

ABB Automation & Power World: April 18-21, 2011

Planning your machine safety strategy Making your company defensible

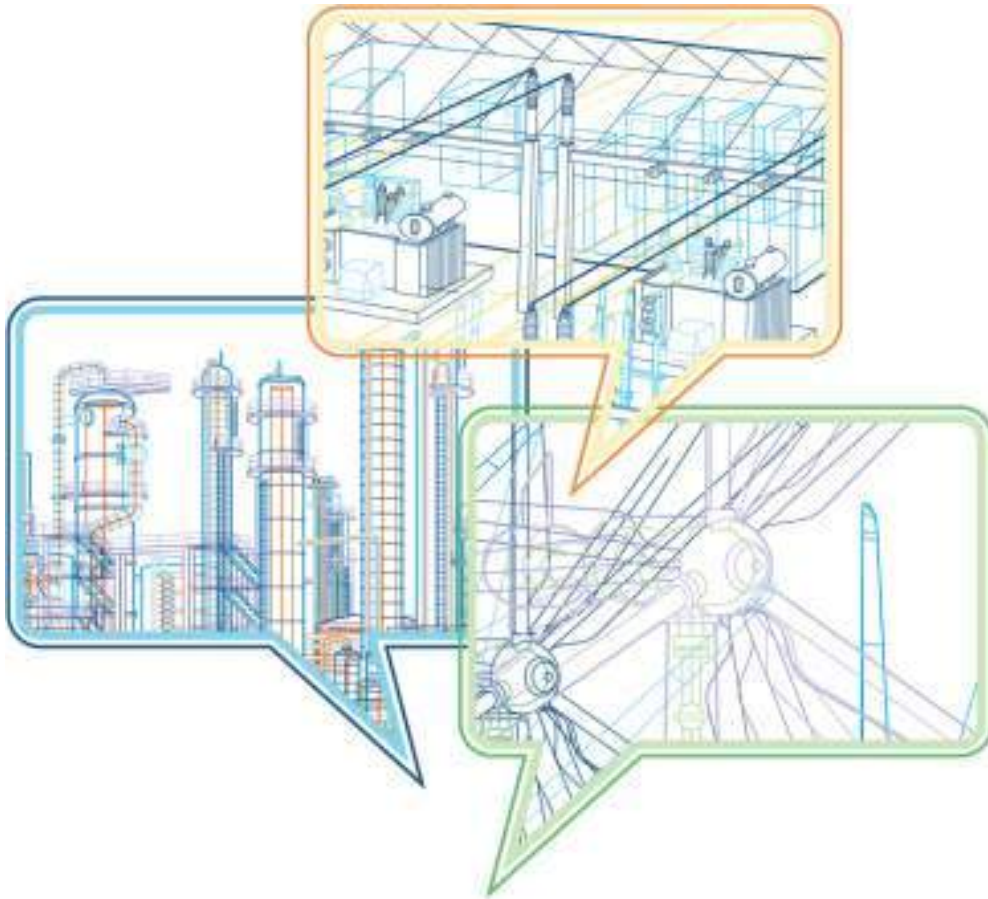
Automation & Power World 2011

April 18-21, 2011 in Orlando, Florida



Automation & Power World 2011

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- Save the date for this "must attend" event!
- April 18-21, 2011
- Orlando World Center Marriott, Florida
- Over 400 hours of educational training
 - Business forum
 - Customer case studies
 - Hands-on training
 - Panel discussions
 - Technical workshops
- Earn PDHs and CEUs
- Technology & Solution Center
 - Over 70,000 sq. ft. of exhibits
- Network with your peers
- www.abb.com/a&world

ABB Automation & Power World

At-a-glance

400+

Educational workshops

Automation & Power World offers over 400 hours of educational workshops specifically designed to make engineers, maintenance and management more valuable to their companies.

70K

Technology & Solution Center

Over 1 ½ acres (70,000 ft²) of with nearly 100 tons of electrical gear and 100's of experts ready to answer any of your questions and share the future of Automation & Power Solutions.

4,000

Connect with peers

With over 4,000 of your peers in attendance, this is a powerful opportunity to network and learn from the industry. In addition, over 45 customers will be sharing their own case studies.

