Part 1: Overview & Methodology

Institutionalizing Alarm Management

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Solutions for Industrial Agility

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Session 1 Agenda

- Alarm management history and introduction
- Impact on business, operations, health and safety
- Prelude to the alarm management lifecycle
- Publications & references

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Alarm management history and introduction

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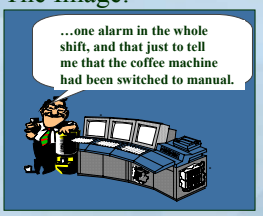
The Image:



The Reality:

….What is the goal?

….What goes wrong?

- Floods of alarms during plant upsets
- Long lists of standing alarms during normal operation
- Unsets/incidents due to missed alarms

"Alarm Systems will be designed, procured and managed so as to deliver the right information, in the right way and at the right time for action by the Control Room Operator to avoid and react to minimize, plant upset, asset or environmental damage, and to improve safety"

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Alarm Management History

Historically it cost money to add alarms, so it was done sparingly.

Now:

➔ Most tags are alarmed

➔ For new incidents more alarms are added

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Significant Historical Events

Milford Haven Refinery: £48M in repairs. £ 200K in fines. Production losses.

Three Mile Island nuclear facility: $1B in losses. No significant causalities. Radioactive releases!

Grangemouth Petrochemical: 2 significant incidents within two months.

Union Carbide, Bhopal, India: High temperature and pressure on a vessel ignored. Methyl Isocyanate leaked killing 3800 persons and leaving over 2700 people with permanent or partial disabilities.

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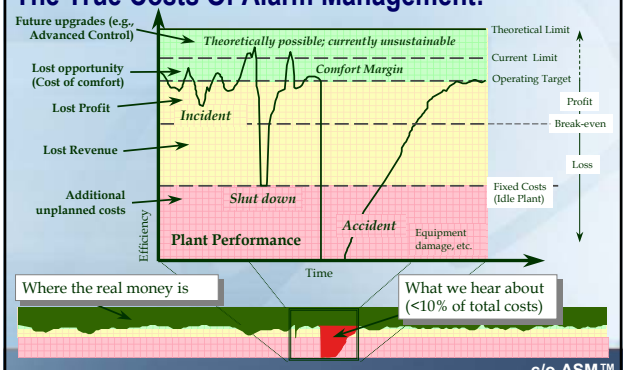
The True Costs Of Alarm Management!



c/o ASM™

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Matrikon Industry Findings

	EEMUA	Oil & Gas	PetroChem	Power	Other
Average Alarms per Day	144	1200	1500	2000	900
Average Standing Alarms	9	50	100	65	35
Peak Alarms per 10 Minutes	10	220	180	350	180
Average Alarms/ 10 Minute Interval	1	6	9	8	5
Distribution % (Low/Med/High)	80/15/5	25/40/35	25/40/35	25/40/35	25/40/35

How many alarms do *you* get every day?

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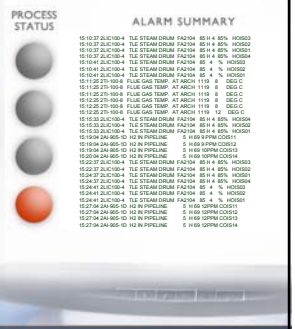
Problem

- Alarms help operators detect and correct process problems
- Operators:
  - must understand, acknowledge, respond & monitor each alarm
  - max. 6 alarms/hour (EEMUA)
- But most operators get over 1200 alarms every day!
- Why?
  - 1000s of alarms configured
  - Incorrect or inconsistent alarm priorities
  - process/equipment changes over time



Alarms are your last line of defense

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When Do I Have A Problem With My Alarms?

- Often a matter of perception…
  - Are you measuring performance against defined metrics?
- Leading Indicators
  - Do you have and alarm philosophy document?
  - Are you historizing Alarm&Events data?
  - Is the ownership of alarms clearly defined and enforced?
  - Are changes tied to a MOC process?
  - Have you performed an alarm rationalization process?
  - Are there policies for effective use of alarm limits in the DCS?
  - Do the operators understand the reasoning, necessary actions and consequences of the alarms?
  - Are we getting alarm floods, inhibited alarms, standing alarms?

Qualitative measures of alarm system performance

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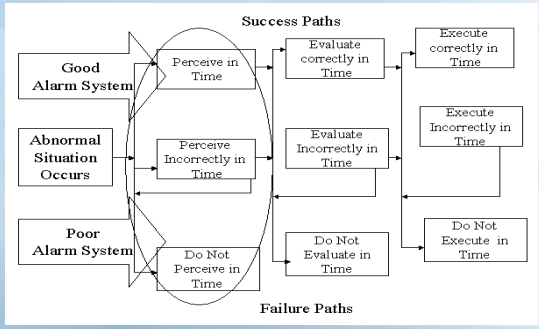
What Is A "Good" Alarm?



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Industry Standard Definition Of An Alarm!

