Proactively Manage Industrial Hygiene, Occupational Health, Hazardous Chemicals, and Environmental Aspects Using SAP EHS Management Risk Assessment

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Sr. Director Solution Management
Operational Excellence, EHS
Presentation Bullet Points

- A proactive risk assessment process will identify and prioritize areas for improvement to reduce EHS risk
- Both simple and complex risk assessments benefit from a unified approach
- Learn how to take a risk-based approach to Industrial Hygiene, Occupational Health, Hazardous Chemical Management, and Environmental Risk
Operational Excellence is a Top Executive Issue - Providing confidence to grow your business

Cost of a single industrial accident 10’s $Billion

Product recall 600 $Million in lost sales

Carbon tax makes the 20% variable energy cost even higher

While the world's GDP is around $46.6 trillion, the value of all assets is assumed to be much higher. Maintenance spend alone comes up to 447 $Billion.
Risk Assessment Solution
Proactively reduce risks to prevent incidents

- Comprehensive environment, health, and safety risk assessments
- Identify and manage hazards and controls
- Configurable analysis methods including graphical risk matrix, measurement comparison to regulatory limits, Job Hazard Analyses
- Industrial hygiene measurements, Similar Exposure Groups, Personal Exposure Profile
- Chemical safety information management
- Guided workflow processes for ease of use; integrated, workflow-enabled action management
- Powerful risk reporting and analysis; dashboards deliver decision-support information
Risk assessment is the process where you:

- Identify hazards.
- Analyze or evaluate the risk associated with that hazard.
- Determine appropriate ways to eliminate or control the hazard.

Canadian Center for Occupational Health and Safety
EHS Managers Already Use Risk Management

Example Standards and Guidelines

- **OHSAS 18001:**
  The most widely implemented standard for Occupational Health and Safety

- **ISO 14001:**
  The most widely implemented standard for Environmental Management

  by William H. Bullock and Joselito S. Ignacio.

- **NORSOK:**
  Norwegian Oil and Gas Standards.

- **COSHH:**
  British Health and Safety Regulations
Models for Operational Excellence

Swiss Cheese Model

Basic concept:
Put controls in place to prevent bad outcomes.

Continuous Improvement Model

Basic concept:
Some risk always remains. Keep trying to reduce it.
Managing safety: control hazards, reduce risks

**REQUIREMENTS-DRIVEN**
- regulatory requirements
- industry best practices & standards
- risk reduction programs

**EVENT-DRIVEN**
- observations
- audits
- incidents

**CHANGE-DRIVEN**
- new equipment
- new chemicals or materials
- new operating conditions
- automation

**SAP EHS Management**
Risk Assessment

**BARRIERS**

**CONSEQUENCE**

**SAP Management of Change**

**HAZARD**

**SAP EHS Management**
Incident Management
Risk Assessment
Process Description

Risk Assessment
Goals of process steps

- **Risk Identification:** What hazards, where, when, and who is affected
- **Risk Analysis:** Understanding the nature and level of a risk
- **Risk Evaluation:** Comparing the results of risk analysis with risk criteria to determine whether the risk and/or its magnitude is acceptable or tolerable
- **Risk Treatment:** The action(s) to prevent an unacceptable risk from causing adverse consequences. Includes improvement actions as well as recurring execution actions.
Simple Risk Assessment

1. Describe the risk in terms of what, where, when (Hazard & agent, location, operational status)
2. Document controls
3. Define tasks for controls
4. Rate the risk using the risk matrix

I think it is too loud when the crane is in operation. Maybe we should require people to wear hearing protection.
Medium Complexity Risk Assessment

1. Describe the risk in terms of what, where, when (Hazard & agent, location, operational status)

2. Analyze the risk using an analysis method
   Example – take exposure measurements and compare to an Occupational Exposure Limit and determine if it is in compliance

3. Document controls

4. Define tasks for controls

5. Rate the risk using the risk matrix

The noise level is 95 dB and the regulatory limit is 85. We must require people to wear hearing protection.
High Complexity Risk Assessment (part 1)

1. Describe the risk in terms of what, where, when (Hazard & agent, location, operational status)

2. Rate the inherent risk (with no controls in place)

3. Analyze the risk using an analysis method
   Example – take exposure measurements and compare to an Occupational Exposure Limit and determine if it is in compliance