≡ JOKAB SAFETY ≡

A MEMBER OF THE ABB GROUP

Educational workshops developed for all audiences

Just a few examples

Roles

Engineering

Management

Maintenance

Company types

Industrials

EPCs

Utilities

OEMs

- The coming wave of process safety system migration
- Implementing an alarm management strategy for a 100,000 I/O system - Case study
- Replacement and retrofit of large motors: Challenges and solutions
- Dynamic studies for large scale renewable energy integration at a Texas CREZ - Case study
- Secure commissioning of your process plant - Case study
- New arc flash mitigation technologies and techniques for a safer working environment
- Robotics 101
- A better approach to non-revenue water loss
- Electric vehicles: Are they real this time?
- Why is SIL more important than architecture?

Past attendees input



“I am impressed with the different parts of the program, the workshops and also the exhibit set-up... there is a lot of information to pick up.”

Duane Souers, Georgia Pacific

“It’s a great opportunity to get a lot of exposure to people and products in one week.”

Pardeep Gill, Alcoa



“It is well worth the time given the opportunities to: learn from industry experts, network with peers in the same industry, learn about emerging technologies, and build excellent supplier relationships.”

Sanjin Osmancevic, National Grid

Planning your machine safety strategy

Making your company defensible

- Speaker name: Lloyd M. Sinnott
- Speaker title: Manager – Training, safety systems and products
- Company name: ABB / Jokab Safety
- Location: Westland, MI
- Contact Info: lloyd.m.sinnott@ca.abb.com

Agenda

- An five eight step method for assessing risk in your operating plant, with reference to: ANSI B11.0 (2010), ANSI/RIA 15.06 (1999) and ANSI/PMMI 155.1 (2008)
- The factors to us to estimate the relative risk level of each machine in your plant.
- The Hierarchy of controls and its use to enhance technological safety solutions
- How human factors such as communication, training, safety culture, and knowledge can significantly impact safety performance levels.
- Stopping time and why it's important to a safety plan

Risk assessment Background

Risk assessment

Definition

- **risk:** The combination of the probability of occurrence of harm and the severity of that harm.
- **risk assessment:** The entire process of identifying hazards, assessing risk, reducing risk, and documenting the results.
- **risk reduction:** That part of the risk assessment process involving the elimination of hazards or selection of other appropriate risk reduction measures (protective measures) to reduce the probability of harm or its severity.

Risk assessment

Why perform a risk assessment?

- It is the Industry Standard
- Makes your company DEFENDABLE
- Only Reasonable way to identify Hazards & Associated Tasks
- Deals with all stakeholders.
- Documentation is created.
- Becomes a part of core business
- Creates a living legacy

Risk assessment

Why not

- We have been building machines like this for years and have never had anyone get hurt.
- I rely on the end user to tell us what to use/do.
- I rely on the machine builder to tell us what to use/do.
- The standards are voluntary anyway.
- We don't keep those kinds of records, they will just be a smoking gun.
- Do you know how much time and money that would take?

Risk assessment

Hazard based

- Hazard based formats look at the machine and its collection of moving parts.
- I.E. Table Saw

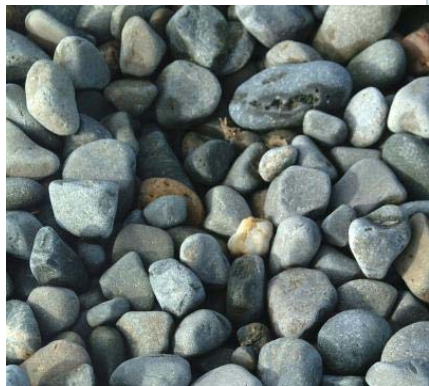
Risk assessment

Hazard based

- Task based looks at:
 - The Machine
 - All Stakeholders that interface with the machine
 - All tasks that are performed by the stakeholders
 - Hazards the stakeholders face performing those tasks
 - reasonably foreseeable uses and misuses

Risk assessment

Where does it fit in?



