Process Safety Audits and Inspections
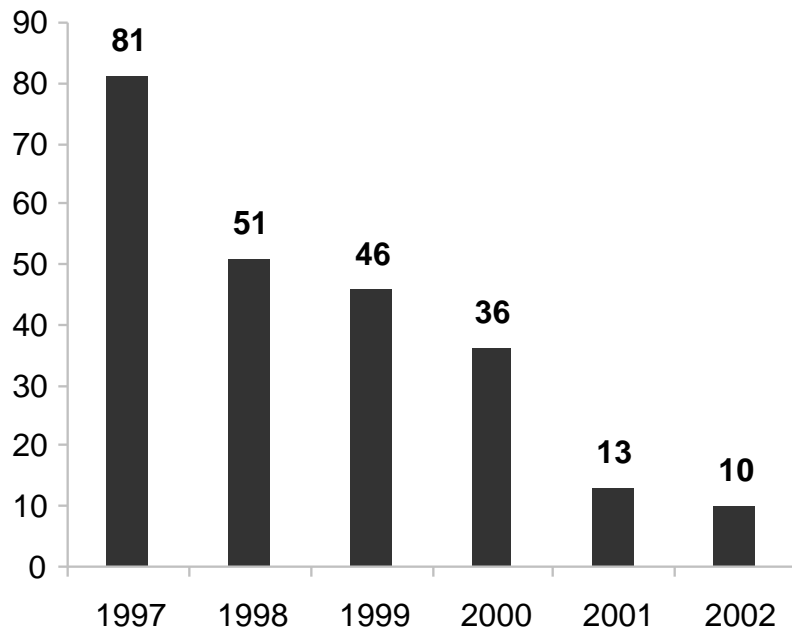
- What makes them successful and efficient?
Examples from the oil and petrochemical industry

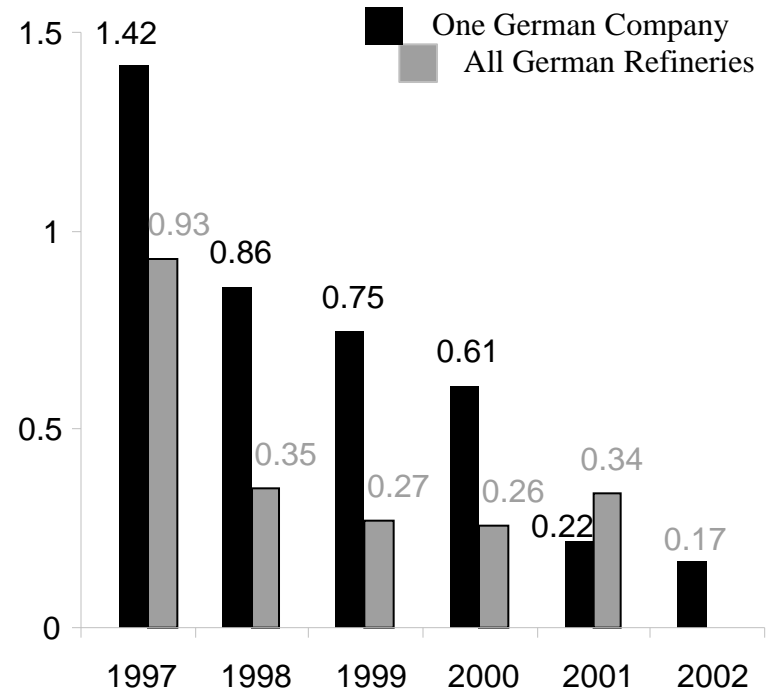**Jürgen Herrmann**

Warsaw, 12 October 2011

Jürgen Herrmann

DAFWC
(Days Away From Work Cases)

DAFWCF
(DAFWC per 200,000 hours worked)

