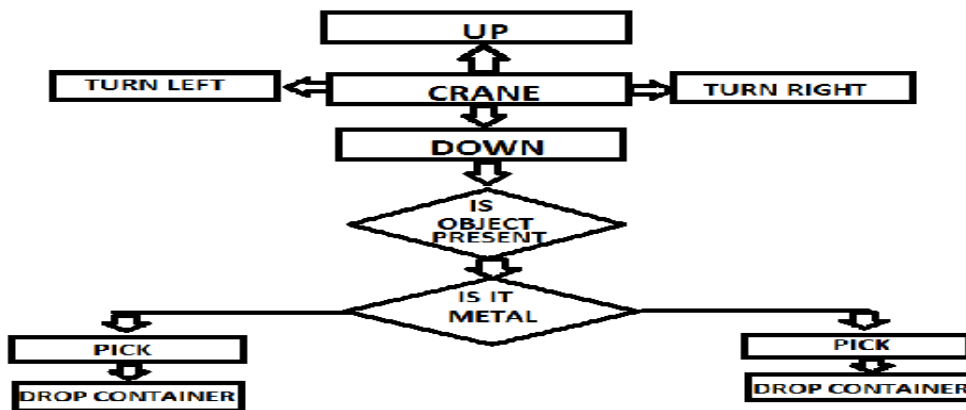
**HARDWARE COMPONENT:**

- DC Motor - 12V, 6rpm

- Push Button - NO,NC

- Proximity Sensor - Metallic & Non Metallic             Rating-6V - 24V DC

- PLC – Micrologix 1000

- Rollers - 2

- Rope or Belt

- Containers - 2

- LED - Red, Green

- Relay - 24V DC Supply

- SMPS - Input 230V AC Output 24 V DC   DC Motor - 12V, 6rpm

**SOFTWARE COMPONENT:**

- *SCADA (Supervisory Control and Data Acquisition).*

## 3.    PROCESS FLOW DIAGRAM



## 4.    WORKING

In this paper complete working of the crane is controlled    by PLC & SCADA. The crane has an assembly of motors and sensors, when object is placed at the desired point, object sensor activates the metal detector sensor which detects whether the placed object is metal or not, the sensor gives feedback to the PLC, then PLC gives command to the crane assembly so that the object is picked up from the specified placed and released in the correct container. Timing control is done to control the motors of the crane assembly.

**Definition of PLC:** A digital electronic device that uses a programmable memory to store instruction and to implement function such as logic, sequencing, timing, counting and arithmetic in order to control machines and processes. The term logic is use primarily concerned with implementing logic and switching operations .Input devices e.g. switches, and output devices e.g. motors, being controlled are connected to the PLC and then the controller monitors the inputs and outputs according t this program stored in the PLC by the operator and so controls the machine or process. Originally they were designed as a replacement for hard-wired relay and timer logic control systems. PLCs have the great advantage that it is possible to modify a control system without having to rewrite the connections to the input and output devices, the only requirement being that an operator has key in a different set of instruction. The result is a flexible system which can be used to control systems which vary quite widely in their nature and complexity.
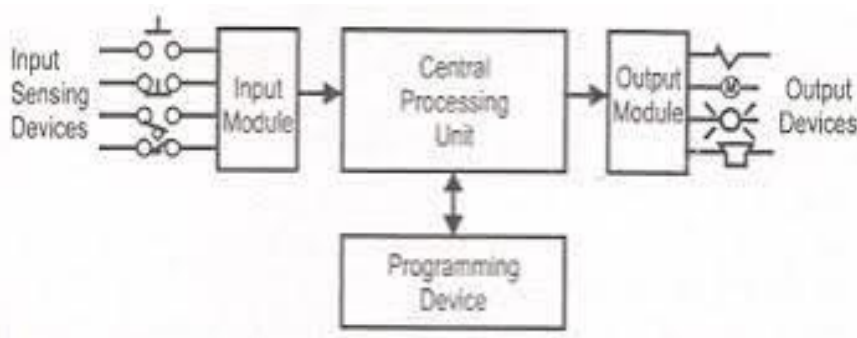


**Block diagram of PLC**

## 5.  PLC OPERATION

- **Check input status:** First the plc takes a look at each input to determine if it is on or off.

- **Execute program:** Next the plc executes the program one instruction at a time.

- **Update output status:** Finally the plc updates the status of the output. It updates the output based on which inputs were on during the first step.

