ABB Consulting

Alarm Management

ABB Group

FORTUNE WORLD'S MOST ADMIRED COMPANIES® 2014

Employees

~140,000

2014 revenue

$39.8b

Present in

+100

countries

Formed in

1988

merger of Swiss (BBC, 1891) and Swedish (ASEA, 1883) engineering companies

Oil & Gas

$6b

R&D

$1.5b

Scientists & Engineers

~8,000

University Collaboration

70

ABB

ABB Consulting
Key Facts

470
EMPLOYEES

£49M
TURNOVER IN 2013

BUILDING LONG TERM STRATEGIC RELATIONSHIPS WITH KEY GLOBAL CUSTOMERS.

CARRY OUT WORK IN A WIDE RANGE OF GEOGRAPHICAL LOCATIONS INCLUDING:
EUROPE ■ MIDDLE EAST
AZERBAIJAN ■ US ■ SE ASIA

PART OF THE CHEMICAL, OIL & GAS BUSINESS UNIT

Aberdeen

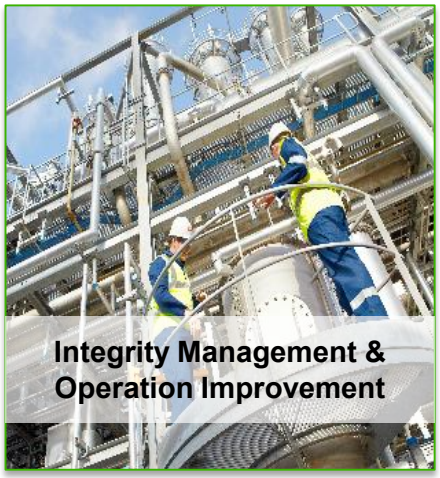
Billingham


Warrington

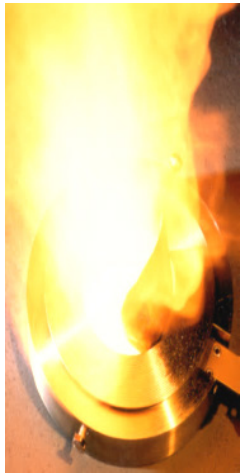

Hull

Key customers

Product areas



Process safety



- Identification and quantifying potential safety problems together with advising on compliance with safety legislation
- Services provided:

Alarm Management	ATEX / DSEAR	Consequence Modelling	Fire, Explosion & Electrostatic Hazards	Fire Safety Reviews
HAZOP	LOPA	Human Factors	Occupied Buildings	Pressure Relief
Process Safety Management (PSM)	Process Hazard Reviews (PHR)	Risk Assessment	SIL / IEC 61508	

- A pragmatic and risk based approach gives customers more risk reduction for their safety consultancy spend.

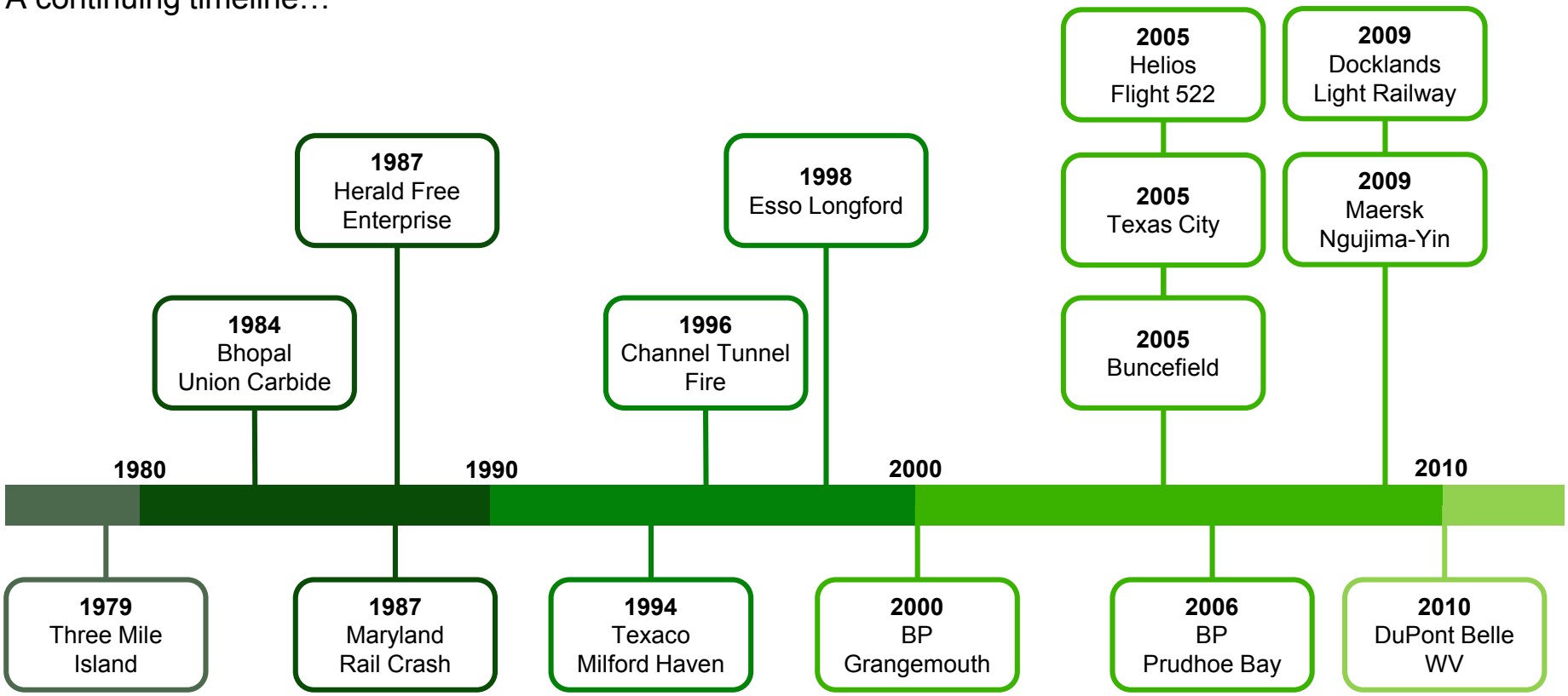
In this presentation

- The continuing timeline of incidents
  - Increasing costs and public expectations
- How far have we come - really?
- Legislation guidance and standards - update
- Technology developments and the human in the loop
- Challenges and case study examples
  - Existing systems
  - New build
- The ABB vision
- Future trends
- Conclusions