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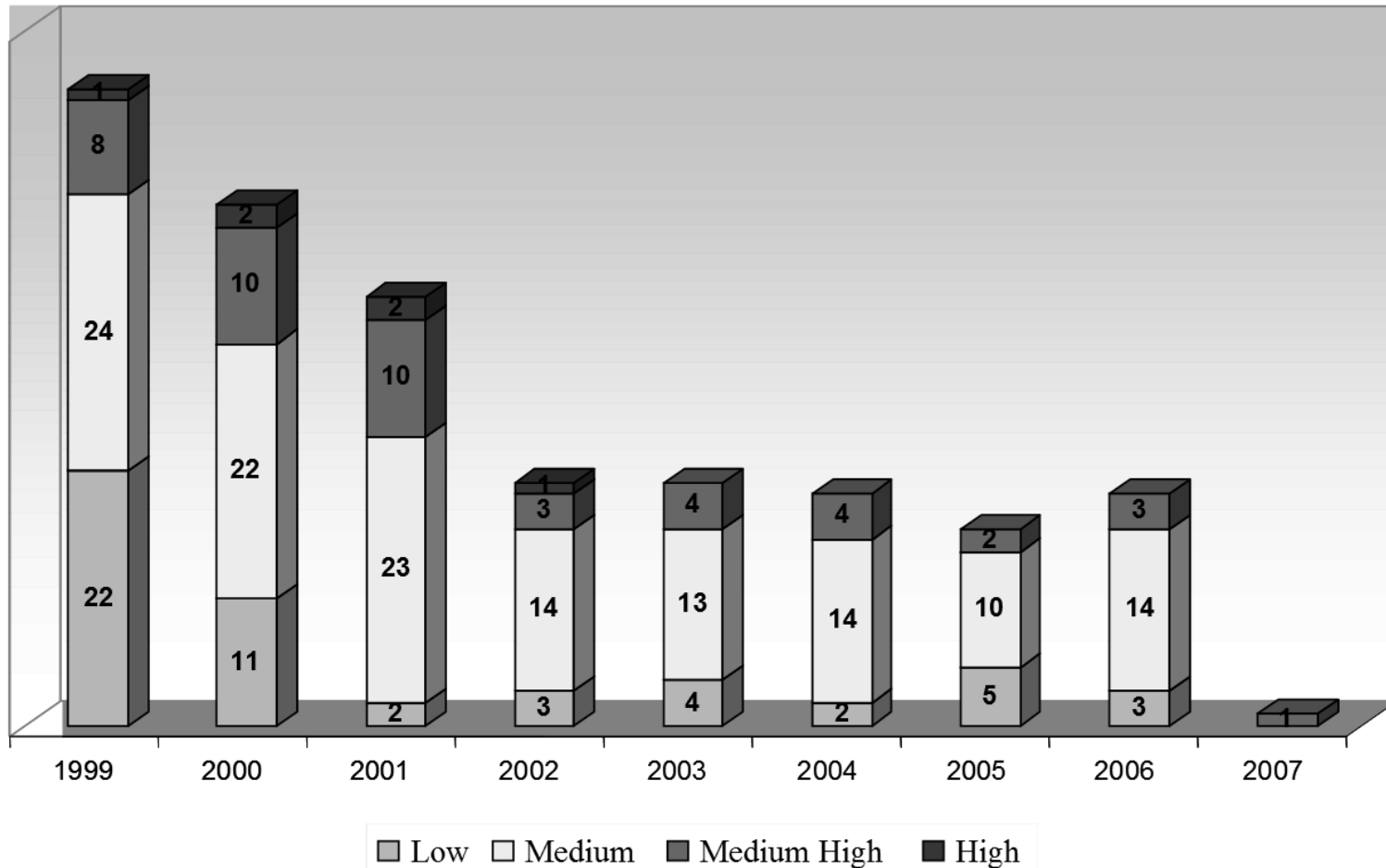
Skikda, Algeria
20th January 2004

Texas City US
23th March 2005

Buncefield UK
11th December 2005

Therefore a new and further improved audit process was established for a German refinery system in 2007

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- **Provide audit results which are based on facts and are comparable between different sites**
  - **Similar facts should result in similar findings (positive and negative)**
- **Support a thorough know-how exchange between different sites**
- **Improve process safety in a continuous and systematic way, in order to initiate and maintain a continuous improvement cycle for process safety**

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What are the prerequisites for the new audit process?

