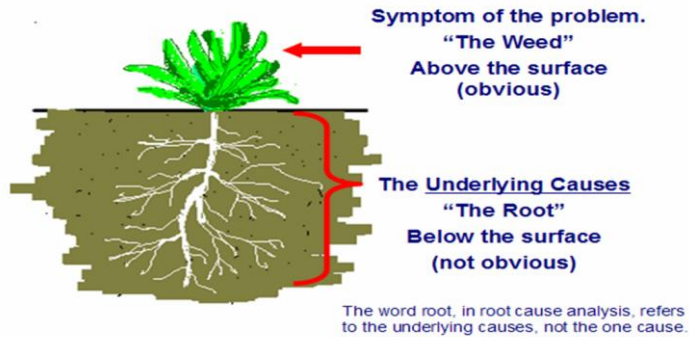
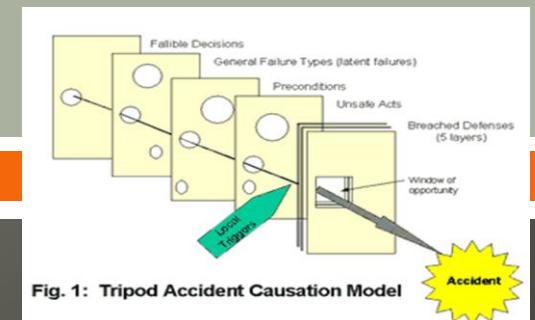


Root Cause Analysis Basics



I ♥
SAFETY

Accident/Incident and Leading Indicator Analysis



Agenda

- ☞ Safety Moment
- ☞ Why understand what your data is telling you
- ☞ Analysis criteria tips
- ☞ Root Cause Analysis
- ☞ Corrective Actions
- ☞ Lost Time & SIF injuries
- ☞ Near Miss
- ☞ Observation and Inspection Data
- ☞ Questions

Audience Intro Questions

- ∞ Manufacturers, Construction, Government, others?
- ∞ Safety Pros, HR Pros, supervisors?
- ∞ What's your data telling you on injury trends?

Safety Moment



Mental Health

Status of Mental Health in the Workplace

- ☞ Surgeon General's Framework for Workplace Mental Health & Well Being (2022) Findings:
 - 76% of respondents reported at least 1 symptom of mental health condition
 - Covid 19 compounded the issue
- ☞ Weapon to combat this is practicing Gratitude

Gratitude Defined

☞ 2 Components

- There are good things in the world – goodness exists
- Goodness that comes from outside ourselves – a gift (small or large)

☞ Physical Benefits

- Stronger immune system
- Lower blood pressure
- Exercise more, take care of themselves
- Less aches/pains

☞ Psychological Benefits

- Optimism
- Happiness
- Feel less lonely
- More helpful, generous, & compassionate

Tips for Practicing Gratitude

- ☞ Right before sleep, first thing in the morning
- ☞ Keep a gratitude journal
- ☞ Kick off team meeting with 1 thing everyone is grateful for
- ☞ Write thank you notes
- ☞ Smile / Happiness when seeing others
- ☞ Drop a quick text (thinking of you)
- ☞ Watch the sunrise / sunset / moon. Go into nature.
- ☞ Do a good turn daily (aka act of kindness)

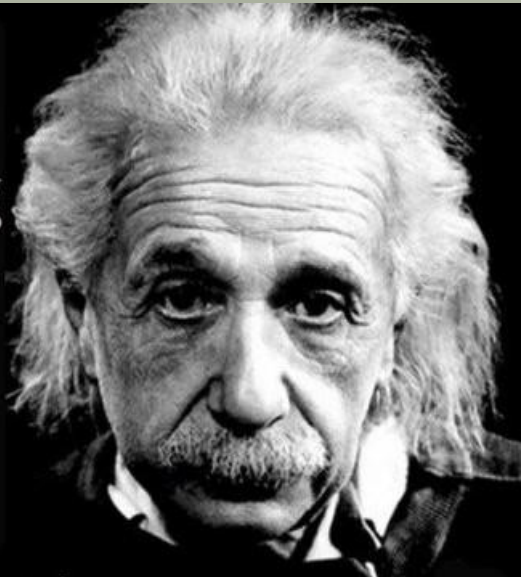


Why Understand our Data?