Risk assessment Process

Risk assessment Flowchart



Risk assessment process

Step one - Prepare

- Outline the Scope of the Risk Assessment
 - The risk assessment shall take into account:
 - the stage of development,
 - intended use of the machine/robot/system
 - anticipated skill and training of operators,
 - additional risk exposure and processes.
- Define the function of the Machine
 - Sequence of Operations
 - Operations Manual
 - Risk Assessments of Similar Machine
 - Applicable Standards
- Form Your **TEAM**

Risk assessment process

Step one – Prepare – TEAM to work on the following

- T** Task, Stakeholder and Hazard Identification
- E** Estimate Risk
- A** Actions (Solutions and Safeguarding)
- M** Manage Residual Risk (Training, Warnings, Awareness Means, PPE)

Risk assessment process

Step one – Prepare – Forming your TEAM

- As a minimum this should include the following types of personnel:
 - Operator(s)
 - Supervisor(s)
 - EHS
 - Maintenance personnel
 - Process, System or Design Engineer
 - Machine Builder/OEM
 - Safety Consultant
- Optimum group size would be 4-8 of the above types of personnel.

Risk assessment process

Step two – Identify

- Identify all stakeholders
- Identify all reasonably foreseeable tasks associated with the machine
 - Identify both foreseeable USES and MISUSES
- Identify hazards associated with each task

Risk assessment process

Step two – Identify - Misuse

reasonably foreseeable misuse: The use of a machine in a way not intended by the supplier or user, but which may result from readily predictable human behavior.

- For example, a risk assessment should address the following human factors:
 - Inappropriate actions as a result of
 - mistakes,
 - errors,
 - and poor judgment,
 - excluding deliberate abuse of the machine;

Risk assessment process

Step two – Identify - Misuse

- Inappropriate actions or reactions taken in response to unusual circumstances such as equipment malfunction;
- The tendency to take the —path of least resistance in carrying out a task; and
- Misreading, misinterpreting or forgetting information.

Risk assessment process

Step three – Identify – Stakeholders

- (a) operators and helpers;
- (b) maintenance individuals;
- (c) engineers;
- (d) technicians;
- (e) sales personnel;
- (f) installation and removal personnel;
- (g) administrative personnel;
- (h) trainees;
- (i) passers-by;
- (j) designers;
- (k) managers;
- (l) supervisors;
- (m) safety personnel;
- (n) safety committees;
- (o) safety consultants; and
- (p) loss control administrators.

Risk assessment process

Step two – Identify – Tasks

- (a) packing and transportation;
- (b) unloading/unpacking;
- (c) systems installation;
- (d) start up/commissioning;
- (e) assembly and trial run;
- (f) operation (all modes);
- (g) tool change;
- (h) planned maintenance;
- (i) unplanned maintenance;
- (j) unjamming;
- (k) major repair;
- (l) recovery from crash;
- (m) troubleshooting;
- (n) housekeeping;
- (o) decommissioning; and
- (p) disposal.

Risk assessment process

Step three – Estimate risk

- Using a risk scoring system estimate the risk for each Stakeholder/Task/Hazard grouping
- Examples of Risk Scoring systems can be found in:
 - ANSI B11.0 Safety of Machinery – General Requirements and Risk Assessment
 - (General Machinery)
 - ANSI/RIA 15.06 Industrial Robots and Robot Systems — Safety Requirements
 - ANSI/PMMA B155.1 Safety Requirements for Packaging Machinery and Packaging – Related Converting Machinery

Risk assessment process

Step three – Estimate risk - Factors



- Risk is estimated based on
 - Severity of Harm
 - Exposure to Hazard
 - Probability of Avoiding Hazard

Risk assessment process

Step three – Estimate risk

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Risk assessment

Guide to risk estimation factors

Risk assessment process

Step three – Estimate risk severity factor

- In estimating the risk arising from a fault(s) in the safety-related parts of a control system,
 - only slight injuries (normally reversible)
 - and serious injuries (normally irreversible, including death) are considered.
- To make a selection
 - the usual consequences of accidents and normal healing processes should be taken into account
 - in determining S1 and S2, e.g. bruising and/or lacerations without complications would be classified as S1,
 - whereas an amputation or death would be classified as S2.

