BTME 3072
Robotics and Automation
Lecture 6

2nd Year

III Semester

Galgotias University

2020-21

Unit I: Introduction to Robotics

- Definition of a Robot –
- Basic Concepts –Robot configurations –
- **Types of Robot drives –**
- Basic robot motions –
- Point to point control –
- Continuous path control.

Objectives of the lecture

- Electric drive system
- Working and application of the electric drive system.

Electric drive system

- The electrical drive system is defined as the system which is use for controlling the speed, torque and direction of an electrical motor.
- Each electrical drive system is different from other electrical drive systems, but there are some common features associated with all electrical drive systems.

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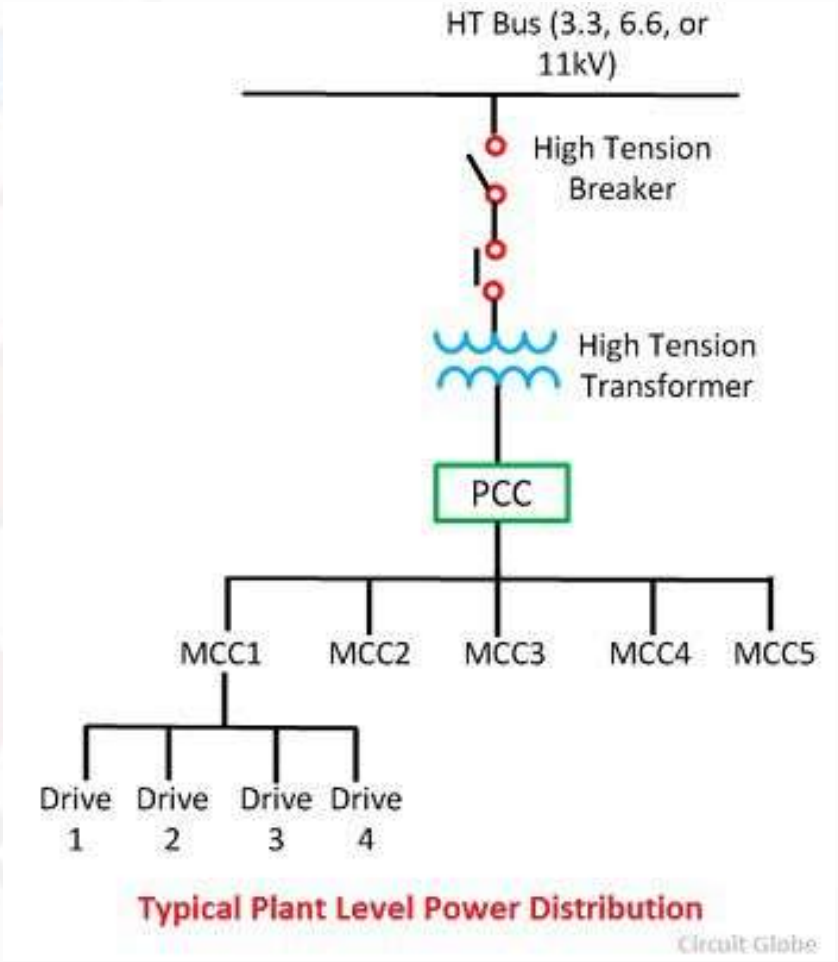
- The figure shown represents the typical layout of a plant level power distribution network.
- This electrical drive system receives its incoming AC supply from a Motor Control Center (MCC).
- MCC controls the power to few drives located in an area.



Typical Plant Level Power Distribution

main parts of these drive systems

- **Incoming AC Switchgear**:
- It consists a switch fuse unit and AC power contractor which have ranges up to 660V, 800A.
- The switch gear replaces the normal contractor by the bar mounted contractor and also used air circuit breaker as an incoming switch.
- The bar mounted contractor increase the range up to 1000V, 1200A.
- It uses the HRC fuse whose rating is up to 660V, 800A.
- The AC switchgear consists thermal overload for protecting the system from overloading.
- Sometimes the contractor of the switchgear is replaced by the moulded case circuit breaker.

Power Converter/ or Inverter Assembly

- This assembly has two major blocks – power and control electronics.
- The power electronics blocks consist of semiconductor devices, heat sinks, semiconductor fuses, surge suppressors, cooling fans.
- Control electronics consist of triggering circuit, its own regulated power supply and driving and the isolation circuit.
- The driving and isolation circuit controls and regulates the power flow to the motor.

Line Surge Suppressors

- It protects the semiconductor converter against voltage spikes produce in the line due to on and off switchings of the load connecting on the same line.
- The line surge suppressor along with the inductance suppress the voltage spikes.
- The line surge suppressor absorbs a certain amount of trapped energy when the incoming circuit breaker operates and breaks the current supplied to the trap.
- The line surge suppressor will not be required when the power modulator is not a semiconductor.

Control Logic

- It is used for interlocking and sequencing of various operations of the drive system under normal, fault and emergency condition.
- The interlocking protects the system against abnormal and unsafe operations.
- The sequencing protects the various drive operations, such as starting, braking, reversing, jogging, etc., which are carried out in a pre-planned sequence.
- For complex interlocking and sequence operations, the programmable logic controller is used.

Advantages of Electric Drives

- Cost is too low as compared to another system of the drive.
- The system is more simple and clean.
- The control is very easy and smooth.
- Flexible in the layout.
- Facility for remote control.
- Transmission of power from one place to other can be done with the help of cables instead of long shafts, etc.
- Its maintenance cost is quite low.
- It can be started at any time without delay.

Limitation of electric drive

- The application of the drive is limited because it cannot use in a place where the power supply is not available.
- It can cause noise pollution.
- The initial cost of the system is high. It has a poor dynamic response.

Application of Electric Drive

- industrial and domestic applications
- transportation systems,
- rolling mills,
- paper machines,
- textile mills,
- machine tools,
- fans,
- pumps,
- robots and washing, etc.

Summery

- Electric drive system and essential parts of the robotics

Questions

Text books

- Introduction to robotics mechanics and control by John J Craig
- Fundamentals of Robotic Mechanical Systems by Jorge Angeles
- Robot Operating System for Absolute Beginners: Robotics Programming Made Easy by Lentin Joseph
- Reference book
  - Robotic process automation
  - Robotic Process Automation For Dummies®, NICE Special Edition

Thank You !