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| **Ref.** | **Unit 6 Concepts & Definitions** | **Terms, Notation, Formulas, Diagrams** |
|  | Processes involving batch and continuous flow of liquids, gasses, and bulk solids. | Process Automation |
|  | Processes usually involving the piece flow of product. | Factory Automation |
|  | A system that combines measuring materials and controlling instruments into an arrangement capable of automatic action. | Process Control |
|  | Using \_\_\_\_\_\_\_\_\_\_\_\_ an operator must visually monitor a process and make corrections as needed. | Manual Control |
|  | Using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ instruments are used to measure and control a process. | Automatic Control |
|  | Process of utilizing instruments to measure and control process variables to manufacture products safely and efficiently. | Industrial (Process) Instrumentation |
|  | Federal agency that enforces safety and health regulations. | Occupational Safety and Health Administration (OSHA) |
|  | The NIST develops measurement standards. | National Institute of Standards and Technology (NIST) |
|  | Parameters or quantities that we wish to control at the correct limit…must be maintained (measured and controlled) in a loop. (e.g. the fluid level in a tank, temperature, pressure…) | Process Variables |
|  | The quantity of fluid passing a certain point within a given period of time. A common unit is gallons per minute (GPM). | Flow |
|  | The amount of heat in a substance; usually measured in degrees Fahrenheit (o F) or Celsius (o C). | Temperature |
|  | The height of material in a container. Typically measured in feet, inches or percent. | Level |
|  | Force divided by the area that the force is acting on. Common unit of measure of pressure is pounds per square inch or PSI. | Pressure |
|  | The desired value of a process variable (e.g. fluid level). Value at which PV is maintained. | Set Point |
|  | When the process variable deviates from the set point. | Process Upset |
|  | The amount of deviation from the set point. | Error |
|  | The difference between the minimum and maximum values of a process variable. | Range |
|  | The difference between the maximum and minimum values of a range | Span |
|  | The ability of a sensor to provide the same result under the same conditions. | Repeatability |
|  | The smallest change in a variable that can be detected by a sensor. | Sensitivity |
|  | The gradual change in a measurement over time when the process conditions are constant. | Drift |
|  | The degree to which a measured value matches the actual process value. | Accuracy |
|  | The milliamp signal (value) and the corresponding value of the process variable are \_\_\_\_\_\_\_\_\_\_\_\_ to one another. | Proportional |
|  | The arrangement of instruments designed to measure and control a process. | Instrument Loop |
|  | A typical control loop contains 3 major elements: | Primary Element  Control Element  Final Element |
|  | The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is typically an electrical device (e.g. a level measuring instrument) that measures the process variable and converts the measurement into a value (electrical signal). | Primary Element |
|  | The most common electrical transmission in a control loop is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ milliamps. | 4 to 20 |
|  | The \_\_\_\_\_\_\_\_\_\_\_\_\_\_ receives the 4-20 mA signal from the primary element (PV), compares it to a set point, and sends a signal (corrective action) to the final element to keep the process variable at the set point. | Control Element  (Controller / PLC) |
|  | In order to maintain (control) the process variable set point (e.g. the level in a tank), a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ must be changed to control the final element (e.g. an actuator controlled valve). | Manipulated Variable |
|  | Receives a signal from the control element and adjusts the manipulated variable in order to keep the process set point. | Final Element |
|  | In \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the final control element is either on or off depending on whether the process variable is above or below set point. (tends to overshoot or undershoot the set point) | On/Off Control |
|  | In \_\_\_\_\_\_\_\_\_\_\_\_\_\_, the final control element changes proportionally to the amount of deviation from the setpoint. (more precise) | Proportional Control |
|  | Ensures that the output of the transmitter is proportional to the Process Variable. | Calibration |
|  | Lists instruments used by tag number. | Instrumentation Index |
|  | Contain applicable codes, standards, wiring and cable requirements, ventilation requirements, power supply requirements, etc. | General Instrumentation Specifications |
|  | Provide information and requirements for proper mounting and connections of a specific instrument. | Installation Detail Drawings |
|  | Identify where an instrument is to be installed. | Location Drawings |
|  | Detailed drawing of equipment, piping, and instrumentation on a project. | Piping and Instrument Drawing  (P&ID) |
|  | P&ID symbol for a discrete, field mounted instrument, visible at field location… |  |
|  | P&ID symbol for a ball valve. |  |
|  | P&ID symbol for a control valve. (Fail to closed position) |  |
|  | Identify instrumentation location, function, and related instrument loop. | Tag Numbers |
|  | Identify location of instrument, when the process is spread across multiple buildings or areas. | Area Designation Numbers |