

ISMI Risk Screening Tool

**SESHA Hill Country Chapter
2010 Symposium
February 12, 2010**

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Presentation Outline

1. Project Background
2. Risk Assessment Primer
3. Description of the Risk Screening Tool
4. Demonstration of the Risk Screening Tool

Project Background

- ISMI Project # ESH1006M, ESH – Technology Deliverable #20: Develop a site risk screening assessment method / tool for use in evaluation of site hazards and auditing
- Project Concept:
 - Identify/develop a method which can be used to evaluate high level ESH / facility risks
 - Method should be more of a risk screening tool rather than a “deep dive” risk analysis
 - Method should be usable for evaluation of risks at the site level and/or used as an audit tool
 - Method must be intuitive enough such that minimal training is required

Risk Assessment Primer

Scoring Risk:

$R = S \times F \times C$, where:

R = (Typically Qualitative) Risk Score

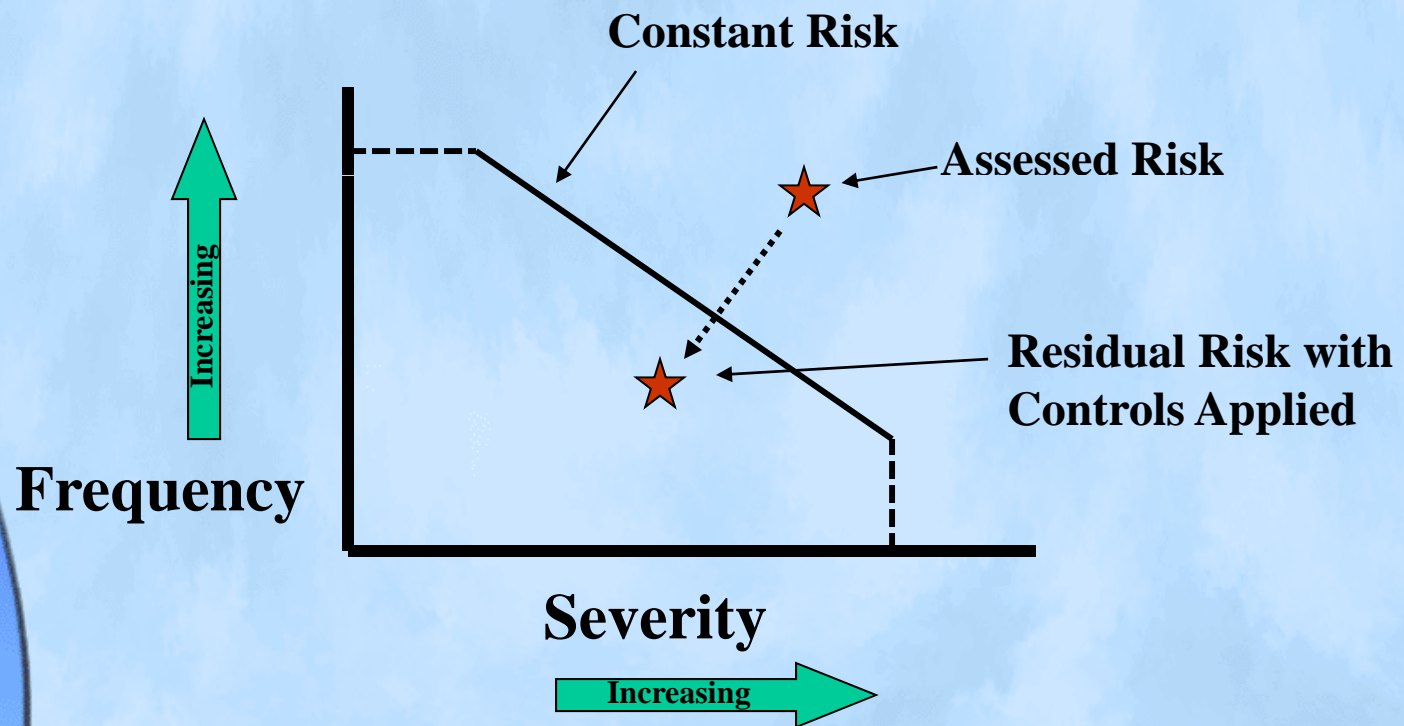
S = Severity of Outcome (worse is higher number)