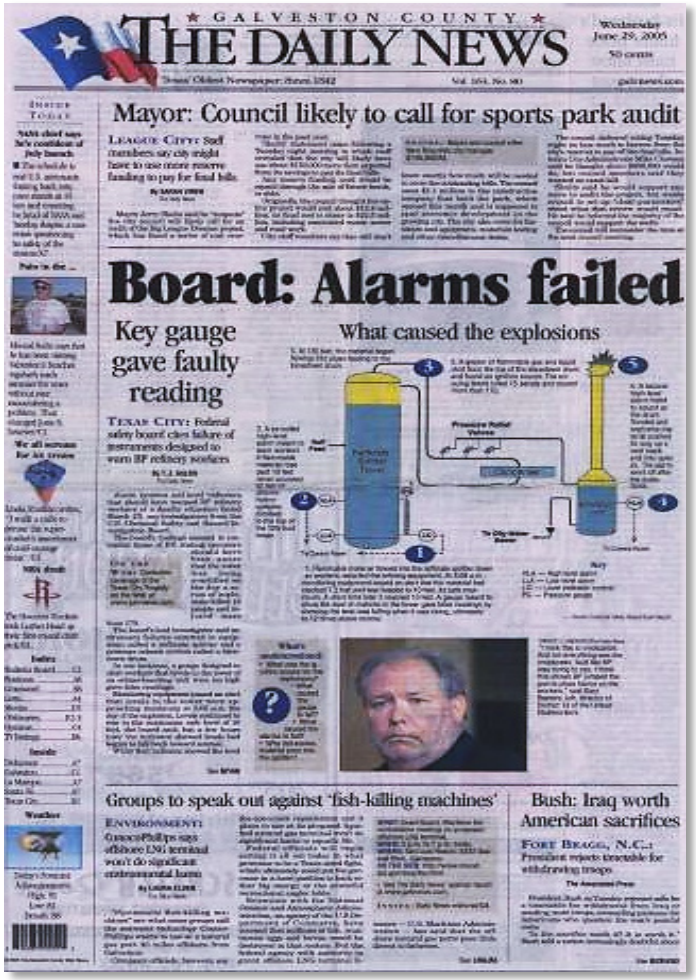
Why do alarms need to be controlled?

Alarming performance?

A continuing timeline…



What used to be press headlines
Texas City 2005



GALVESTON COUNTY

THE DAILY NEWS

Wednesday
June 29, 2005
50 cents

Mayor: Council likely to call for sports park audit

League City staff members say city might have to use more reserve funding to pay for final bills.

Board: Alarms failed

Key gauge gave faulty reading

Texas City: Federal safety board cites failure of instruments designed to warn BP refinery workers

What caused the explosions

Groups to speak out against 'fish-killing machines'

Environment: ConocoPhillips says offshore LNG terminal won't do significant environmental harm

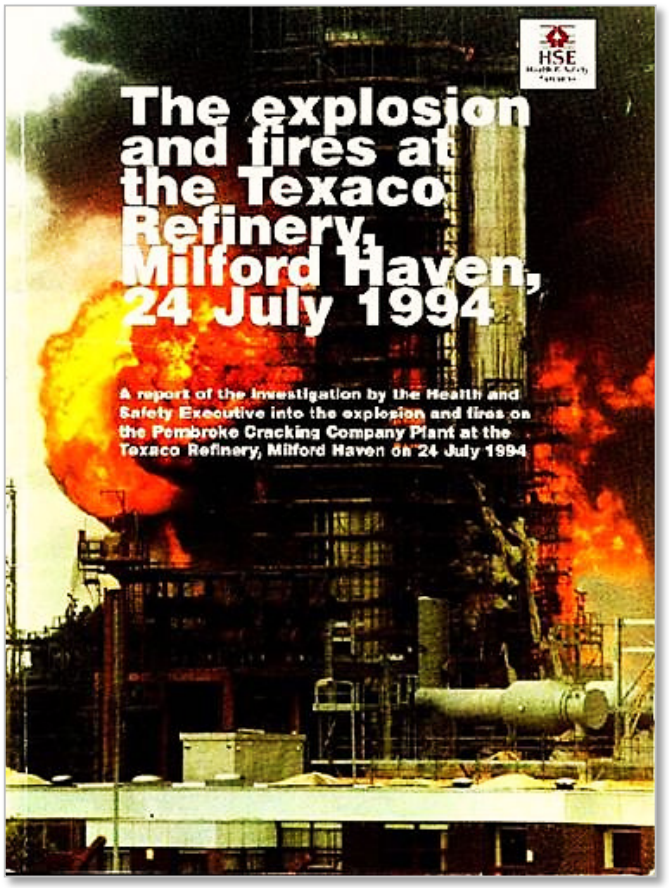
Bush: Iraq worth American sacrifices

Fort Bragg, N.C.: President rejects timetable for withdrawing troops

Is now 24/7 news feed
Deepwater Horizon 2010

Alarming performance?

TEXACO MILFORD HAVEN 1994



MAERSK NGUJIMA-YIN APRIL 13TH 2009

Extract from HSE investigation report

- Control panel graphics did not provide necessary process overviews.
- Excessive number of alarms in emergency situation reduced effectiveness of operator response

Alarming performance?

TEXACO MILFORD HAVEN 1994

FPSO compressor damage

MAERSK NGUJIMA-YIN APRIL 13TH 2009

Extract from DMA report

...other important findings about equipment...included:

- Alarm overload in the control room (up to 3605 per day and typically in excess of 300/day)
- Poor control room screen ergonomics, leading to delays in diagnosing the causes of alarms

