Module - 1

Introduction to Electrical Control Systems

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Lecture - 1

FUNCTIONS OF A CONTROL SYSTEM

by

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Outcomes

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- List and describe the functions of a control system
- Define various terms related to electrical control systems

What is Motor Control

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- A motor controller might include a manual or automatic means for:
  - starting and stopping the motor,
  - selecting forward or reverse rotation,
  - selecting and regulating the speed,
  - regulating or limiting the torque, and
  - protecting against overloads and faults

Functions of Control System

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Starting Stopping Reversing Running
Speed control Safety of operator

- ***Starting***
  - The motor can be either started by connecting them directly across the line or by applying reduced voltage.
  - The starting method depend upon the power capacity of supply line, size of motor and the type of load.
- ***Stopping***
  - Motor can be stopped by disconnecting it from the supply and then motor will coast to a stand still.
  - Braking is used to stop the motor in shortest possible time. (mechanical or electrical)
- ***Reversing***
  - Motor controllers are used to change the direction of machines automatically or at the command of an operator.

Functions of Control System .....

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- ***Running***
  - maintain the desired operational speed and characteristics when the motor is running.
- ***Speed control***
  - Speed control is another major function of controllers.
  - Some applications require a very precise speed while other requires multi speeds.
- ***Safety of operator***
  - Many mechanical safe guards have been replaced or aided by electrical means of protection.
  - Pilot devices in controllers provide a direct means of protecting machine operator from unsafe conditions.

Terminology

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- Control
- Control component
- Controller
- Local control
- Remote control
- Contact
- Normally closed and normally open contacts
- Automatic
- Solid state devices
- Static control
- Horse power
- Torque
- Overload
- LVP
- LVR

Definitions

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- ***Control***
  - govern or regulate the functions of a motor or machine.
  - Applied to motors, control perform several functions such as starting, acceleration, speed, protection, reversing and stopping.
- ***Control component***
  - Any piece of equipment used to regulated or govern the function of a machine or motor.
- ***Controller***
  - A device or group of devices that govern, in a predetermined manner, the delivery of electric power to apparatus connected to it.
- ***Local control***
  - Control function, initiation or change accomplished at the same location as the electric controller.

Definitions …

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- ***Remote control***
  - Control function, initiation or change of an electrical device at a point away from the controller.
- ***Contact***
  - A conducting part which acts with another conducting part to complete or to interrupt a circuit.
- ***Normally Closed and Normally Open contacts***
  - Contacts, which are Closed in the state of rest, that is, when they are not energized (electrically) or activated are called normally closed contacts (NC).
  - Contacts, which are Open in the state of rest, that is, when they are not energized (electrically) or activated are called normally open contacts (NO).

Definitions .....

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- ***Automatic***
  - Self acting, operating by its own mechanism when activated by some triggering signal; for example a change in current strength, pressure, temperature or mechanical configuration.
- ***Solid state devices***
  - Electronic components that control electron flow through solid materials such as crystals.
  - e.g., transistors, diodes integrated circuits.
- ***Static control***
  - Control system in which solid state devices perform the functions.
  - No moving parts or without motion.

Definitions .....

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- ***LVR***
  - Low Voltage Release
  - It is a maintained-contact type of pilot device used in Two- wire control to provide low voltage release.
  - Low-voltage release means that in the event of a power loss, the contactor will de-energize, stopping the motor.
  - However, when power is restored, the motor will restart without warning
- ***LVP***
  - Low Voltage protection
  - It is a momentary-contact type pilot device and a holding circuit contact to provide low voltage protection
  - The starter will drop out when there is a voltage failure, but it will not pick up automatically when voltage returns.

Next Lecture

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Introduction to Control Systems Components

Thank You