ALARM

Alarm

- An alarm is a report of an abnormal process event that requires an operator to take action.
- **Categories of alarms**

  Safety – catastrophic failure, loss of life

  Operational – plant or equipment failure/trip

  Information – process inefficiencies

Objectives of a good alarm system

- Presents only useful & relevant alarms
- Each alarm should have a defined response
- Clearly identifies the problem
- Allows adequate time for response
- Frequency: < 6 alarms per hour, steady state
- < 60 alarms per hour, plant upset

Alarm System Design

- General
- Design alarm strategy before configuration commences
- Create rules for assigning priorities
- Consider system defaults

Considerations in alarm design

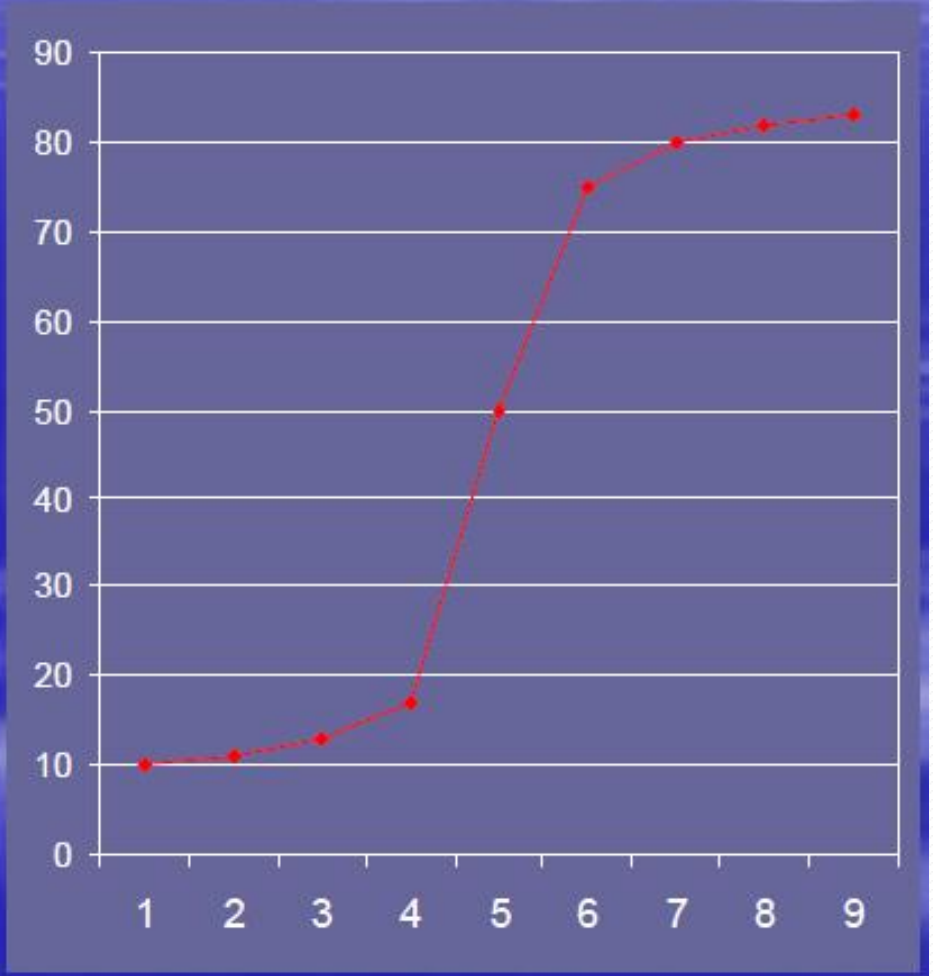
- Purpose of the alarm
- Response required by the operator
- Consequences of not responding to the alarm
- Time required for the operator to respond
- Effectiveness of operator response

What should **not** be an alarm

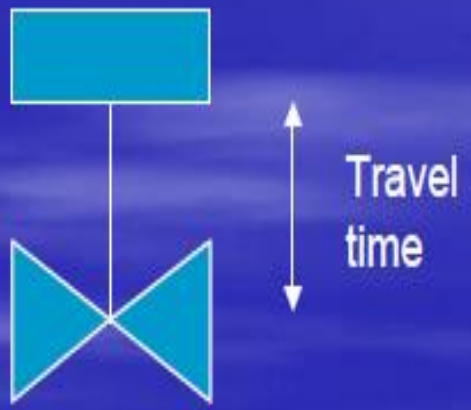
- Events that do not require an operator response
- Events that an operator cannot respond to
- Confirmation of actions taken by the operator
- Duplicate signals

- Alarm types
  - Absolute: eg, high/low alarms
    - Simple ✓
    - Inflexible ✗
  - Deviation: deviation of PV from setpoint
    - Must be suppressed during plant disturbance

- Alarm types
  - Rate of change
    - Predictive ✓
    - Susceptible to noise ✗



- Alarm types
  - Discrepancy Alarms
    - Motor/valve travel time
    - Degradation of equipment can lead to spurious alarms ✘



- Alarm types
  - Retriggering alarms
    - Re-alarm if alarm not cleared after a period of time.
  - Calculated alarms
    - Powerful & flexible
    - Possible with modern control systems
    - Dynamic alarm parameters

- Alarm Priority

  - Determined by:
    - severity of consequences
    - and time taken to take action

  - Priority bands: Maximum 4
    - Critical (in safety system only)
    - High
    - Medium
    - Low
    - Logging (does not count in the maximum number of bands)

Create a set of rules to determine alarm priority to ensure consistency of alarm response.

Alarm Priority

Example 1

Priority	Safety Risk	Economic Loss	Environmental Risk
Critical	> 0.1	> $100,000	> 0.1
High	> 0.01	> $10,000	> 0.01
Medium	> 0.001	> $1,000	> 0.001
Low	< 0.001	< $1,000	< 0.001

Example 2

Priority	Operational
Critical	Total loss of plant
High	Loss of plant area
Medium	Loss of equipment → loss of production
Low	Loss of equipment without loss of production

- Alarm Priority
  - Alarm priorities provide ways of presenting alarms of different levels of importance to the operator:
    - Audible tone
    - Colour
    - Acknowledgment requirements

- Design alarm strategy:
  - Performance Objective
  - Priority allocation rules
  - Rules for determining critical alarms (to be handled by safety system)
  - Design of alarm interface to operator
  - Alarm configuration
    - Setpoints
    - Hysteresis
  - Rules and policies for alarm suppression
  - Change management
  - Alarm review management and policy