Risk assessment process

Step three – Estimate risk exposure factor

- A generally valid time period during which parameter F1 or F2 should be selected cannot be specified.
- However, the following explanation can facilitate the right decision in cases of doubt.
 - F2 should be selected if a person is frequently or continuously exposed to the hazard.
 - It is irrelevant whether the same or different persons are exposed to the hazard on successive exposures.

Risk assessment process

Step three – Estimate risk exposure factor

- The duration of exposure to the hazard should be evaluated on the basis of an average value which can be seen in relation to the total period of time in which the equipment is used.
 - For example, if it is necessary to reach regularly between the tools of the machine during cyclic operation in order to feed and move work pieces, then F2 should be selected.
 - If access is only required from time to time, then F1 can be selected.

Risk assessment process

Step three – Estimate risk avoidance factor

- When a hazard arises,
 - it is important to know if it can be recognized
 - and whether it can be avoided before it leads to an accident.
- For example, an important consideration is whether the hazard can be
 - directly identified by its physical characteristics,
 - or whether it can only be recognized by technical means, e.g. indicators.

Risk assessment process

Step three – Estimate risk avoidance factor

- Other important aspects which influence the selection of parameter P include,
 - operation with or without supervision;
 - operation by experts or nonprofessionals;
 - speed with which the hazard arises, e.g. quickly or slowly;
 - possibilities for hazard avoidance, e.g. by taking flight or by intervention of a third party;
 - practical safety experiences relating to the process.
 - Proximity of hazard