Maersk Ngujima-Yin April 13th 2009

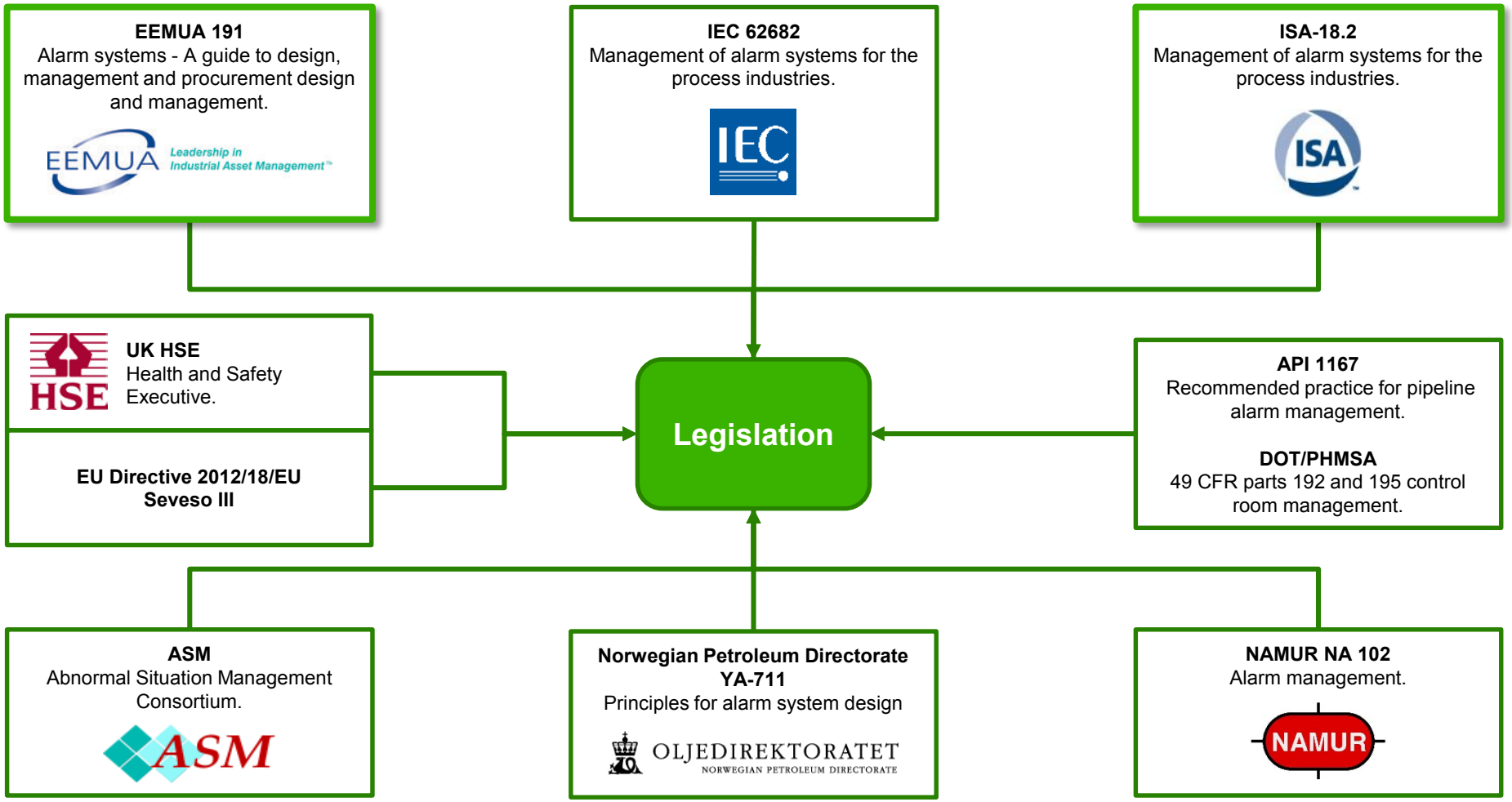
- Operating in the Vincent Field off the cost of North West Australia, Nigaloo National Park
- Vessel originally build in 2000 and served as a VLCC until Sep 2007. Rebuilt in Singapore. In Jun-Jul 2008 the vessel was commissioned and commenced oil production

12.50 approximately on the 13th of April 2009 an explosion and subsequent fire occurred in the vessels gas compression module M60 due to a severe breakdown of a 3rd stage HP gas compressor.

No persons were injured by the explosion and fire or subsequently during the fire fighting.

1425 approximately the fire was contained while boundary cooling and vigilance was maintained until next day.

Legislation, guidance and standards....



EU - Seveso III

Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012

on the control of major accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC

Annex III (b)

...information on the safety management system and the organisation of the establishment...

(iii) operational control - adoption and implementation of procedures and instructions for safe operation, including maintenance, of plant, processes and equipment, and for **alarm management** and temporary stoppages; taking into account available information on best practices for monitoring and control, with a view to reducing the risk of system failure; management and control of the risks associated with ageing equipment installed in the establishment and corrosion; inventory of the establishment's equipment, strategy and methodology for monitoring and control of the condition of the equipment; appropriate follow-up actions and any necessary countermeasures;

US DOT / PHMSA 49 CFR 195 & 192

49 CFR 192.631 Hazardous Liquids

49 CFR 195.446 Natural and other Gas

Control Room Management (CRM)

Effective February 1st 2010

Implementation deadline (most provisions) August 1st 2011

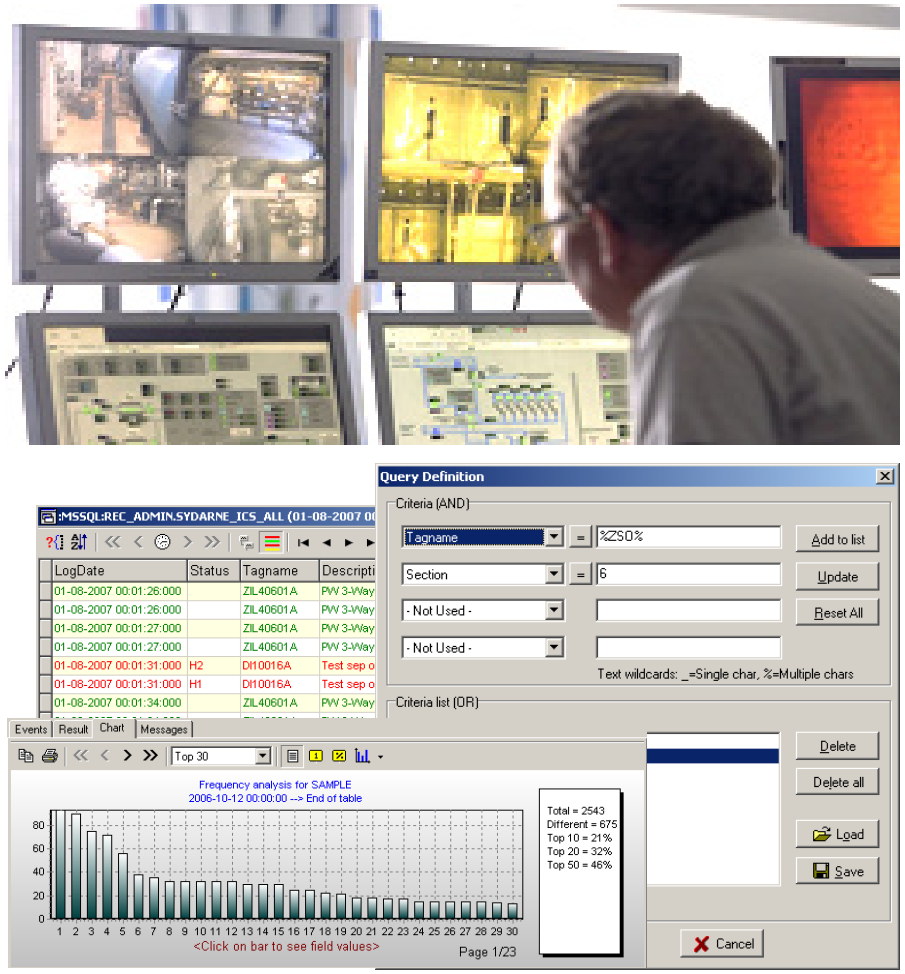
Alarm management Implementation deadline August 1st 2012

Requirements

Alarm management plan which includes:

- Reviews of safety related alarm operations
- Records of points affecting safety off-scan / inhibited / generated false values / manually forced
- Annual review / verification of:
  - Safety related setpoint values and alarm descriptions
  - Content / volume of controller activity
- Annual review of plan

What has improved...