F = Frequency of Initiating Event

C = Quality of Risk Controls (worse is higher number)

- Risk controls generally composed of a combination of detection and response systems.
- Hierarchy of controls is prevention, prediction, automatic and manual. (Manual considered unreliable, at best.)
- Rigorous maintenance of detections required or should be expected to fail upon demand.
- Residual risk is reduced by lowering S, F or C.

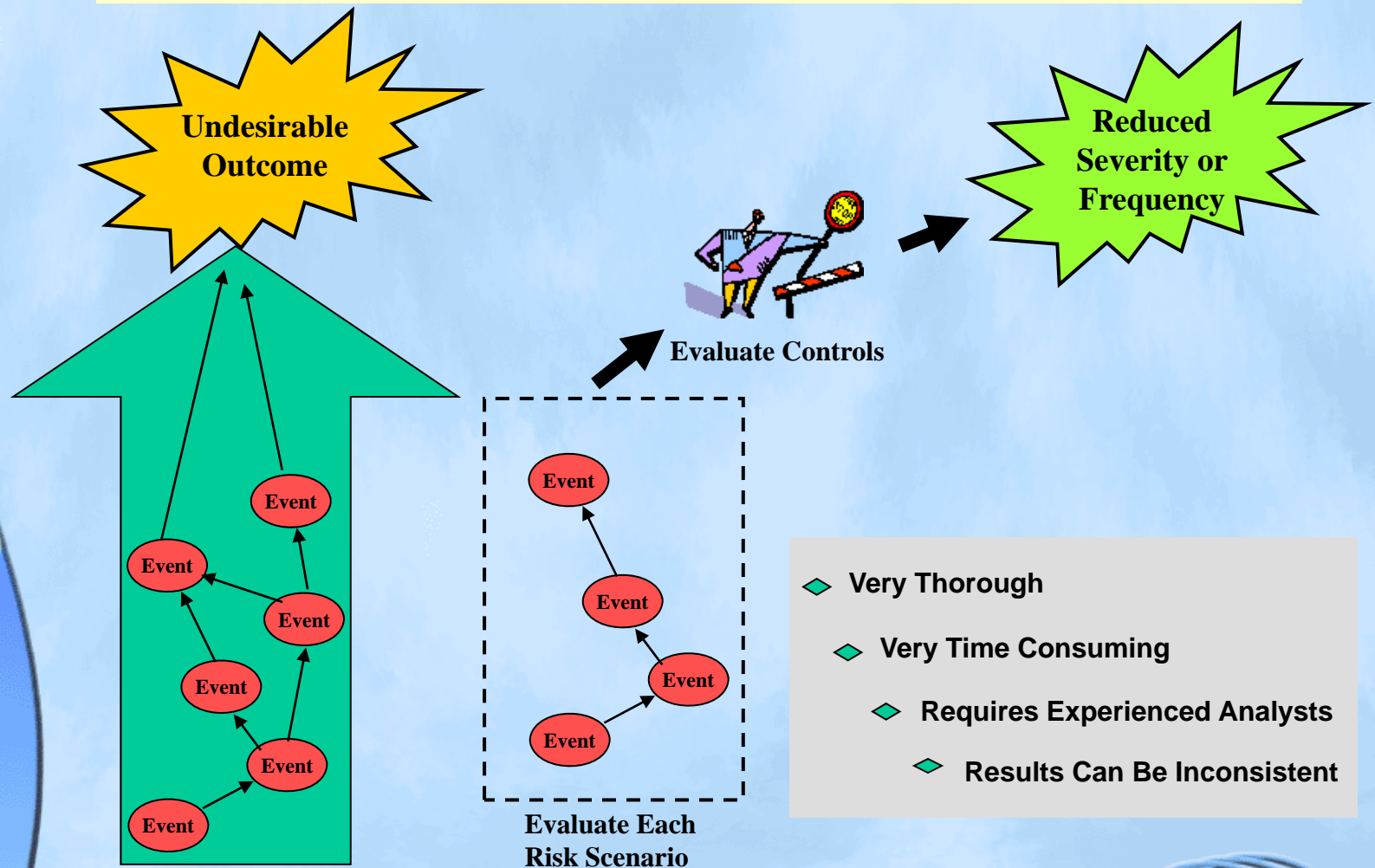
Severity and Frequency Relationship



Controls Are Used to Reduce Frequency and/or Severity

Risk Assessment Approaches

“Bottom-Up” Method



Investigate Possible
Event Combinations

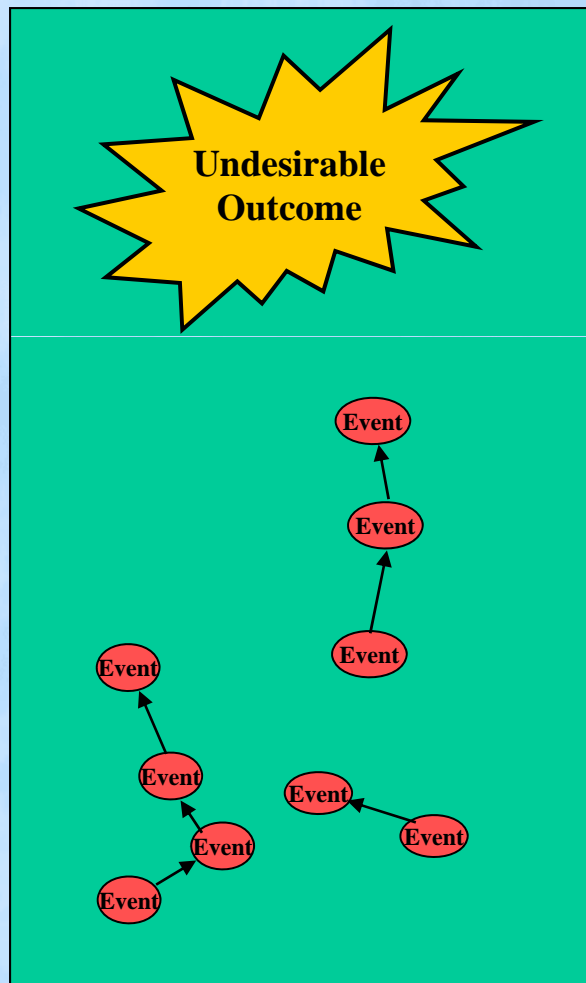
Evaluate Each
Risk Scenario

Evaluate Controls

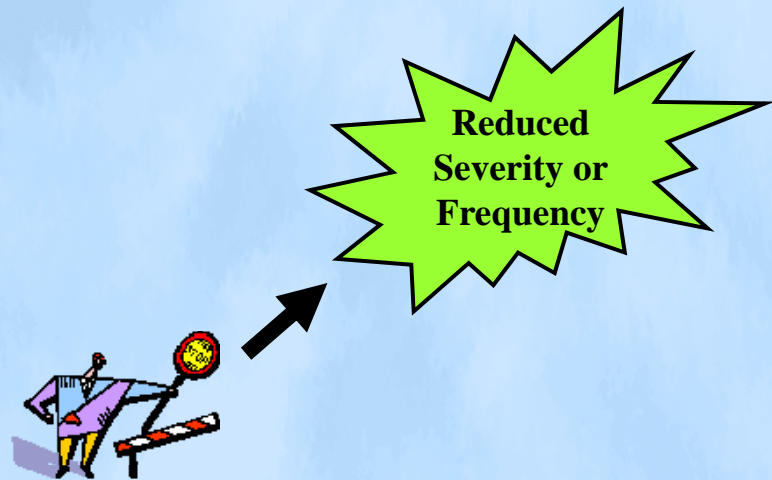
- ◆ Very Thorough
- ◆ Very Time Consuming
- ◆ Requires Experienced Analysts
- ◆ Results Can Be Inconsistent