Insanity:
doing the same thing
over and over again
and expecting
different results.

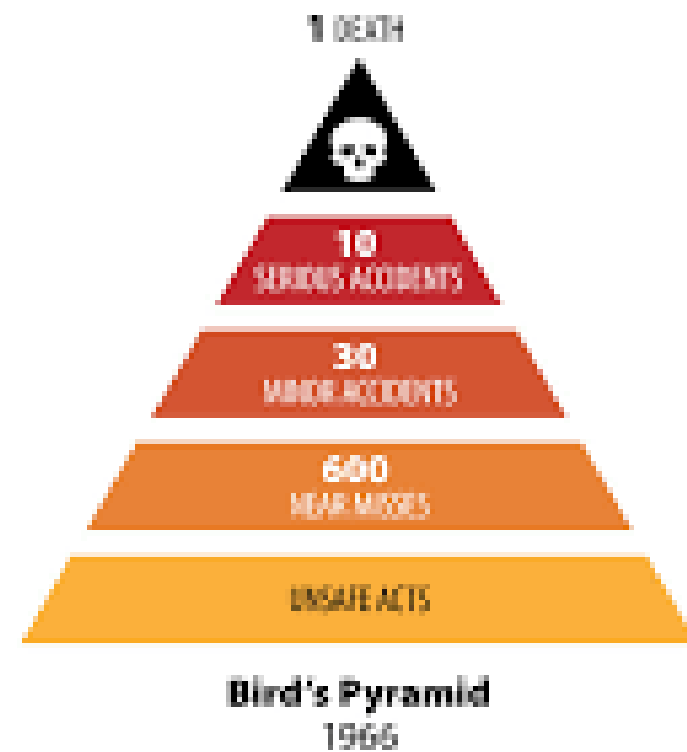
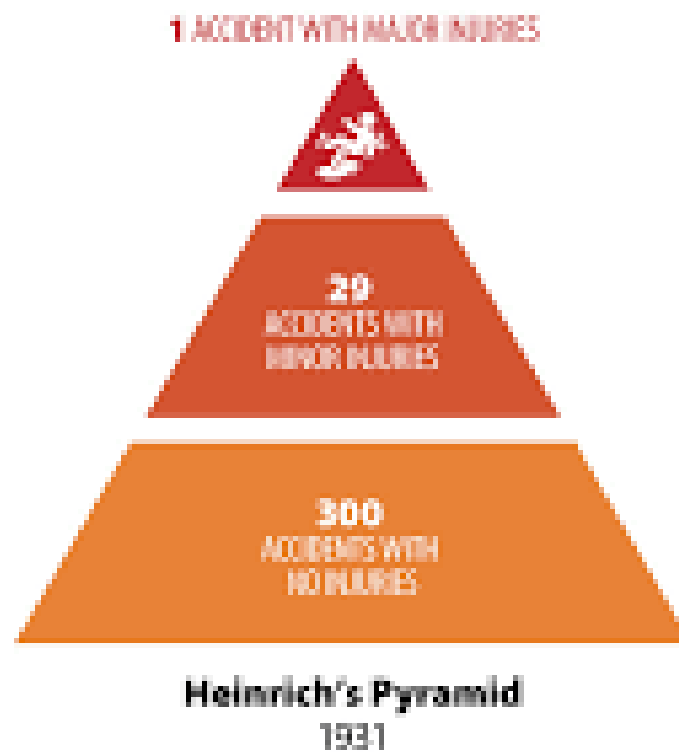
- Albert Einstein



The PDCA Cycle

SafetyCulture







What analysis criteria are we
using for our data?