Technology developments have facilitated

- HMI improvements
  - Enhanced graphics (e.g. right click for Alarm Help)
  - Task based displays for support in abnormal situations
  - Use of audio and visual cues to indicate alarm priority
- Application of enhanced and advanced alarm methods
- Development of tools and facilities e.g.
  - Filtering of alarms by area/ priority
  - Alarm logging and reporting
  - Alarm analysis

What have we neglected?

In moving from this……

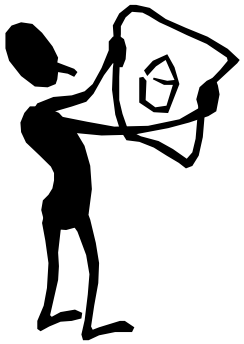
……to this

We have focused on the technology

We are still convinced that the more alarms we have - the better protected is the plant

We have lost sight of "the human in the loop"

Back to first principles....



What is alarm management for?

From Wikipedia

Alarm management is the application of human factors (or ergonomics as the field is referred to outside the U.S.) along with instrumentation engineering and systems thinking to manage the design of an alarm system to increase its usability.

Australia Workcover

"fitting the work to the worker"

Existing systems
The challenges

Most owner / operators are now aware

- They may understand the problem
  - But do not necessarily see the solutions

Some are spending a great deal (time/ money) to achieve “compliance”

Some efforts are stalling

Often the solutions are more about ways of working than technical / system changes

e.g. Nuisance alarm management

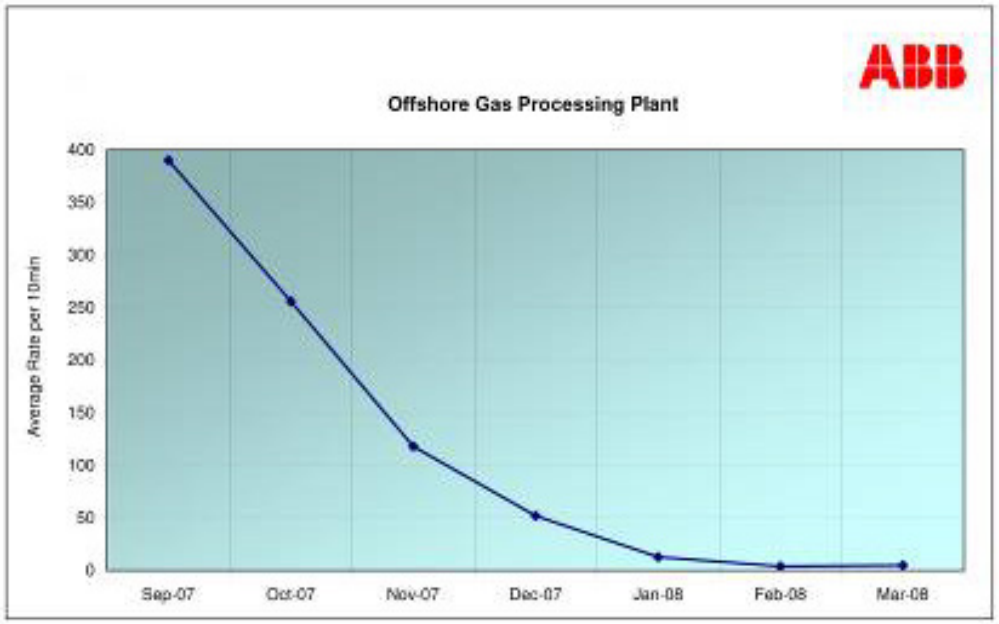
Larger tasks require careful scoping and planning - may seem to require man-years of effort

- Consider options for tasks such as alarm rationalisation
- If tackling alarm floods start with “low hanging fruit”

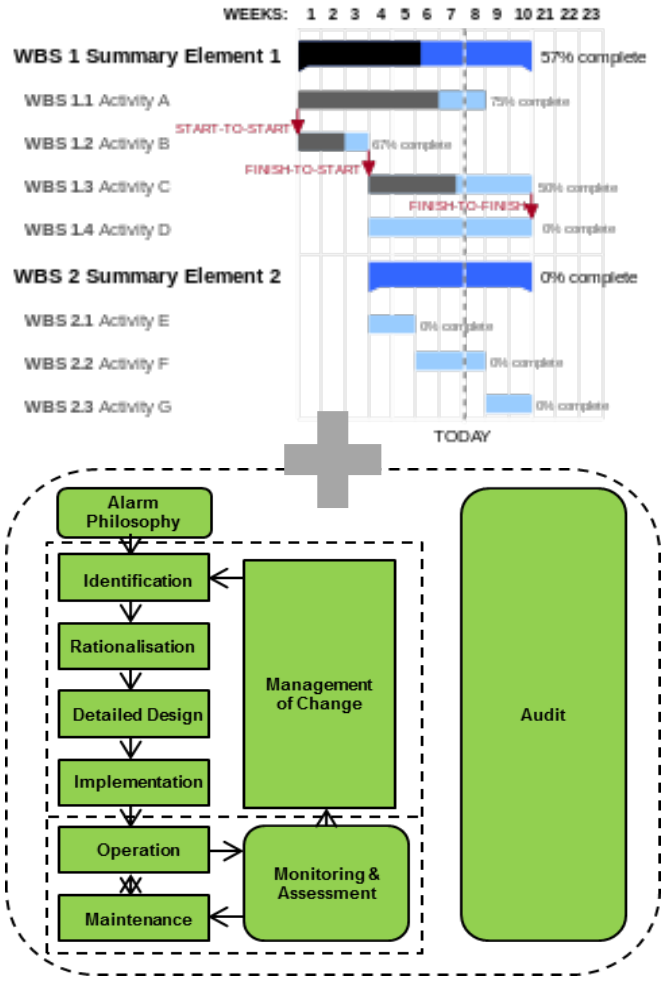
Existing system project
As described by one of our clients...

Rashid Petroleum Company (Egypt)

"**This is what success looks like**. WDDM alone had 6 trips in 2008 compared to 25 in 2007, and 17 in just the second half of 2006. This has a **significant business value**".