4. Document controls

5. Define tasks for controls

6. Rate the initial risk using the risk matrix (with some controls in place)

7. Compare initial risk rating to goals to determine acceptability

8. Define tasks for risk reduction

9. Rate the residual risk (with improvements in place)
High Complexity Risk Assessment (part 2)

10. Continuously monitor the effectiveness of the controls (based on audits, inspections, incidents….)

11. Implement additional tasks based on results

12. Continue to complete recurring tasks

13. Periodically re-assess the risk (revisit all steps, incorporating any new information)

And also more complexity in determining appropriate controls and tasks, such as

- Using Similar Exposure Groups to determine which employees need medical monitoring such as a hearing test
- Using chemical safety data sheets to determine safety procedures
- Creating control questions for use in evaluating effectiveness

The inherent risk of hearing loss is high. We must make sure people are wearing hearing protection. And we need to try to install less noisy equipment.
Simple Risk Assessment Process

Risk Assessment

Identification
- Risk Identification
- Review / Edit Basic Information

Analysis
- Analyze/Quantify

Evaluation
- Determine Inherent Risk
- Determine Initial Risk

Treatment
- Is risk level acceptable?
- Is risk level acceptable?
- Define New Controls
- Determine Residual Risk
- Review Summary
Risk Assessment With Expert EHS Processes Layered In

- **Identification**
  - Chemical safety data review
- **Analysis**
  - Industrial Hygiene monitoring
    - OEL comparison
- **Evaluation**
  - Medical surveillance proposal
- **Treatment**
  - eg. Hazard communication
  - eg. Implement PPE, install equipment
  - eg. Medical treatment, job reassignment
Guided Activity for Identifying Risks and Hazards

Select for each hazard category the applicable hazards, and then choose the Next push button.

Note that you can only select hazards that are in the hazard and control register. If you do not see the relevant hazard here, you can request the hazard and complete the risk identification process later.
Rating Risk with Graphical Risk Matrix

Risk Assessment: Noise assessment McKee Plant

Assessment Steps

Graphical Risk Matrix

- Completion Status: Open, In Process, Completed

Likelihood
- Rate
- Unlikely
- Possible
- Likely
- Almost Certain

Severity
- Low
- Minor
- Moderate
- Major
- Critical

Scores

1 2 3 4 5
6 7 8 9 10
11 12 13 14 15
16 17 18 19 20
21 22 23 24 25
### Risk Controls

**Risk Assessment: Cobalt oxide**

- **Risk Assessment ID:** 3
- **Created On:** 13.04.2012 14:16

#### Risks

<table>
<thead>
<tr>
<th>Location</th>
<th>Hazard Cause</th>
<th>Hazard</th>
<th>Operations</th>
<th>Agent</th>
<th>Risk Type</th>
<th>Severity</th>
<th>Likelihood</th>
<th>Level Icon</th>
<th>Risk Level</th>
<th>Evaluation</th>
<th>Risk ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>McKee Pl...</td>
<td>Chemical</td>
<td>Solid Sub...</td>
<td>Normal O...</td>
<td>cobalt oxide</td>
<td>Inherent...</td>
<td>Minor</td>
<td>Unlikely</td>
<td>Low</td>
<td>Acceptable</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

#### Assessment Steps

<table>
<thead>
<tr>
<th>Step</th>
<th>Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review/Edit Basic Information</td>
<td>✔️</td>
</tr>
<tr>
<td>Review Amounts</td>
<td>✔️</td>
</tr>
<tr>
<td>Determine Inherent Risk</td>
<td>✔️</td>
</tr>
<tr>
<td>Review/Edit Existing Controls</td>
<td>✔️</td>
</tr>
<tr>
<td>Determine Initial Risk</td>
<td>✔️</td>
</tr>
<tr>
<td>Define New Controls</td>
<td></td>
</tr>
<tr>
<td>Determine Residual Risk</td>
<td>✔️</td>
</tr>
<tr>
<td>Review Summary</td>
<td></td>
</tr>
</tbody>
</table>

#### Define New Controls

- **View:** New Controls

<table>
<thead>
<tr>
<th>Type</th>
<th>Subtype</th>
<th>Catalog</th>
<th>Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person-Related</td>
<td>Personal Protective...</td>
<td>Respiratory Protective...</td>
<td>Dust mask</td>
<td>In Process</td>
</tr>
</tbody>
</table>

- **Completion Status:**
  - Open
  - In Process
  - Completed
Risk-based Control Inspections

Control Inspection – Fire Extinguisher Inspection for Markdorf

Requestor Comment: This is the comment the Responsible gave to the inspector when creating the Control Inspection Series. This field is free text and not mandatory.