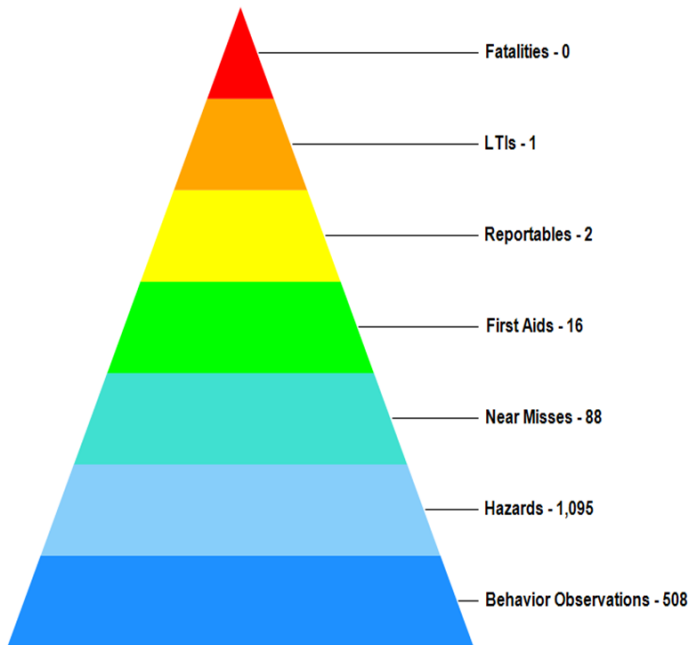
Ideas

- ✎ Length of Employment
- ✎ Days in Current Job
- ✎ Day of Week
- ✎ Department
- ✎ Equipment
- ✎ Causes
- ✎ Shift
- ✎ Hours worked in last week/month
- ✎ Severity of Injury
- ✎ Type of Injury
- ✎ Body Part
- ✎ Month

Data Analysis Tools

- EHS Software Programs
- Excel Spreadsheets with all types of charts

Safety Pyramid as of 10-Sep-2021

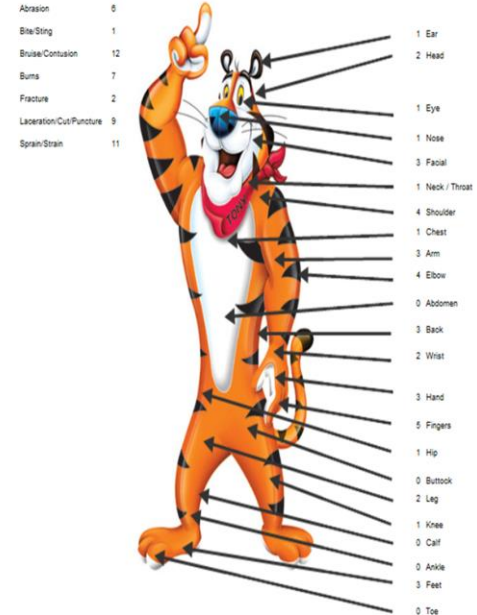


Insight
See insights - make change

Bodily Injury Summary

1/1/2015 - 3/1/2016

KAPP



Heat Map



What Root Cause Analysis Tools
are we using?

Examples

- 5 Why
- 6W2H
- Fishbone
- FMEA – Failure Modes Effect Analysis
- DMAIC – Six Sigma (Broader than 1 incident)
- TapRoot





DEFINE

- Launch Team
- Establish Charter
- Plan Project
- Gather the "Voice of the Customer"
- Plan for Change



MEASURE

- Document the Process
- Collect Baseline data
- Narrow project focus



ANALYZE

- Analyze Data
- Identify Root Cause
- Identify and Remove Wastes



IMPROVE

- Generate Solutions
- Evaluate Solutions
- Optimize Solutions
- Pilot
- Plan and implement