Greenfield projects
The challenges



Most owner / operators are now aware

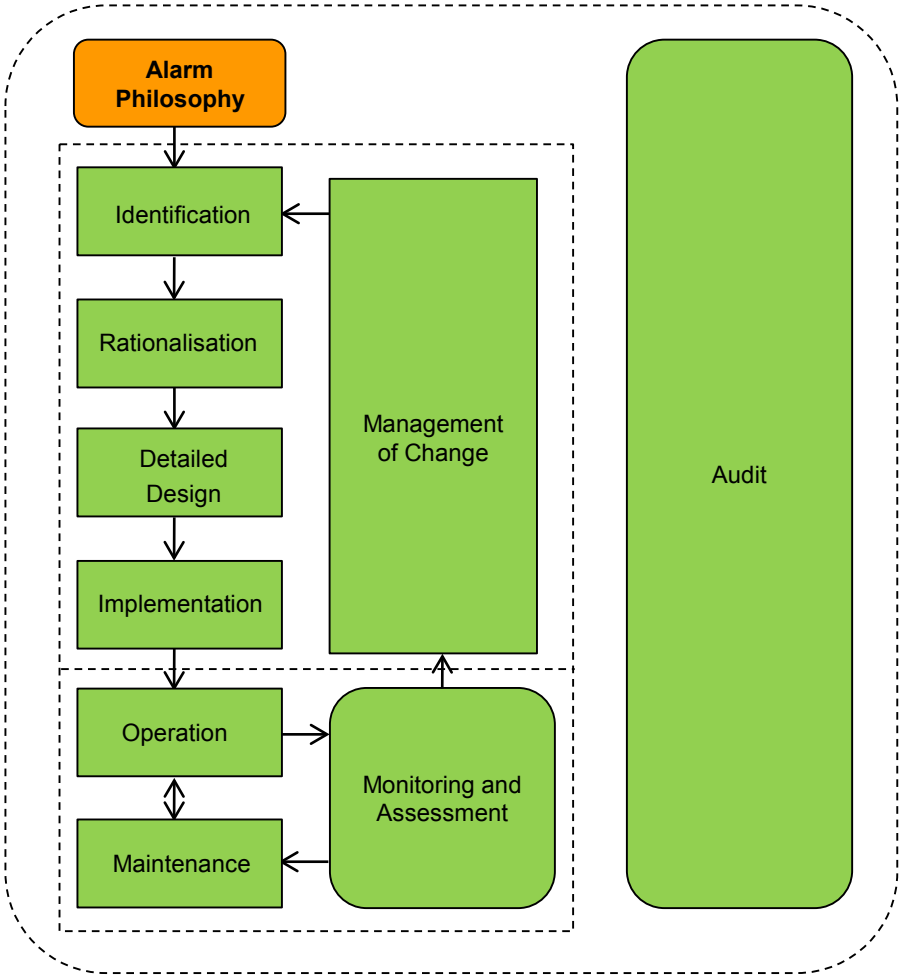
- that they should address alarm management before handover to operations

Many are doing alarm reviews to rationalise alarms

Most have yet to integrate the alarm management lifecycle into their project lifecycle

= ?

Greenfield projects
The challenges

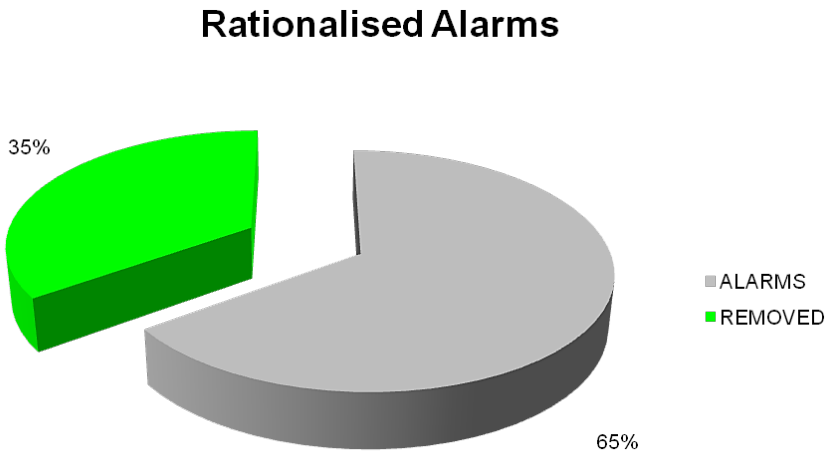


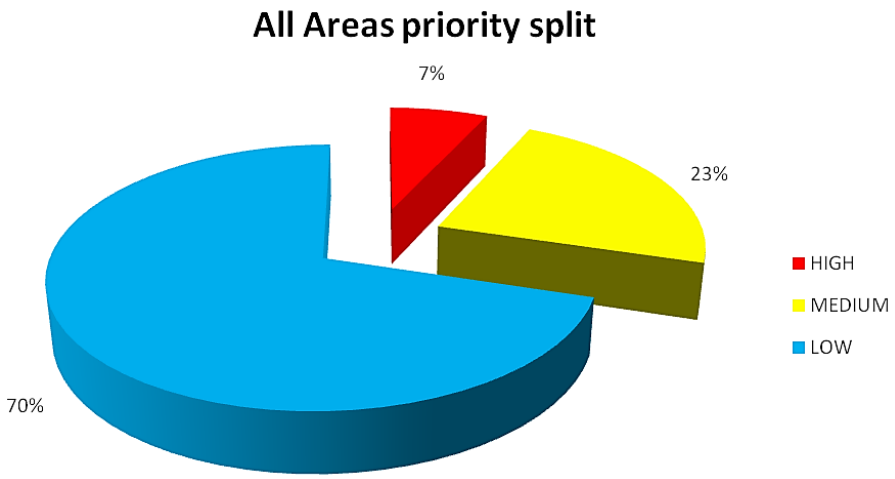
Most projects have an alarm philosophy

The challenge is the **implementation**

- What is the impact on those involved in the project?
  - EPC/ ICSS supplier package vendors
- How is the alarm philosophy to be communicated?
  - Timely communication is vital
- How does the master alarm database work with standard project tools?