- **Open-minded site management and employees with an eagerness to learn and improve their own systems and processes**

- **Experienced and open-minded auditors (looking at audit findings from different angles & considering various aspects) with a broad and profound operating and expert know-how and different backgrounds; they should be widely accepted and respected by the audited site**

- **A cold-eye assessment of a site's systems and processes, especially concerning process safety**

- **One audit standard (one audit program and questionnaire) and audit process should be applied to different sites, which is fully accepted by the audited site**

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- **Experienced and open-minded auditors**

- **1 audit lead and up to 8 experienced auditors with operating, maintenance, process safety, environment and management background**

- **The 8 auditors are split into 4 independent teams, with each team covering 3 to 5 audit elements**

- **The audit teams evaluate all relevant systems and processes (management system verification) and verify their findings in the site and plants, looking for hard facts and interviewing people at different organizational levels (field verification)**

- **The audit process takes about 1 week**

- **The site gets preliminary feedback each day (orally) and a final presentation at the end of the audit**

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The process safety audit standard (OSHA PSM)

15 Elements of process safety build the basis of US 29 CFR §1910.119

1. Process Safety Management System
2. Employee Participation
3. Process Safety Information
4. Process Hazard Analysis
5. Operating Procedures
6. Training
7. Contractors
8. Pre-Startup Safety Review
9. Mechanical Integrity
10. Safe Work Permits
11. Management of Change
12. Incident Investigation
13. Emergency Planning & Response
14. Compliance Audits
15. Trade Secrets

- The OSHA PSM Standard is internationally accepted
- The Standard elements are detailed and well-explained
- The questionnaire gives clear guidance
- The audit standard, process, questionnaire and other details (e.g. requirements on the audit team) are explained in great detail
- See e.g. LITERATURE

Thus the standard is clearly defined and guarantees identical application by different auditors at different sites!

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Management system verification (paper work)

- **Determine what mechanisms (e.g. policies, procedures) exist to obtain and maintain up-to-date information on:**
  - technology (e.g. process flow diagrams, process chemistry, maximum inventories, safe operating limits)
    - Where is this information located?
    - How is this information kept up-to-date?
    - etc …

Field verification (visiting plants & talking to people)

- **Confirm the location of the Process Safety Information …**
  - Can all of the material identified in the P&I be readily obtained?
  - Do employees know what the PSII is and where it is located?
  - Can employees locate the material that is identified in the P&I?
  - etc …

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What are the auditing criteria?

- **Priority 1 (P1) – Finding**
  - Non-compliance with the OSHA PSM audit protocol
    or
  - Non-compliance with the site's own practices, standards, procedures or systems
    or
  - Deviation from regulatory requirements