An alarm is a timely, informative warning of an abnormal event requiring operator intervention in order to prevent one or combination of the following incidents :

- personal injury
- an environmental incident
- equipment damage
- major product quality
- economic loss incident

What Is Alarm Management?

"Process by which alarms are *engineered*, *monitored*, and *managed* to ensure *safe, reliable* operations"

Alarm management is a continuous lifecycle or a process

Impact on business, operations, health and safety

Business Justification

- Serious plant upsets and incidents
  - Loss of life, injury, safety related, environmental
  - Often linked to inadequate performance of alarm systems
- Production performance
  - 2-5% of plant throughput is typical
- Operational Efficiencies

Regulatory Trends

- UK Health and Safety Executive (HSE) mandating alarm management at numerous sites to maintain license to operate. Looking to legalize EEMUA guidelines
- Insurance companies mandating alarm management programs
- ResponsibleCare™ auditing and requiring up to date alarm management programs

Regulatory Trends

FDA

21 CFR 11 expectations to include electronic records/signatures for alarm acknowledgement records (especially relating to CODs)

"The agency considers such operator actions as activating a manufacturing sequence or turning off an alarm to warrant the same audit trail coverage as operator data entries in order to document a thorough history of events and those responsible for those events."

http://www.fda.gov/ora/compliance_ref/part11/frs/background/11cfr-fr_02.htm

Future Guidelines

ISA SP18.2 committee formed in 2004 to create an ANSI standard around alarm management.

Likely the basis for North American OSHA recognized best practices

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Prelude on a practical approach to alarm management

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Alarm Management Lifecycle

Benchmark & Assessment
Alarm Philosophy
Alarm Rationalization
Implementation & Execution
Continuous Improvement
Maintenance

- Alarm Management is a complete Life Cycle Design and Monitoring Process to ensure that plant objectives are in sync with the alarm system implementation
- Alarm Management solution must cover the entire life cycle with a scalable approach to a complete Alarm Management Solution
- The objective of this approach is to bring the initial benefits of alarm management as quickly and effectively as possible and to produce a self-sustaining alarm management competency within the organization

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Alarm Management Lifecycle

Benchmark & Assessment
Alarm Philosophy
Alarm Rationalization
Implementation & Execution
Maintenance
Continuous Improvement

- **It all starts with archiving the data!**
- Understand where you are and where your focus should be
- Analyze your current system to determine problem areas
- Determine key alarm performance metrics to answer the following:
  - What is your operators' workload?
  - How often are you at risk of serious plant disturbances?
  - How often has your alarms system caused problems?
  - How does your performance compare to other like facilities/plants?

You can not improve what can not be measured!

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Alarm Management Lifecycle

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Continuous Improvement

- Clearly defines the objectives of the alarm system and the ground rules for its implementation
- Procedures for defining and configuring alarms, alarm settings and priorities
- Define appropriate response procedures & ownership
- Integration with existing management of change

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Alarm Management Lifecycle

Benchmark & Assessment
Alarm Philosophy
Alarm Rationalization
Implementation & Execution
Maintenance
Continuous Improvement

Phase 1:

- Use benchmark data and start with quick clean-up…bad actors

Phase 2:

- Systematic review of alarm settings in the process…engineering the alarms
- Store alarm information in master database
- This database will form both the change management system and the online operator assistance

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Alarm Management Lifecycle

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- Implement Alarm Strategy on DCS
- Strategy for reducing alarms
- Advanced Alarming Strategies
  - Alarm shelving
  - Dynamic alarming
  - Alarm grouping
  - Alarm eclipsing

Alarm Management Lifecycle

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- Integrate into workflow and management practices
- Manage Change to maintain effectiveness and prevent unauthorized changes
- Track changes with Master alarm database
- Monitor the AMS performance and effectiveness with technology
- Once you get to this point, you have a complete alarm management solution

Alarm Management Lifecycle

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Continuous Improvement

- Validate system against goals (alarm philosophy) and benchmarks
- Important check to avoid the need to repeat above procedures
- Periodic follow-up of alarm performance and analysis of alarm floods
- Committed documentation to alarm changes with integration to MOC process
- Leverage A&E database for operational efficiencies

Publications

1. EEMUA document #191 (www.eemua.co.uk)
2. Campbell Brown, D., "Horses For Courses - A Vision For Alarm Management", Paper presented for IBC 2002
3. Andow, Peter, "Alarm Performance Improvement During Abnormal Situations," HAZARDS XV: The Process, Its Safety, and the Environment: Getting it Right, Institute of Chemical Engineers, Manchester, UK, April 2000
4. ABNORMAL SITUATION MANAGEMENT: NOT BY NEW TECHNOLOGY ALONE...
   Authors Edward Cochran,Peter Bullemer, Honeywell,
   From 1996 AICHE Safety Conference
5. Joe Alford, Eli Lilly, Senior alarm management practitioner in the pharmaceutical industry

Conclusion

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