Greenfield Project example

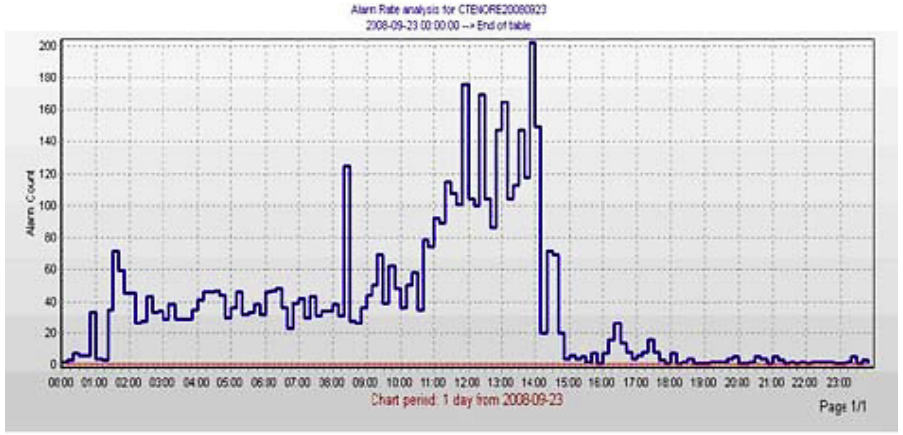




Series of alarm reviews held post Hazard studies and LOPA

- Alarm philosophy enhanced with alarm ‘rules’ agreed for current and future system design
- Over 35% of proposed alarms agreed as not ‘good’ alarms
- 78% of alarms proposed for ICSS removed
- All alarms prioritised on same basis
- Detailed alarm responses documented for all alarms
  - For download to ICSS (alarm help)

Success factors



What distinguishes the successes?
- those who are getting it right

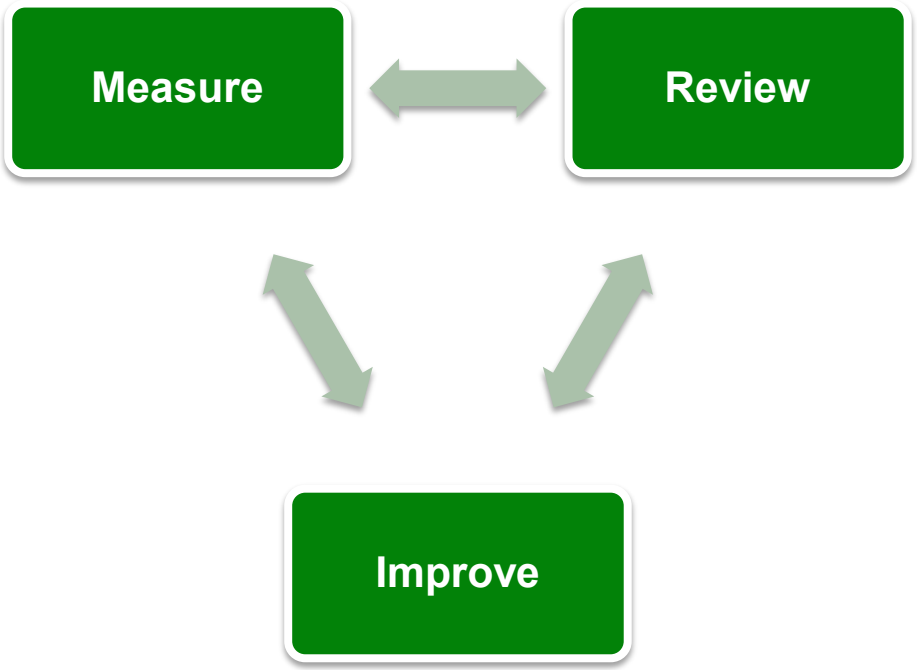
- Focus on operator (not on technology)
- Team / multi discipline approach
- Lifecycle framework
  - Essential for holding the gains
- Local champion
  - Ensures benefits identified and maintains momentum

Alarm management
The ABB vision

A lifecycle approach:

The main elements

1. Management responsibilities (who does what?)
2. Control of design and development
3. Testing
4. Measuring performance
5. Training and competence
6. Review and continuous improvement

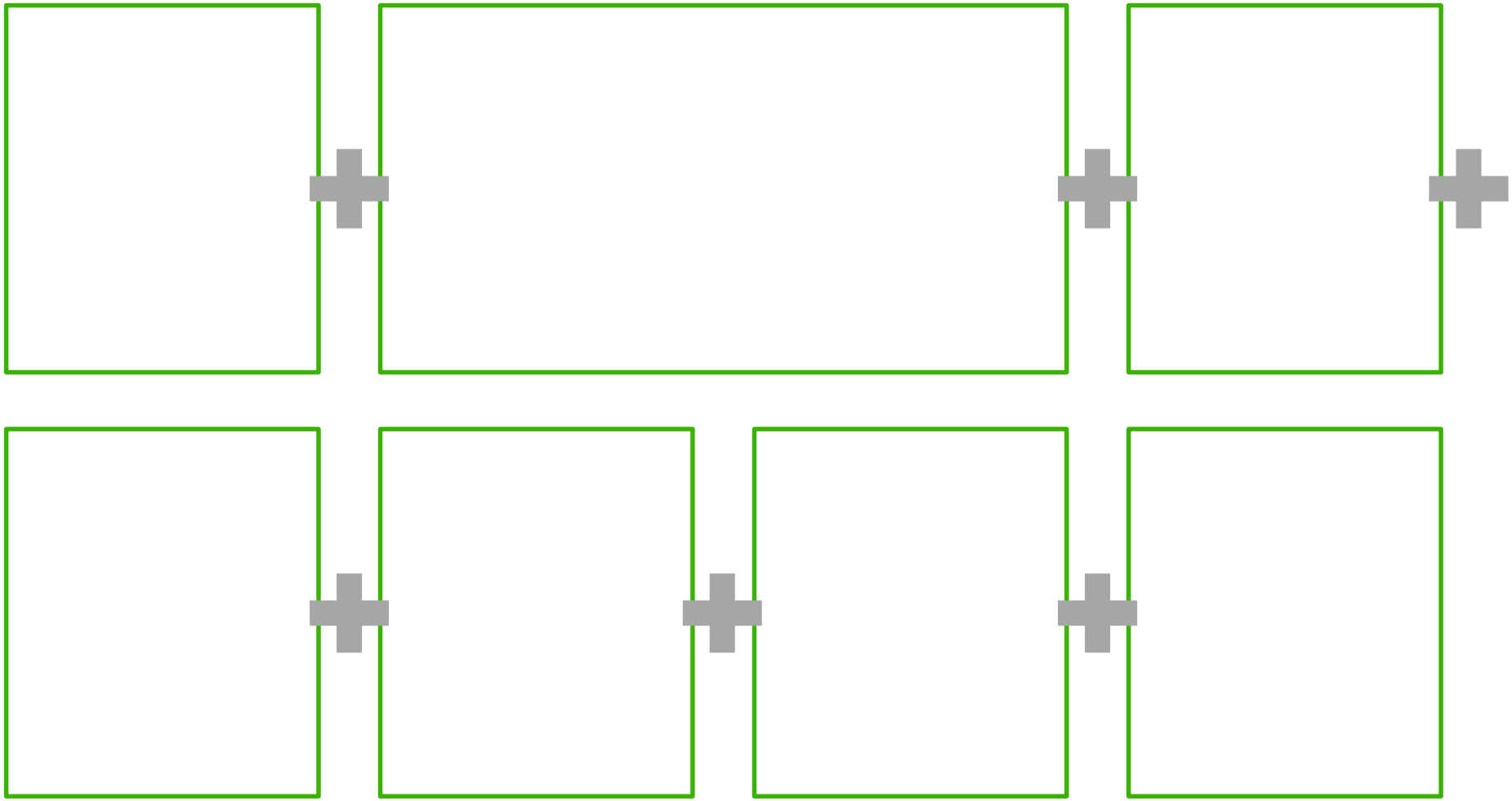


The virtuous circle
Very similar in a number of respects to quality management
- an ongoing framework is needed

Typical service components...