Location – Markdorf 1

<table>
<thead>
<tr>
<th>Plant:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Street:</td>
<td>Dornierstr. 3</td>
</tr>
<tr>
<td>Postal Code:</td>
<td>98677</td>
</tr>
<tr>
<td>City:</td>
<td>Markdorf</td>
</tr>
</tbody>
</table>

Controls to Inspect

<table>
<thead>
<tr>
<th>Control Name:</th>
<th>Dry Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Catalog:</td>
<td>Fire Extinguisher</td>
</tr>
<tr>
<td>Hazard:</td>
<td>Fire</td>
</tr>
</tbody>
</table>

Questions

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounted in an easily accessible place, no debris or material stacked in front of it.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety pin is in place and intact. Nothing else should be used in place of the pin.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label is clear and extinguisher type and instructions can be read easily.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handle is intact and not bent or broken.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure gauge is in the green and is not damaged or showing “recharge”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge hose/nozzle is in good shape and not clogged, cracked, or broken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extinguisher was turned upside down at least three times (shaken)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Remarks


Date of Inspection

Send

This form will be sent to the responsible Risk Assessment Team Lead
### Tasks

**Risk Assessment: Noise assessment McKee Plant**

- **Risk Assessment Type:** Health
- **Status:** In Process
- **Risk Assessment ID:** 2
- **Created On/At:** 03/09/2012 12:41

#### Implementation
- **Priority:** Normal

#### Task Schedule
- **Start Date / Time:** 03/14/2013 17:41:00
- **Recurrence:** Yearly
- **Recur Every:** 1 Year(s)
- **On The:** First Monday June
- **Due Date Range:** 1 Week(s)
  - Next due date is 06/09/2014

#### Responsibilities
- **Responsible:** Robin Haas
- **Implementor:** Robin Haas
- **Approver:**

#### Documents
- **Document Type:**
- **File Name:**
- **Uploaded On:**
- **Uploaded By:**

#### Task Processes
<table>
<thead>
<tr>
<th>Status</th>
<th>Approver</th>
<th>Implementor</th>
<th>Responsible</th>
<th>Due Date</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Process</td>
<td>Robin Haas</td>
<td>Robin Haas</td>
<td>Robin Haas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Industrial Hygiene Monitoring
## Risk-based Health Surveillance Proposal

### Health Surveillance Protocols and Recommendation Criteria

<table>
<thead>
<tr>
<th>Type and Description</th>
<th>Protocol Name</th>
<th>Country</th>
<th>Region</th>
<th>Status of Current Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>005 Immunization</td>
<td>General Protocol</td>
<td>Germany</td>
<td></td>
<td>Released</td>
</tr>
<tr>
<td>002 Chemical</td>
<td>Chemical exposure</td>
<td>USA</td>
<td>Alabama</td>
<td>Released</td>
</tr>
</tbody>
</table>

### Recommendation Criteria

The protocol "Noise exposure" is recommended by the system for country "USA" and region "Alabama". The recommendation is based on the following information:

For agent "Noise / ID: 4", all of the following criteria are fulfilled:
- Risk Level: High  
- Value Type: TWA  
- Exposure Rating: Threshold value exceeded  

OR

For agent "Noise / ID: 4", all of the following criteria are fulfilled:
- Value Type: TWA  
- Exposure Rating: Threshold value exceeded

### Details

**Display Revision:** 02.05.2011

**Revision Remarks:**

**Recommendation Criteria**

<table>
<thead>
<tr>
<th>Agent</th>
<th>Risk Level</th>
<th>Value Type</th>
<th>Exposure Rating</th>
<th>Age</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise / ID: 4</td>
<td>High</td>
<td>▼</td>
<td>Threshold value exceeded</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td>Noise / ID: 4</td>
<td>▼</td>
<td>TWA</td>
<td>Threshold value exceeded</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>
# Hazard Communication – 3 Options

## Analyzed Job

<table>
<thead>
<tr>
<th>No.</th>
<th>Job Step</th>
<th>Hazard</th>
<th>Required Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setup Drilling Rig</td>
<td>Heat Stress</td>
<td>Competence, Training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noise Exposure</td>
<td>Personal Protective Equipment: Silicone Ear Plugs</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Slips and Trips</td>
<td>Personal Protective Equipment: Safety Shoes</td>
</tr>
<tr>
<td>3</td>
<td>Drill Wall</td>
<td>Noise</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Place Cement Casting Around Pipe</td>
<td>Noise Exposure</td>
<td>Personal Protective Equipment: Hearing Protection</td>
</tr>
<tr>
<td>5</td>
<td>Clean up</td>
<td>Slips and Trips</td>
<td></td>
</tr>
</tbody>
</table>