Risk assessment Process - Continued

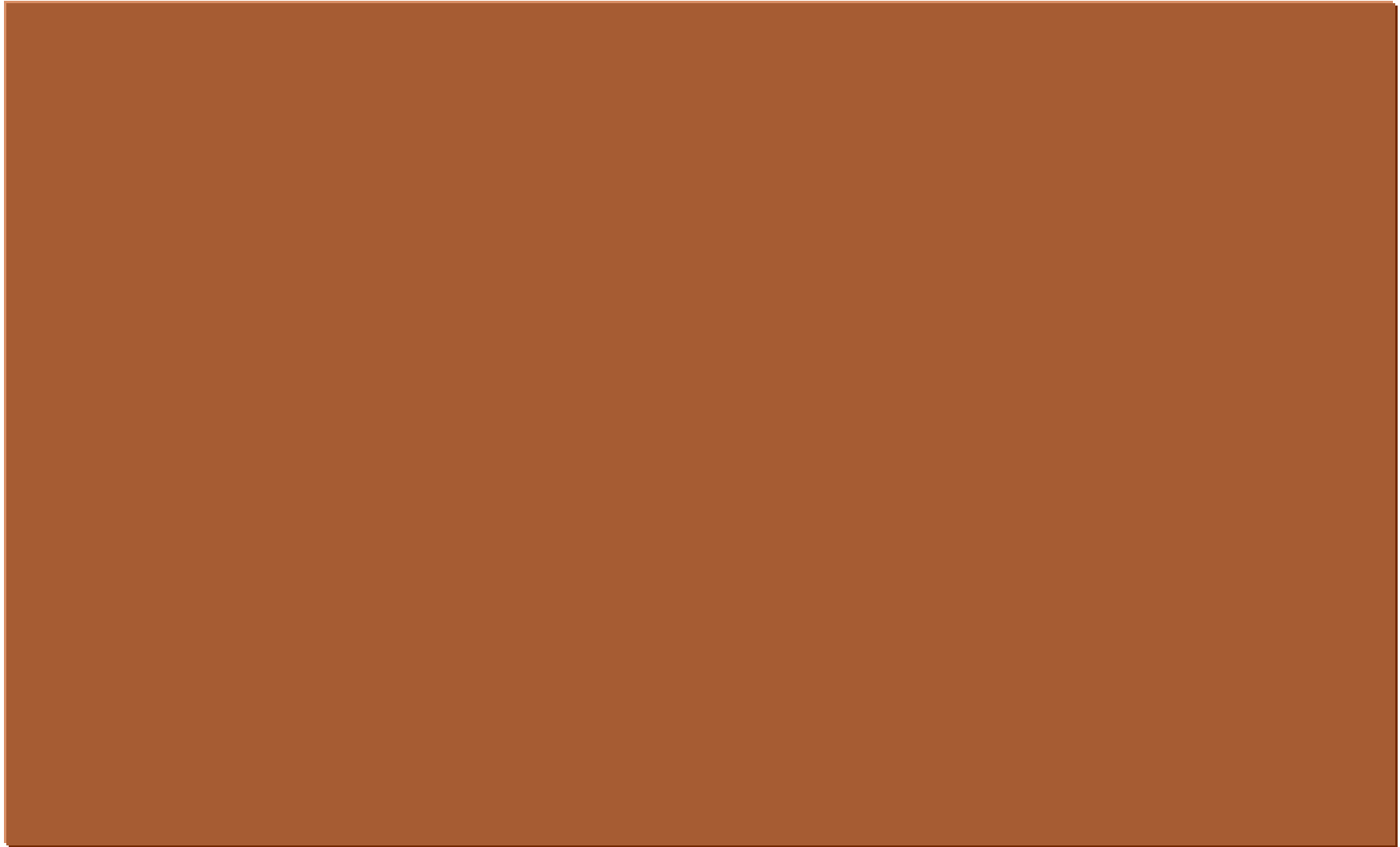
Risk assessment process

Step four – Reduce risk

- Choose and apply Safeguards based on Risk.
- Technical protective measures (i.e. design, safeguards) should be applied to the fullest extent which is practicable before using such protective measures which include:
 - work organization,
 - correct behavior,
 - attention,
 - skill,
 - training,
 - or application of personal protective equipment.

Risk Assessment Process

Step Four – Reduce Risk – Hierarchy of Safety Controls



Risk assessment process

Step four – Reduce risk – Engineering support

- Since Engineering Controls are the most effective means of Safeguarding
 - the collaboration between Safety and Engineering professionals is a key element of a successful safeguarding strategy.
- **safeguard:**
 - A barrier guard, device or **safety procedure** designed for the protection of personnel.
- **safeguarding:**
 - The act of providing personnel with protection from a hazard.
- **safeguarding device:**
 - A means that detects or prevents access to a hazard.

Risk assessment process

Step five – Access residual risk

- Validate that the Safeguards Selected are sufficient.
- Enhance Selection with Hierarchy of Control
 - Enhance safeguarding with:
 - Awareness Barriers
 - Visual Indication
 - Audible Alarms
 - Policy and Procedures
 - Training
 - PPE

Risk assessment process

Step six – Validate the selections

- Once safeguards are selected the process must be repeated to determine if each identified hazard has been protected so that the remaining risk is tolerable.
- Re-evaluate the Avoidance, Severity and Exposure criteria for each task and hazard combination using scoring system
- If the risk reduction category is now acceptable, the risk reduction for that task and hazard combination is complete.
- If the risk reduction category is not acceptable install appropriate safeguards and repeat this step.
- **acceptable risk:** A risk level achieved after risk reduction measures have been applied. It is a risk level that is accepted for a given task (hazardous situation) or hazard.

Risk assessment process

Step six – Validate the selections

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Risk assessment process

Step seven – Document

- The risk assessment will be documented at each stage of system development.
- The user shall maintain a file documenting the most recent risk assessment's for each machine/system in use.
- At a minimum the file must contain lists of
 - tasks,
 - hazards,
 - risk reduction category,
 - and safeguards selected.
 - Photos
 - Notes
 - Description of Operations
 - Minutes
 - Attendance

Risk assessment

Cultural shift

Risk assessment process

Step eight – Follow-up – Factors to consider

- Vision
 - Color Blind
 - Limited Vision – Peripheral
- Hearing
 - Audible Warnings
 - Sounds from machine
- Language
 - Warning Labels
 - Instructions
 - Manual of Operations
 - Culture

Risk assessment process

Step eight – Follow-up – Factors to consider

- Vision
 - Color Blind
 - Limited Vision – Peripheral
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Risk assessment process

Step eight – Follow-up – Communicate

- Zero Risk can not be achieved.
- Reduce risks to an acceptable or “tolerable” level.

- Clearly identify and **communicate** remaining risk to the user.