Risk Assessment Approaches

“Top Down” Method



Start with Known Undesirable Outcome
and Relevant Risk Scenarios



Evaluate Controls

Reduced
Severity or
Frequency

- ◆ Focuses on Known, High Risk Issues
- ◆ Assessments are Relatively Quick
- ◆ Expertise in Risk Analysis Not Required
- ◆ Consistent Results Site to Site

Description of Tool

Intended Use

- Allow broad, uniform “top down” EHS risk screening of sites, for only high risk concerns, in a format usable by non-risk management specialists.
- Provide, typically annual, reports useful for further risk reduction activities and tracking of these activities.
- Allow user additions of risk scenarios and risk controls.

Intended Users

Site EHS personnel and/or corporate auditors

Tool Availability

Public version of tool is available directly from ISMI.

Software Requirements

Microsoft Excel 2003, with macros enabled



Description of Tool

What High Risks Are Covered = “Very Undesirable Outcomes” Resulting In

- Loss of Personnel
- Loss of Utilities/Materials
- Loss of Structures/Property
- Loss of Compliance

What Types of High Risks Are Not Covered

- Security, including cyber, product and personnel
- Financial, such as from rising utility costs or interest rates

Important Assumptions

- Initiating events realistic (therefore F not small).
- Residual risk rankings assume that detections are being adequately maintained.
- Facility has obtained all required credits, licenses and permits, and compliance with all conditions is achievable.
- Facility has access to at least one acceptable provider of all necessary utilities and raw materials.

Description of Tool

User Definition of Site Specific Scenarios

- Very Undesirable Outcome
- System/Subsystem
- Cause of Outcome
 - Not Functioning
 - Service Interrupted
 - Release from Containment
 - Quality Corrupted
 - Fire
 - Not Available
 - Injury or Death
- Subsystem Effect
- Initiating Events

All from drop down lists!

Description of Tool

User Definition of Site Specific Controls

- Detection Example
- Detection Type
 - Manual-Post Failure
 - Automatic-Post Failure
 - Manual-Predictive
 - Automatic-Predictive
 - Preventive
- Maintenance Performed?
- Maintenance Type
 - None
 - Not Required, Routine Replacement or Inspection, Continuous Monitoring
- Response Example
- Response Type
 - Not Required
 - Manual-Hands On
 - Manual-Remote
 - Automatic

All from drop down lists!

Description of Tool

Tool Outputs

- Residual Risk Ranking – From matrix created especially for this project (see next slide)
- Risk Reduction Opportunities
 - Possibilities for improved controls
 - Possibilities for reduction of severity or frequency

Description of Tool

Residual Risk Ranking Matrix

Residual Risk Keys			Detection		Response		
Word Description	Color Code	Numeric Code	Type	Definition	Type	Definition	Example
Highest	Highest	5	Manual-Post Failure	Human discovers failure after it occurs.	Manual-Hands On	Human performs response.	Hand close valve
Very High	Very High	4.5	Manual-Post Failure	Human discovers failure after it occurs.	Manual-Remote	Human initiates a mechanical response.	Human activation of valve auto-closer
High	High	4	Automatic-Post Failure	Continuous sensor detects failure after it occurs.	Manual-Hands On	Human performs response.	Hand close valve
High	High	3.75	Automatic-Post Failure	Continuous sensor detects failure after it occurs.	Manual-Remote	Human initiates a mechanical response.	Human activation of valve auto-closer
High	High	3.5	Automatic-Post Failure	Continuous sensor detects failure after it occurs.	Automatic	Sensor sends signal to initiate mechanical response.	PLC activation of valve auto-closer
Medium	Medium	3	Manual-Predictive	Human parameter measurement, usually with an instrument, for changes that could result in failure.	Manual-Hands On	Human performs response.	Hand close valve
Medium	Medium	2.5	Manual-Predictive	Human parameter measurement, usually with an instrument, for changes that could result in failure.	Manual-Remote	Human initiates a mechanical response.	Human activation of valve auto-closer
Low	Low	2	Automatic-Predictive	Continuous sensor measures for parameter changes that could result in failure.	Manual-Hands On	Human performs response.	Hand close valve
Low	Low	1.5	Automatic-Predictive	Continuous sensor measures for parameter changes that could result in failure.	Manual-Remote	Human initiates a mechanical response.	Activate automatic valve closer
Minimal	Minimal	1	Automatic-Predictive	Continuous sensor measures for parameter changes that could result in failure.	Automatic	Sensor sends signal to initiate mechanical response.	PLC activation of valve auto-closer
None	None	0	Preventive	Design prevents possibility of failure.	Not Required	Failure is not possible.	Noncombustible materials of construction prevent fire.