  finding
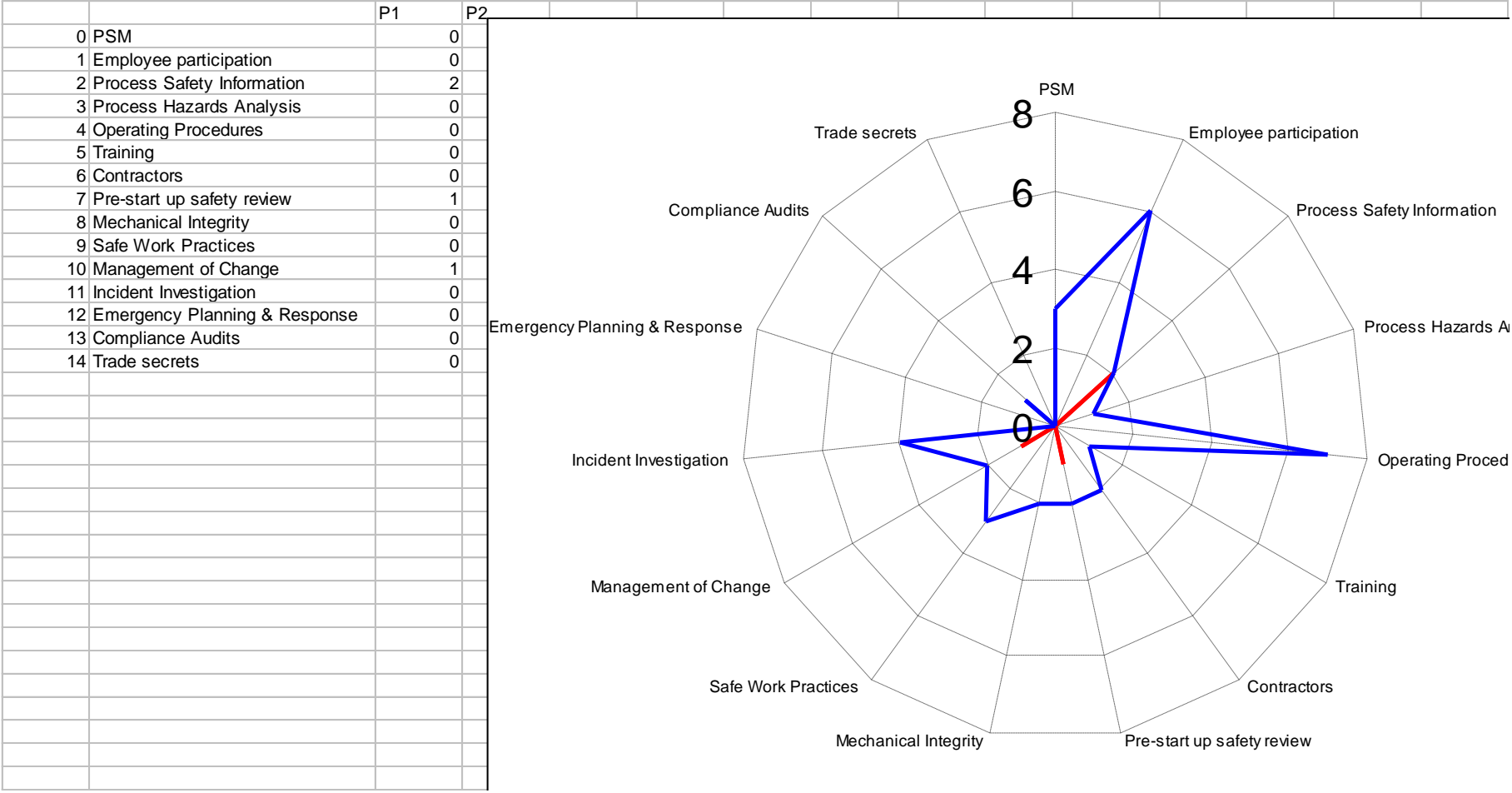
- **Priority 2 (P2) – Opportunity for improvement**
  - Represents minor cases of non-compliance
    or
  - Opportunities for further improvement of practices, standards, procedures or systems including compliance issues

  room for improvement

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		P1	P2
0	PSM		0
1	Employee participation		0
2	Process Safety Information		2
3	Process Hazards Analysis		0
4	Operating Procedures		0
5	Training		0
6	Contractors		0
7	Pre-start up safety review		1
8	Mechanical Integrity		0
9	Safe Work Practices		0
10	Management of Change		1
11	Incident Investigation		0
12	Emergency Planning & Response		0
13	Compliance Audits		0
14	Trade secrets		0

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	Element	Judgement	Findings P1 and P2
0	PROCESS SAFETY MANAGEMENT	(yellow)	3 opportunities for improvement (P2)
1	EMPLOYEE PARTICIPATION	(green)	6 opportunities for improvement (P2)
2	PROCESS SAFETY INFORMATION	(yellow)	2 findings (P1), 2 opportunities for improvement
3	PROCESS HAZARDS ANALYSIS	(orange)	1 opportunity for improvement (P2)
4	OPERATING PROCEDURES	(yellow)	7 opportunities for improvement (P2)
5	TRAINING	(green)	1 opportunity for improvement (P2)
6	CONTRACTORS	(green)	2 opportunities for improvement (P2)
7	PRE-STARTUP SAFETY REVIEW	(green)	1 finding (P1), 2 opportunities for improvement
8	MECHANICAL INTEGRITY	(green)	2 opportunities for improvement (P2)
9	HOT WORK PERMITS	(green)	3 opportunities for improvement (P2)
10	MANAGEMENT OF CHANGE	(yellow)	1 finding (P1), 2 opportunities for improvement
11	INCIDENT INVESTIGATION	(green)	4 opportunities for improvement (P2)
12	EMERGENCY PLANNING AND RESPONSE	(green)	no findings, no opportunities
13	COMPLIANCE AUDITS	(yellow)	1 opportunity for improvement (P2)
14	TRADE SECRETS	(green)	no findings, no opportunities

element established systematically	(green)
element established but not systematically	(yellow)
element not fully established and not systematically	(orange)
element not establihed	(red)

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- The site should consider documenting some of their general business processes in their Integrated Management System:
  e.g. process safety, risk management, site goals and evaluation of goals in order to embed all processes into one management system and to involve even more employees

- The site should consider exchanging the still existing PAAG procedures with their new HAZOP procedure, embedding the HAZOP into their Integrated Management System in order to streamline their risk management

- The site should consider putting more resources into their process safety department in order to shorten the timeline of their pending process safety activities

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What has the new audit process achieved?