- Communicate the Risk and Residual Risk through:
 - Manuals
 - Safety AND MACHINE Training
 - Awareness means
 - Labels
 - Work Instructions

Risk assessment process

Step eight – Follow-up – Training

- Every aspect of safety for NORMAL and EXTRAORDINARY operation
- Operation
- Maintenance
- Emergency stops, Main Power Source
- Guards and any Kinetic Energy
- Planned stops to restore or clean product out before continuing operation.
- Include do's and don'ts
 - What needs to be done to restart the machinery
 - LOTO procedure for all forms of energy

Risk assessment process

Step eight – Follow-up – Cultural shift

- **Some of things we often do:**
 - We spend the least amount of money possible – not using the latest technology or quality.
 - Not meeting or exceeding the industry standards

- Training often ends in the class room. Little on the job follow-up.
 - Training is an after thought:
 - Done to fill time when the line is down
 - Only done with new employees
 - Scheduled:
 - before or after regular shift
 - Overtime shift

- *Is this the recipe for good results?*

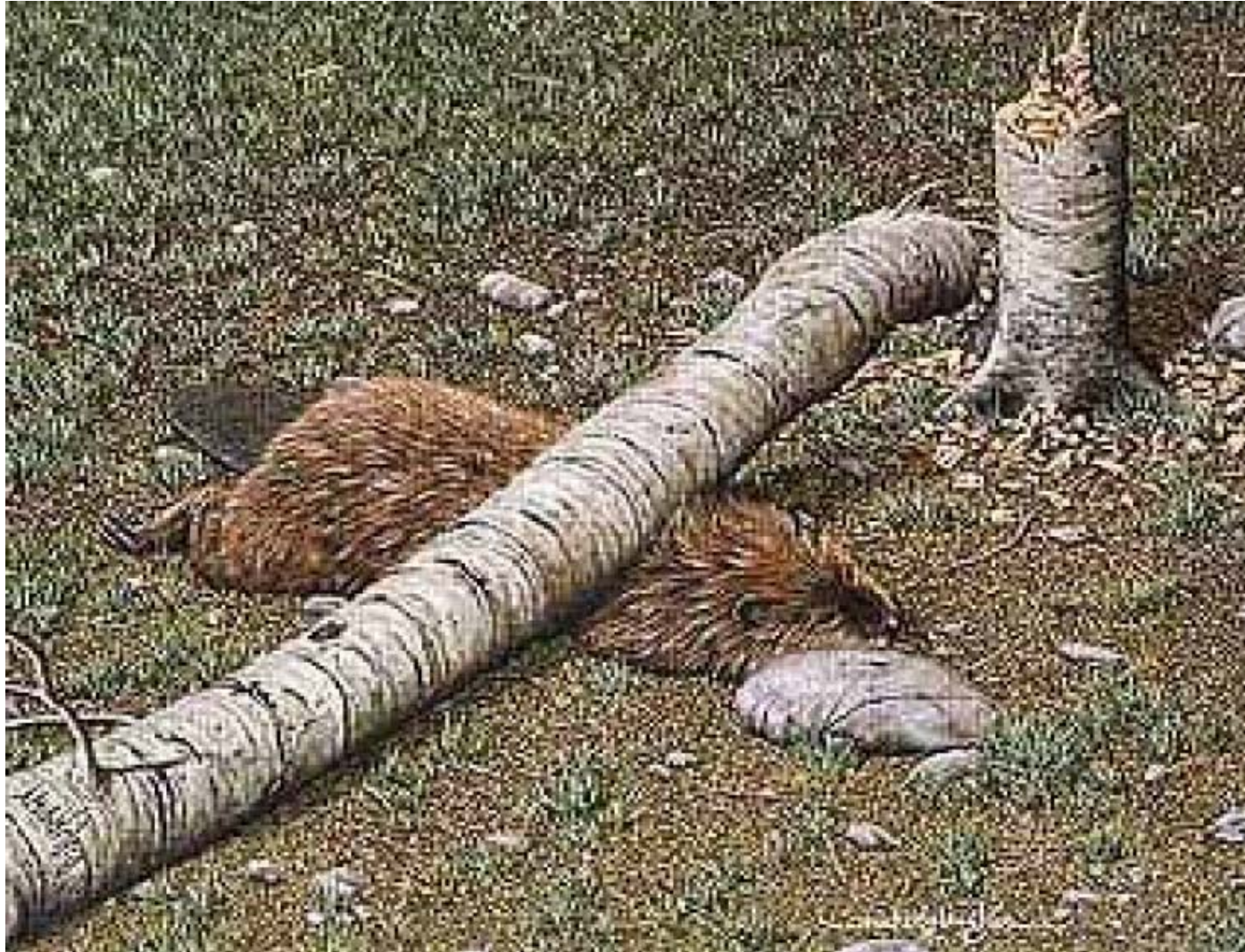
Risk assessment process

Step eight – Follow-up – Cultural shift – The hero

- You've carefully thought out all the angles.
- You've done it a thousand times.
- It comes naturally to you.
- You know what you're doing, its what you've been trained to do your whole life.
- Nothing could possibly go wrong, right?
- I have special training .. *I am a maintenance worker...*

Risk assessment process

THINK AGAIN



Risk assessment process

Step eight – Follow-up – Cultural shift



- **You might not see this:**
 - On an Aircraft Flight Deck Door
 - Subway Train
 - Amusement Park Ride
 - High-rise building elevator
 - Bungee Jump Tower
 - A highway intersection
 - A hospital operating room

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Workshop statistics

