

ASM Overview EPRI Meeting

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ASM Consortium Vision

- The ASM improves the safety, reliability and efficiency of process plants by
 - Sharing in investments to lower cost
 - Non-competitive collaboration
 - Bridging research into development and deployment of solutions for plant operations



Leading and influencing industry



A Joint Research and Development Consortium

Founded in 1994

Creating a new paradigm for the operation of complex industrial plants, with solution concepts that improve Operations' ability to prevent and respond to abnormal situations.

ASM Principles

- 1. Not by technology alone
- 2. People play a major role in avoiding or mitigating plant upsets
- Systems should be designed for the abnormal not just normal
- 4. Systems should be designed for adaptation

www.asmconsortium.org



Abnormal Situation Management® Consortium



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Early Findings

Initial studies showed that improvement opportunities are wide ranging

- Management policies and practices
- Operator capabilities and training
- Equipment design and maintenance
- Control system capabilities, design and maintenance
- Control room design
- Intra/inter team collaboration
- Operating procedures
- Operating within limits

No one company can solve it all, need a holistic approach



Industry Challenges

Safety

Protect People, Assets and Process



Billions lost per year in Petrochem Industry

Reliability

Improve Availability Reduce Downtime



Millions lost per year due to unplanned production losses

Efficiency

Improve Productivity Reduce Cost



Fewer people can make better decisions, faster



What is an Abnormal Situation?

- An industrial process is being disturbed and the automated control system can not cope...
- Consequently, the operations team must **intervene to supplement** the control system.
- Impacts profitability in multiple ways:





Fundamental ASM Problem

The Paradox of Automation...

- Better automation leads to more sophisticated processes
- More sophisticated processes leads to more opportunities for error
- We "fix" the increasing errors with still more automation

When things go wrong, people have difficulty intervening to correct the problem!

Poor User Centered Automation!



Unexpected Events Cost 3-8% Capacity





Moving Forward





How Important is the Problem?



Texas City Incident

15th Body Pulled from Refinery Rubble By KEVIN MORAN Copyright 2005 Houston Chronicle

TEXAS CITY - The only worker still missing after the explosion of BP's Texas City refinery was found dead in the plant's rubble today, bringing the death toll to 15. At least seven other blast victims, meanwhile, are fighting for their lives in hospitals.



The report identified numerous failings in equipment, risk management, staff management, working culture at the site, maintenance and inspection and general health and safety assessments.

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The Pembroke Accident



An HSE report quotes:

• 275 alarms in the 11 minutes before the explosion

• " ... warnings of the developing problem were lost in the plethora of instrument alarms triggered in the control room, many of which were unnecessary and registering with increasing frequency, so operators were unable to appreciate what was actually happening ..."

Too Many Alarms Can Contribute to Incidents



Human Factors are at the core...

42% of Abnormal Situations People Related

ASM Consortium Research



 "In systems where a high degree of hardware redundancy minimizes the consequences of single component failures, human errors may comprise over 90% of the system failure probability."

"A Manager's Guide to Reducing Human Errors" API Publication 770, March 2001

"Human failures are responsible for up to 80% of all types of accident"

UK Health & Safety Executive (HSE) Human Factors Briefing Note No. 1 Introducing Human Factors



Tendency to 'Blame' The Operator



To help the Operator – you need to understand the problem!

Humans and Computers

"Blink"

Humans are good at:

- "Recognition"
- Pattern recognition
- Troubleshooting
- New situations

"Think"

Computers are good at:

- "Cognition"
- Vigilance tasks
- Repetitive tasks
- Fast response to defined situations
- Automated procedures



Factors in Complacency

- Discounting risk
- Over-relying on redundancy
- Unrealistic risk assessment
- Ignoring low-probability, high-consequence events
- Assuming risk decreases over time
- Ignoring warning signs

Learn from past incidents.... Don't make the same mistakes...



Management Responsibility

- Most mistakes are committed by skilled, careful, productive, well-meaning employees.
- Rather than blaming the individual involved attempt to identify the root causes of the error in the work situation and implement appropriate corrective actions."

"A Manager's Guide to Reducing Human Errors" API Publication 770, March 2001

Operators need better tools, training and leadership!

Expertise is <u>critical</u> when automation fails





ASM Consortium – Organization Structure

- Leadership
 - Strategy, investments, Consortium operations
- Research
 - Linked with Academia and Honeywell Labs, plan and execute research initiatives
- Development and Deployment
 - Linked with Honeywell Process Solutions, direct funding, provide feedback, test and deploy product solutions
- Communications
 - Create, publish and deliver internal and external resources and tools to further the ASM Consortium goals

~\$2.5 M invested by members 2009
>\$50M invested over life of Consortium

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Structure



ASM Information and Reports Available to Members



ASM Seven Practice Areas

- Abnormal Situation Understanding
- Management Structure & Policy
- Training and Skill Development
- Communications
- Procedures
- Control Room and Field Environment
- Monitoring, Control and Support Applications