Description of Tool

Sample Scenarios from Tool

Very Undesirable Outcome	System/Subsystem	Cause of Outcome	Subsystem Effect	Initiating Events
Loss of Utility/Materials	Electricity	Service Interrupted	Loss of electrical power	Short in power line
Loss of Utility/Materials	Electricity	Service Interrupted	Loss of electrical power	Short in power line
Loss of Utility/Materials	City Water	Service Interrupted	DI/UPW processing halted	Supply pipe damaged
Loss of Utility/Materials	City Water	Service Interrupted	DI/UPW processing halted	Supply pipe damaged
Loss of Utility/Materials	Natural Gas	Service Interrupted	Boilers can't produce steam	main valve shut
Loss of Utility/Materials	Natural Gas	Service Interrupted	Boilers can't produce steam	main valve shut

Corresponding Controls from Tool

Detection Example	Detection Type	Maintenance Performed?	Maintenance Type	Response Example	Response Type
	Identify Detection Types at Facility: Preventive, Automatic-Predictive, Manual-Predictive, Automatic-Post Failure, Manual Post Failure	Either Not Maintained or Maintained	Identify How Maintenance of Detection is Performed: Either Not Maintained or Not Required, Scheduled Activity/Replacement, Routine Inspection/Maintenance or Continuous Monitoring		Automatic, Manual-Hands On (done by person), Manual-Remote (initiated by human, done by equipment) or Not Required
Sensor detects disruption	Automatic-Post Failure	Not Maintained	None	Activate redundant power	Automatic
Sensor detects disruption	Automatic-Post Failure	Maintained	Not Required, Routine or Continuous	Activate redundant power	Automatic
Observation	Manual-Post Failure	Not Maintained	None	Notify water supplier of needed repair	Manual-Hands On
Observation	Manual-Post Failure	Maintained	Not Required, Routine or Continuous	Notify water supplier of needed repair	Manual-Hands On
Pressure sensor	Automatic-Post Failure	Not Maintained	None	Alarm initiates manual response	Manual-Remote
Pressure sensor	Automatic-Post Failure	Maintained	Not Required, Routine or Continuous	Alarm initiates manual response	Manual-Remote

Description of Tool

Features and Standardized Reports

- Features
 - Add detection choices
 - Add response choices
 - Add risk scenarios
 - Add prevention or improvement options
- Standard Reports
 - Risk Screening Summary
 - Risk Screening Completion Status
 - Risk Ranking Improvement Options
 - Systems with No Maintenance
 - Scenarios Re-Assessed (i.e. original controls changed to reduce residual risk ranking)
 - Added Scenarios and Controls

Description of Tool

Using Tool to Modify Residual Risk

- Typically, residual risk is reduced by:
 - Modifying the severity of outcome or
 - Modifying the frequency of an initiating event
- The ISMI Risk Screening Tool is more controls focused
 - Risk scenarios are laid out to the point of an initiating event
 - Subsystems that are not applicable at a site can be recorded as NA
 - Risk scenarios that are not applicable at a site are simply not recorded
 - The user selects “as implemented” controls
 - Reducing risk for an applicable risk scenario involves improving the controls
 - Replacing manual detection with automatic
 - Replacing manual response with automatic
 - Replacing automatic detection with predictive
 - Instituting a prevention is recorded here

Demonstration of ISMI Risk Screening Tool