**DEFINITION OF SCADA**: SCADA stands for Supervisory Control and Data Acquisition. It is a computer system, for gathering and analyzing real time data. SCADA systems are used to monitor and control a plant or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining and transportation.

**SCADA OPERATION**: SCADA systems deploy multiple software and hardware elements that allow industrial organizations to

- Monitor, gather, and process data

- Interact with and control machines and devices such as valves, pumps, motors, and more, which are connected through HMI (human-machine interface) software

- Record events into a log file.
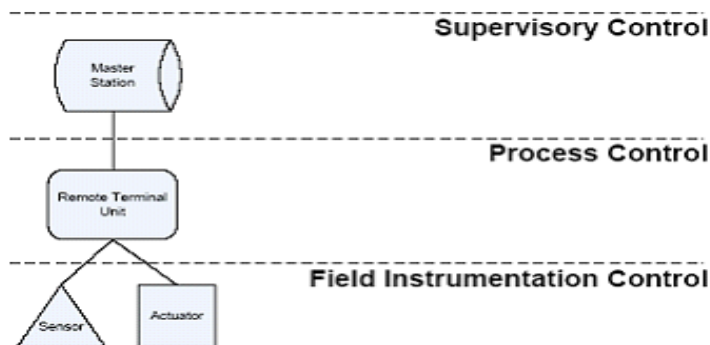


**Basic operations of SCADA**

**SOFT WIRING:** The soft wiring advantage provided by programmable controllers is Tremendous. In fact, it is one of the most important features of PLCs. Soft wiring makes changes in the control system easy and cheap.

## 6.  APPLICATIONS

PLC & SCADA have a wide range of applications to sum up it can be said that they are used for complete automation of a system, but industrial crane based on PLC & SCADA have following application: CONTINOUS CASTING MACHINE (CCM), WIRE ROD MILL (WRM),OPEN HEARTH FURNACE,COLD ROLLING  etc…

## 7.  ADVANTAGES

- There are many advantages of this crane system  in industrial sector like sugar mills.

- PLCs are similar to computer but have certain features which are specific to their use as controllers. These are:

o   They are rugged and designed to withstand vibrations, temperature, humidity and noise.

o   The interfacing for inputs and outputs is the controller.

o   They are easily programmed and have easily understood programming language.

o   It contains programmable functions.

o   It scans memory, inputs and outputs in predetermined manner.

o   It provides error checking diagnostics.

o   A PLC can provide some form of monitoring capabilities

o    A PLC can be effectively designed for a wide variety of control tasks.

• PLC provides the advantage of soft wiring.

•  It is used by facilities such as water treatment plants that are spread out over a large area or multiple buildings, to collect data and control system operation on a supervisory level. In other words, after looking at input data, it sends signals to the various PLCs and other devices to adjust their operating parameters.

• This crane system based on PLC & SCADA can be used for multiple purpose in industries.

## 8.    DISADVANTAGES

• This is a large setup and requires a large cost for setting up the whole system.

• Cost of maintenance is fairly high.

• This system will not be useful and cost effective for small scale industries.

• The system is very complicated and a lot of wiring is required.

• This system will increase unemployment.

## 9.    FUTURE SCOPE

• This system has a great scope in industrial area.

• As population is increasing day by day, so this system will help to satisfy the demands of future population, as this system help in increasing productivity.

• India is heading forward in automation in every field so this system will help to speed up the walk of the country towards automation.

• This automatic crane system will be used for multiple purposes in near future.

## 10.    CONCLUSION

Despite of all the complexities this automatic crane system based on PLC & SCADA have tremendous scope and advantages if used in large scale industries. India is a country which is heading towards automation, so this system will prove a turnout & will be very beneficial for the country.

 PLC in recent years experienced unprecedented growth as universal element in industrial automation. It can be effectively used in applications ranging from simple control like replacing a small number of relays to complex automation problems. Today the PLCs are used for control and automation job in a single machine & it increases up to full automation of manufacturing/testing process in a factory.

SCADA systems are the backbone of modern industry. Modern SCADA systems allow real-time data from the plant floor to be accessed from anywhere in the world. This access to real-time information allows governments, businesses, and individuals to make data-driven decisions about how to improve their processes. Without SCADA software, it would be extremely difficult if not impossible to gather sufficient data for consistently well-informed decisions.

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