Over 400 hours of training

- ~45 customer presented case studies
- 87 sessions in the Technology and Solution Center
- 11 hours of panel discussions consisting of customers, industry experts and ABB executives
- Nearly 50 hours of hands on technical training

ABB Automation & Power World Registration options

	Full Conference	Courtesy Registration
Access to ABB product developers and application experts in the 70,000 ft ² (over 1.5 acre) Technology & Solution Center		
Access to a series of complimentary and educational workshops.		
Free Lunch and Tuesday Evening Reception		
Access to over 300 additional educational workshops – Including ARC Analysts presentations		
Up to \$1,500 off a future ABB purchase*		
Complimentary ARC report valued at \$2,500!*		
Evening Events (Monday and Wednesday)		
* See www.abb.com/a&pworld for more details	Cost	Free!
	\$300 per day or \$800 for all three days.	

Top ten reasons to attend



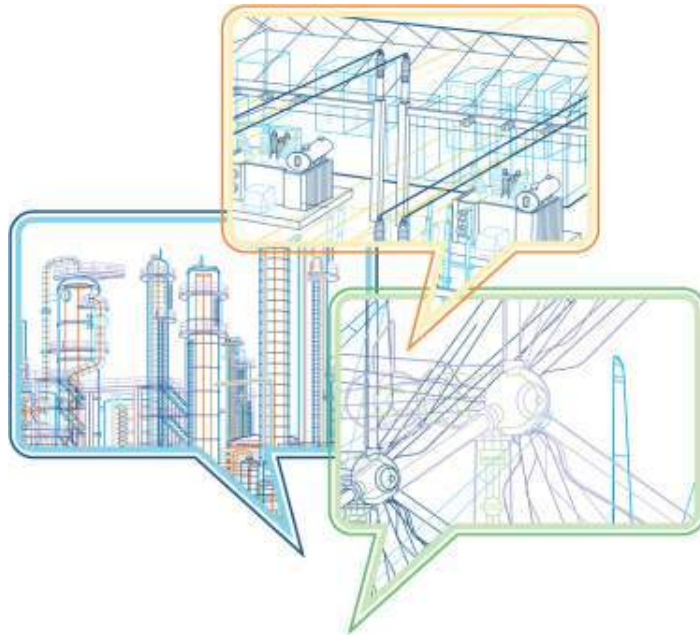
- Become more valuable, choose from over 400 educational workshops and hands-on training sessions
- Connect with thousands of peers and industry experts from 40 countries
- Ask questions of, and give feedback to, ABB product developers and executive management
- Get up to date with new and emerging technologies and industry trends
- Learn how to maximize the value from your existing assets
- Discover how to improve grid reliability, energy efficiency and industrial productivity
- Apply lessons learned from over 45 customer-presented case studies
- Focus on critical non-technical issues facing your company in the business forums
- Succeed professionally by earning CEUs on select workshops and PDHs for every workshop you attend
- See the widest range of technologies from one company at one conference

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