- **It provides objective audit results**

  The use of 1 standard and 1 audit process
  provides the audit team as well as the audited site with
  a well-defined and reproducible audit scheme and framework

- **It supports a thorough exchange of know-how.**

- **People from the site get in close contact with the auditors and can discuss openly, and both can enter into a learning process**

- **A continuous improvement process for process safety is established, and often
  discussions during the audit lead to
  additional work issues and inter-site work groups trying to find
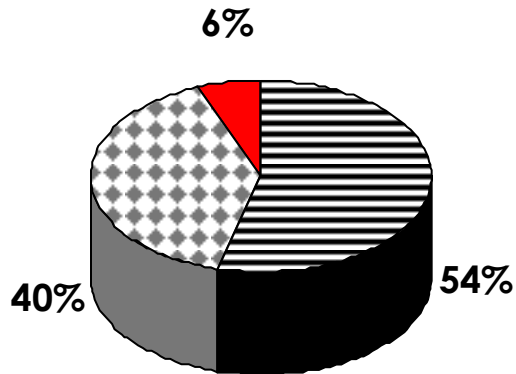 the best solutions or shared good practices for the different topics**

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What has the new audit process contributed from the employees' view?

Examples from an employee survey at a German site:
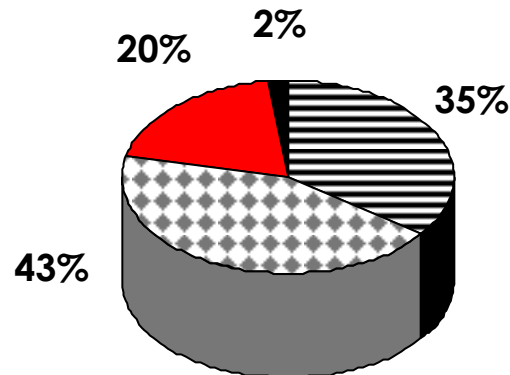
Management is committed to IMS

Answers:
54 % very positive
40 % positive
 6 % negative
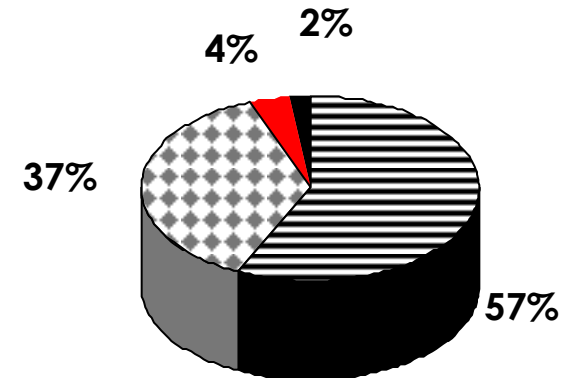
IMS contributes to better business results

Answers:
35 % very positive
43 % positive
20 % negative
 2 % very negative

Employees identify with HSSEQ goals

Answers:
57 % very positive
37 % positive
 4 % negative
 2 % very negative

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This is the personal view of the author!

- **A good working atmosphere between authorities and site management is essential**

- **Experienced auditors with a wide range of profound knowledge (and familiar with different legislation, legal frameworks and contexts) can be brought together from various federal states or countries**

- **One audit standard (one audit program and questionnaire, e.g. the OSHA PSM standard) can be used for different sites and countries**

- **In one period of time one site should be visited by one audit team only, and the corresponding audit should cover all relevant legal or mandatory aspects (e.g. only ONE audit for environment, occupational safety and process safety)**

Jürgen Herrmann

"Guidelines for Auditing Process Safety Management System"
by AIChE (CCPS)
2nd edition (New York, 2011)
John Wiley & Sons
ISBN 978-0-470-28235-9 (hardback)
900 pages!

… and of course the different standards and guidelines from AIChE, CCPS, etc.

… as an alternative the "International Safety Rating System (ISRS)" by Det Norske Veritas (DNV)

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