- Gap analysis / scoping study ‘AM benchmark’
- Training
  - Public training events
  - Client customised training
- Improvement and rationalisation projects
  - Alarm logging and analysis
  - Alarm system documentation / procedures
  - Rationalisation reviews
- Continuous improvement
  - Facilitation / coaching to establish process
  - Remote expert support / analysis

Service offering example
Benchmark (alarm management health check)



Service offering example - Benchmark (“AM Health Check”)

- Operational control system

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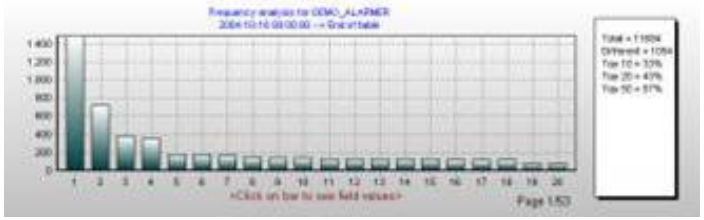

- Detailed analysis of alarm system statistics.

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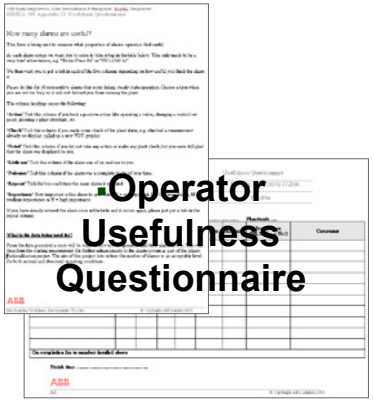

- Operator Usefulness Questionnaire
- Document
- Spreadsheet

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- Operator Interviews
- Document

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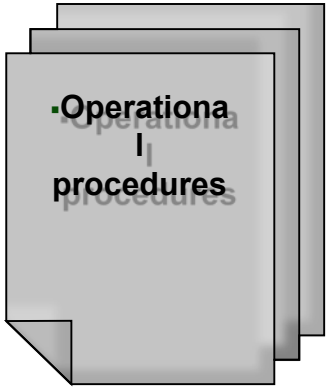

- Operational procedures

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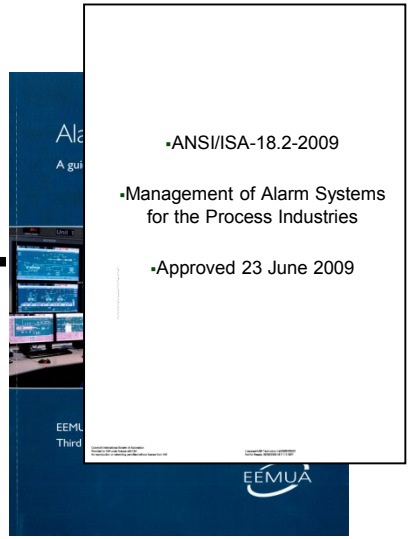

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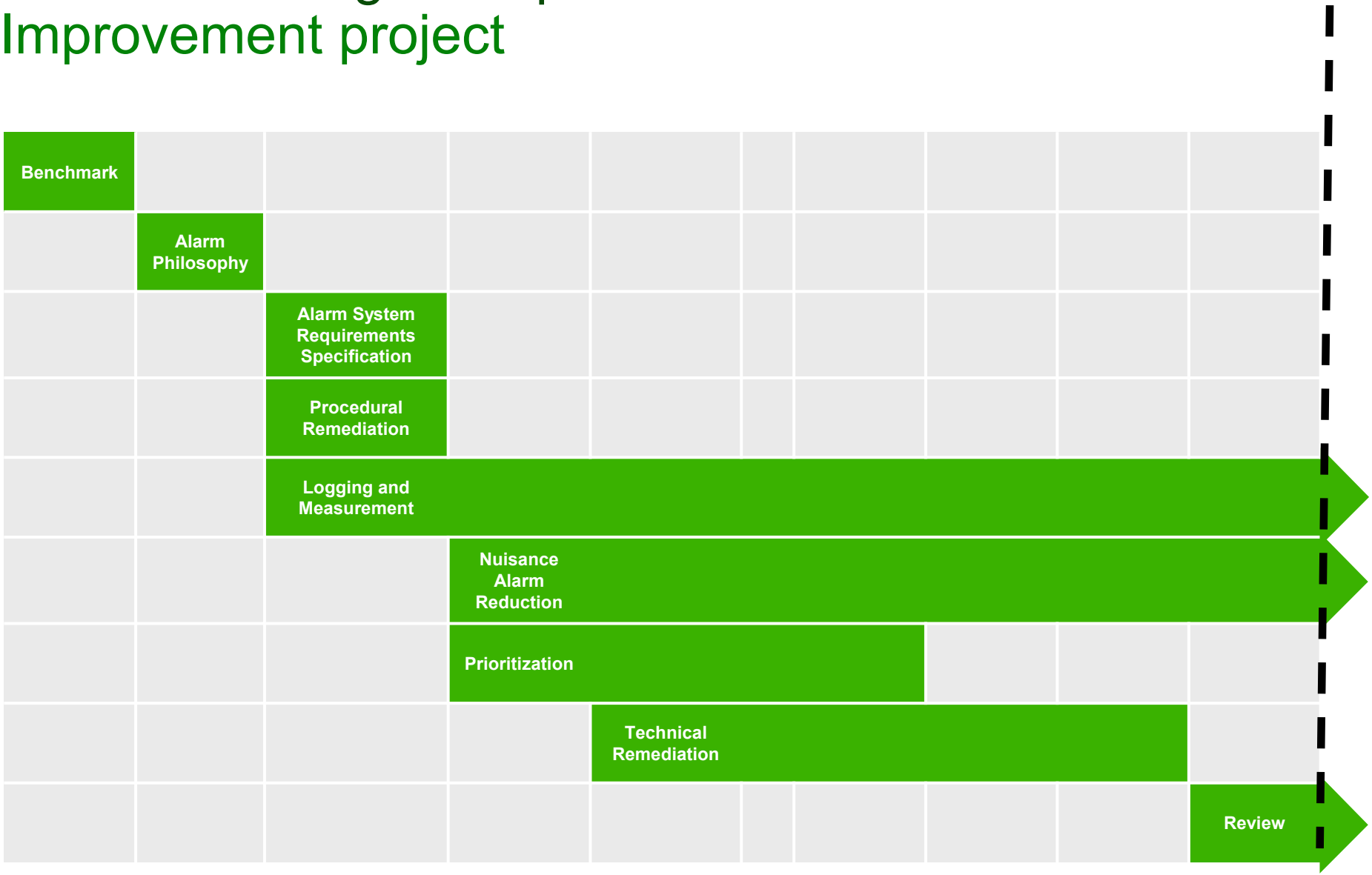
- Analysis of previous incidents and learning events.