ASM = <u>Prevention, Detection, Mitigation</u> of Abnormal Situations



ASM Consortium - Improving Safety

Safety

Protect People, Assets and Process



Billions lost per year in Petrochem Industry

Addressing Alarm Flooding

- Purpose: Design and evaluated new displays for operators during alarm flood situations
- IP Generated: Two patent applications filed based on 2007/2008 display designs
- Product Implications: Productization in Experion will start in 2009; technology transfer started in Q4 2008

Root Causes of Abnormal Situations

- Purpose: Identify common failures and causes of abnormal situations
- IP Generated: One disclosure filed covering analysis method and work process
- Product Implications: Supports need for products like UniSim (training, leadership), Operations Management (task communication, coordination), ProcOps (procedure enforcement), ASM guidelines

ASM Research Project Examples



ASM Consortium - Improving Reliability

Reliability

Improve Availability Reduce Downtime



Millions lost per year due to unplanned production losses

Evaluation of Structured Shift Handover (2008/2009 Project)

- Purpose: Quantify benefit of structured approach to shift handover
- IP Generated: None yet (likely in 2009)
- Product Implications (in 2009): Requirements and electronic checklist design for Operator Logbook

Interaction Requirements and Effective Display Design (2008/2009 Project)

- Purpose: Quantify value of interaction requirements methodologies/overview displays
- IP Generated: None yet (likely in 2009)
- Product Implications (in 2009/2010): No direct product implications but provides projects/services organization input on the value of using interaction requirements during operator display design projects

ASM Research Project Examples



ASM Consortium - Improving Efficiency

Efficiency

Improve Productivity Reduce Cost



Fewer people can make better decisions, faster

Low vs. High Fidelity Simulators

- Purpose: Investigate the value of low/ high fidelity simulators for process control training
- IP Generated: None
- Product Implications: Provides use cases, requirements, and information on value proposition for UniSim
- Case Studies



Other ASM Research Program Activity

- ASM Research Roadmap
- ASM Research History
 - Over 200 projects completed over life of ASMC
 - Results members can use now and implement for advantage
- 2009 Funded Projects
 - Interaction Requirements and Effective Display Design (2008 project continuation)
 - Operator Evaluation of Visual Thesaurus Objects
 - Evaluation of Structured Shift Handover
 - Addressing Alarm Flooding
 - Interactive Analysis of Alarm System Improvements
 - Effective Operations Team Leadership
 - Procedure Execution Failures During Abnormal Situations
 - ASM Research Test Bed



ASM Product Development & Deployment

- Procedural Operations
- Early Event Detection
- <u>Human Machine Interface DCS Improvements</u>
- <u>Alarm Management Tools</u>
- Asset Management Tools
- Operator Station Furniture
- <u>Scouts</u>
- Handheld Mobile Tools
- Shape Library Solution Pack
- Process Optimization Software
- Operator Simulation Training
- Project/Solutions Deployment Improvements
- <u>ASM Analysis Audit, Site Studies, Benchmarking</u>

Honeywell invests in and develops products based on ASM input!

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ASM Communication

- Maintain a public website <u>www.asmconsortium.org</u>
- Develop Operation Outreach activities
 - Webinars, training and events to improve ASM Learning's
- Publish papers at relevant conferences
- Maintain, publish and sell guideline books:
 - Effective Operator Display Design 2008
 - Effective Alarm Management Practices 2009
 - Effective Procedural Practices 2010
 - Effective Operations Practices 2010/11

ASM Changing "members only" paradigm Expect more publically available information!



Guideline Publications



-Guideline Books available on Amazon.com or Createspace.com



Examples: Case Studies



Advanced Alarm Management

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- Why focus on alarm system?
 - Allow operators to identify situations and act on them faster
 - Operators can focus on more productive tasks than acknowledging nuisance alarms

EEMUA Guidelines suggest 1 alarm/10 minutes



Advanced Alarm Management

• Irving Oil – Saint John, New Brunswick



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ASM Consortium Guidelines Effective Alarm Management Practices 2009

Benefit

- 45% decrease in average daily alarm rate
- Enhanced the refinery staff's response time

Improved operator productivity and safety!



Designed for ASM[®] Operating Displays

- NOVA Chemicals Corporation – Joffre, Alberta
 - 6 billion lbs of ethylene annually
 - 2 billion lbs of polyethylene annually



Benefit

- Solution Time: 35 48% faster
- Success Rate: 25% higher
- Save \$800,000 per year

Improved operator productivity and safety!



Advanced Alarm Management



Benefit

Reduced alarms from 1,200 an hour to 288 per day
Reduced trips – payback in one less trip per year

Improved operator productivity and safety!

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Summary

- ASM is a difficult problem.
- No one company or organization can solve all the issues.
- The potential for improved plant <u>safety, reliability and</u> <u>efficiency</u> is significant
 - ASM technology and practices improve operator performance for incident avoidance in abnormal situations
- ASM Public Website
 - www.asmconsortium.org

We see synergy with our efforts, do you?