## Control Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Subtype</th>
<th>Catalog</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person-Related</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competence</td>
<td>Training on Task</td>
</tr>
<tr>
<td></td>
<td>Hazard Signs/Warnings/Labels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Personal Protective Equipment</td>
<td>Hearing Protection</td>
</tr>
<tr>
<td></td>
<td>Safety Shoes</td>
<td></td>
</tr>
</tbody>
</table>

## Additional Location(s) Where Analysis is Valid

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Technical Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motlee Plant</td>
<td>Plant</td>
<td>Motlee Plant</td>
</tr>
</tbody>
</table>

## Safety Plan

### Relevant Risks
- Welding Work
- Nearby Operations
- Chemical Liquid

## Planned Safety Measures

- Operations and Safety Measures
- Maintenance of leaking pump
- Welding Goggles
- Read and understand:
  - Leather Gloves
  - Read and understand:
    - Disposable Chemical Suit
    - Read and understand:
      - Operation 0010 Maintenance of leaking pump
Executive Insight with Top Risk Dashboard

Risk Assessment - Top Risks

Risk Summary

<table>
<thead>
<tr>
<th>Risk Assessment Type</th>
<th>Risk Level</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Low</td>
<td>3</td>
<td>100.00%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>2</td>
<td>66.67%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1</td>
<td>100.00%</td>
</tr>
<tr>
<td>Environment</td>
<td>Low</td>
<td>1</td>
<td>25.00%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>1</td>
<td>25.00%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1</td>
<td>33.33%</td>
</tr>
<tr>
<td>Health</td>
<td>Low</td>
<td>3</td>
<td>100.00%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>2</td>
<td>66.67%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1</td>
<td>33.33%</td>
</tr>
<tr>
<td>JHA</td>
<td>Low</td>
<td>1</td>
<td>25.00%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>1</td>
<td>25.00%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1</td>
<td>33.33%</td>
</tr>
<tr>
<td>Safety</td>
<td>Low</td>
<td>1</td>
<td>25.00%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>1</td>
<td>25.00%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1</td>
<td>33.33%</td>
</tr>
</tbody>
</table>

Total Assessments by Risk Level for Risk Assessment Type Environment

Top 10 Risks for Risk Assessment Type Environment

Display Risk Assessment for Risk R5276 (Hazards: Gases)
The risk-based approach to managing environment, health, and safety is game changing.

With a unified approach, you will have greater assurance that all risks are being managed appropriately.

With a unified approach, you will be better able to prioritize EHS improvements.

Embedding EHS requirements into a risk framework increases the efficiency and effectiveness by providing clarity and ensuring that nothing gets dropped.
Leverage Your ERP Data with Native Integration

**Quality Management**
- Logistics (GR, suppliers, returns, batch release & inventory control)
- EAM (test equipment, calibrations)
- FICO (quality-related-costs)
- Manufacturing (in-process controls, SPC, deviation mgmt.)
- Customer Service (complaints)

**Enterprise Asset Mgmt**
- FICO (cost tracking)
- Procurement
- MM (inventory mgmt. mat mgmt)
- HCM (scheduling, timekeeping, skills)
- EHSM (risks/controls to PM safety plan)
- MRS (scheduling)
- PS
- PPM

**Leverage SAP Investment**
- Business Workflow
- Document Management
- BI/BW/BOBJ
- Mobility
- HANA

**EHS Management: HSE**
- HCM (employee master data, timekeeping)
- EAM (Func. Loc., PM not., MM, risk/controls to PM safety plan)
- QM (QM notification)
- MOC (change request)
- FICO (cost tracking)

**EHS Management: PSS**
- SAP ERP Logistics (MM, PP, SD, QM)
- Global Trade Services
- Transportation Management
- Extended Warehouse Mgmt
- PLM Recipe Development

**Management of Change**
- EAM (Func. Loc, PM not., MM)
- EHSM (risk assessment)
Return on Investment

59%
More likely that best-in-class companies conduct proactive risk assessments to mitigate adverse events in operations than laggards

Source: Aberdeen Group, April 2011

2x
Likelihood that best-in-class companies provide real-time EHS data to decision makers to provide actionable intelligence, compared with laggards

Source: Aberdeen Group, April 2010
Best Practices

- ISO 14001, ISO 55000, OHSAS 18001, as well as various industry standards all recommend a proactive risk-based approach to managing environment, health and safety. Operational controls are an essential element of this approach.
Key Points

- A proactive risk assessment process will identify and prioritize areas for improvement to reduce EHS risk
- Both simple and complex risk assessments benefit from a unified approach
- Learn how to take a risk-based approach to Industrial Hygiene, Occupational Health, Hazardous Chemical Management, and Environmental Risk
THANK YOU FOR PARTICIPATING.

SESSION CODE: 0504

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