Service offering example
Improvement project



Recent developments....

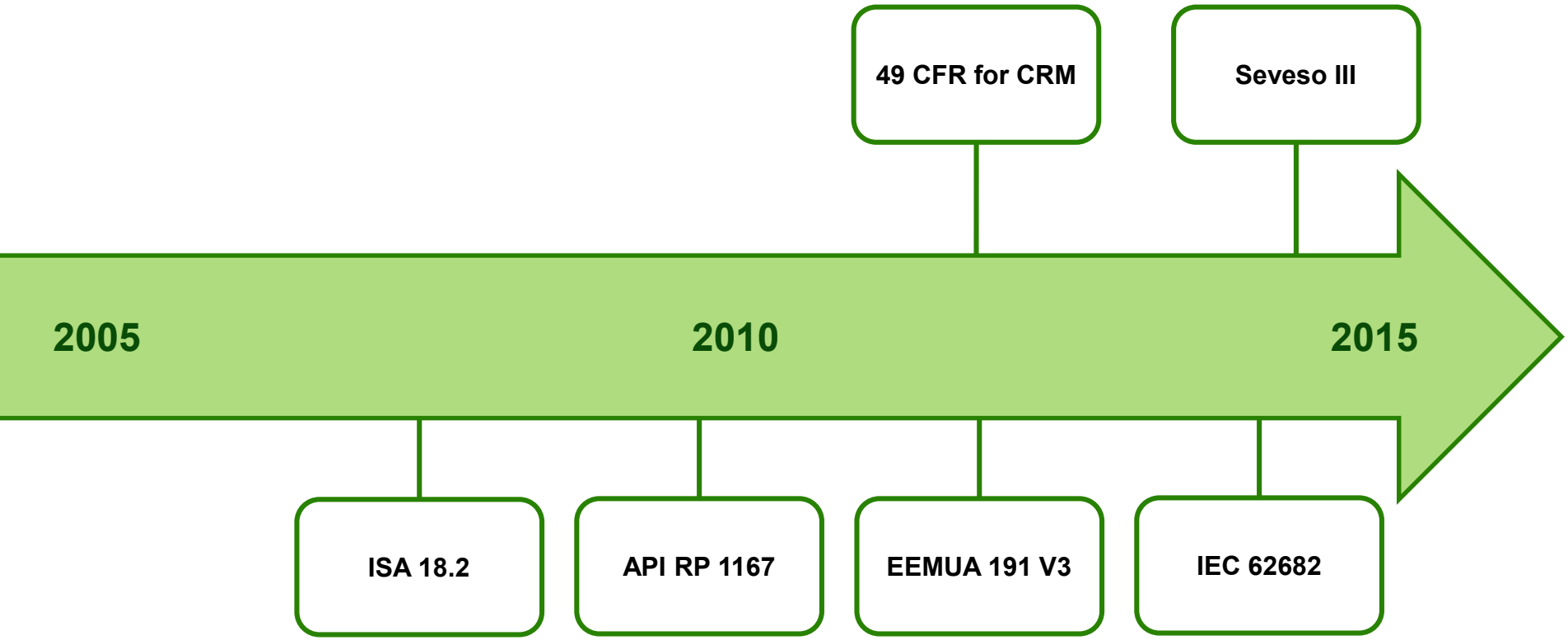
IEC 62682

Management of alarm systems for the process industries (published October 2014)

Finally an international standard:

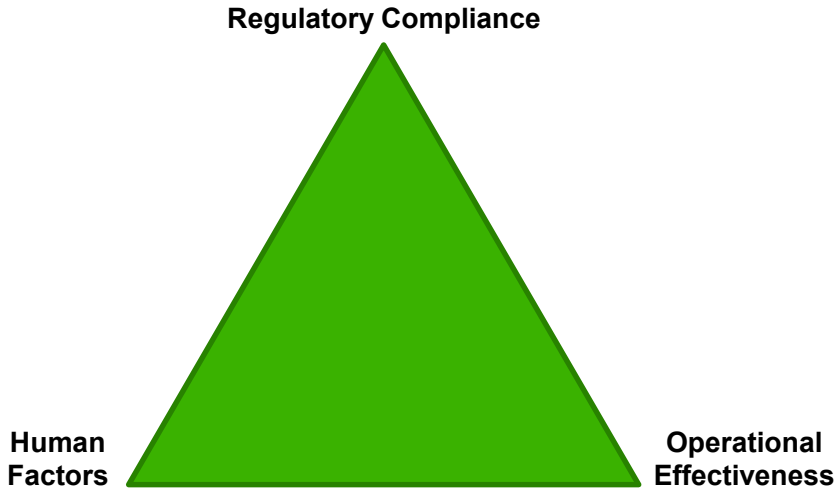
- Based on ISA 18.2 lifecycle concept
- Will give us all a common framework and common language
- Clearly identifies requirements as well as recommended good practice
  - Now we can truly aim for compliance
  - Should facilitate improved understanding between supplier and owner / operator
- Complements IEC 61511
- Can be supported by application of EEMUA 191 guidance

More future trends....



With all this activity in terms of legislation and standards, we should expect the focus on alarm management to continue

Conclusions



The focus needs to move from technology improvements back to the strengths, constraints and needs of the mark I human operator.

The advent of IEC 62682 is prompting a move to more specific requirements and expectations for good practice

Those who reap the range of benefits of effective alarm management will be those who embrace and apply alarm management in the context of operational human factors

My favorite quotes…

"Operator focus changed from servicing alarms to servicing the process and equipment"

Simon Babb, ConocoPhillips

"If you think safety is expensive, try an accident"

Dr. Trevor Kletz

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