


ELECTRICAL ENGINEERING BASICS

Introduction to Automation

A brief overview
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1




ELECTRICAL ENGINEERING BASICS

What is Automation

- General definition:
 - Past examples of basic automation
- Brief history
- What is automation today


2



Why Automation

- What are the benefits
 - Personnel safety
 - Speed of production
 - Repeatability and consistency of production
 - Reduced cost due to product savings
 - Using less material
 - Less failures
- What are the cons
 - Job loss's
 - Reduced job satisfaction
 - still need operators


3



Levels of Automation System

- Level 0 (workers)
- Level 1 (first level managers)
- Level 2 (mid-level manager – tell you to change but NOT how to change)
- Level 3 (higher managers – removed from actual work, tend to steer....)
- MES (Manufacturing Execution Systems, not MESS, but close)
- ERP (Enterprise Resource Planning)
- CLOUD (9) Big Data,
- IIOT (Industrial Internet of Things) pyramid
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- Can be viewed as the Automation Pyramid – Old and New


4



Components of Automation System

- Level 0
 - I/O: digital, analog, network (RS232, 485, SSI, Ethernet, Profibus)
 - Actuator-sensory-interface (ASI)
 - MCC, VFD's
- Level 1 (milliseconds, short data storage) Direct Control
 - PLC's (WAGO, EZ-Automation, Redline, Hirschmann, Opto-22, Siemens, AB, Schneider, Toshiba, GE, Emerson, ABB, etc.)
 - Examples of PLC code IEC 61131-3:2013 standard
 - Ladder Diagram, Function Block Diagram, Sequential Function Charts, Structured text, Instruction List
 - PID loops
 - MMI, OMI, HMI, SCADA
 - Computers


5



Components of Automation System

- SCADA
 - Collecting Data
 - Realtime Analysis
 - Supervisory Functions
- Level 2 (minutes, large data storage)
 - Computers – mill tracking, setup, strip-cooling sprays, pacing, furnace soaking, etc
 - Be careful of acronyms:
 - OPC- Open Platform Communication's
 - OPC – OLE for Process Control
 - OLE – Object Linking and Embedding
- Level 3, MES (Manufacturing Execution Systems),
 - Computers, database, scheduling, supply-chain
- ERP (Enterprise Resource Planning)
- CLOUD (9)

6



Future of Automation

- Always a guess
 - Who thought that the smart-phone would change so much so quickly, not just phone-calls & texting, but camera, videoing, GPS, unlimited Apps
 - Nano technology
 - Quantum computing