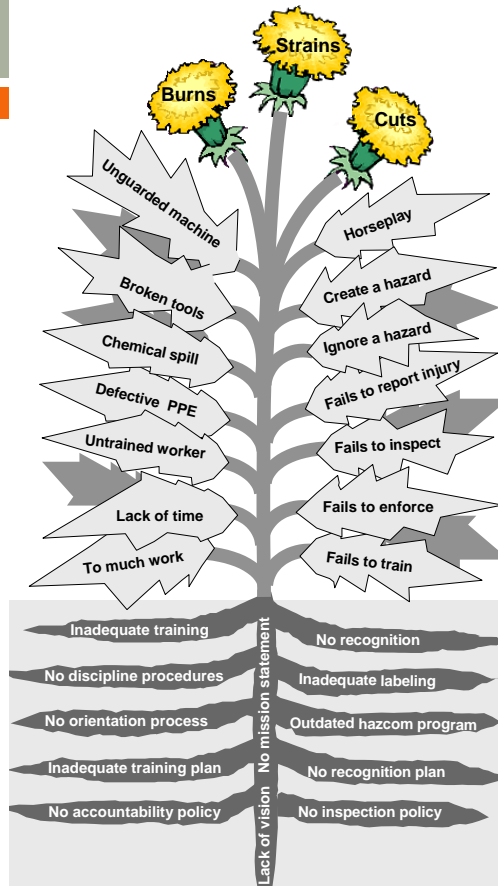
CONTROL

- Control the Process
- Validate project benefits

Importance of RCA and CAPA

- ✂ Ineffective Root Cause Analysis (RCA), Corrective And Preventative Action (CAPA), or both leads to repeat incidents.
 - Definition of Insanity
- ✂ Don't look at your investigations as a task to be done, but as an opportunity to learn something from.
 - Ask Learning Questions

Multiple Causation and the Accident Weed



Any way you look at it, design is the key to an effective safety management system.

If design is flawed, yet perfectly implemented, the system fails. If design is perfect, yet implementation is flawed, the system fails as a result of design flaws in other related processes.

1. Direct Cause of Injury

- Always the harmful transfer of energy.
- Kinetic, thermal, chemical, etc.
- Contact with, exposure too, etc.

2. Indirect (Surface) Cause of Injury

Primary Surface Cause

- Produces the accident
- Unique hazardous condition/unsafe behavior
- Exists/Occurs close to the injury event
- Involves the victim, possibly others

Contributing Surface Cause

- Contributes to the accident
- Unique hazardous condition
- Inappropriate/unsafe behavior
- Exists/occurs more distant from the accident
- Exists/occurs anytime, anywhere by anyone

3. Basic (Root) Cause of the Injury

Inadequate system implementation

- Failure to carry out safety policies, programs, plans, processes, procedures, practices
- Pre-exist surface causes
- Under control of management
- Failure can occur anytime, anywhere
- Produces common surface causes

Inadequate system design

- Poorly written or missing policies, programs, plans, processes, procedures, practices
- Pre-exist surface causes causes
- Under top management control
- Produces inadequate implementation

Learning Questions

- ☞ Tell me about your experiences with (topic). What about (topic) is difficult?
- ☞ Are the procedures for (topic) practical, doable? Help me understand.
- ☞ Of all the rules or procedures pertaining to (topic), which do not seem to fit the job you do? Tell me more.
- ☞ Tell me about a near miss you've experienced when performing (topic)
- ☞ While performing (topic), do you know of a specific area where it is easy to make a mistake? Tell me more. Any ideas on how we can fix it?

Human and Organization Performance - HOP



Dr. Todd Conklin
Fisher Improvement Technologies (FIT)

Human and Organization Performance (HOP)

∞ Deviations from Expected Outcome

- Event
- Accident
- Failure
- Injury/Near Miss/First Aid
- Quality Defect

∞ Are our systems robust, strong, and resilient enough to absorb any of our mistakes preventing a Deviation from Expected Outcome?

Error Traps & Our Trends — linked?

- ✎ First Time/Infrequent Task
- ✎ Overconfidence
- ✎ Vague/Poorly Written Guidance
- ✎ Poor/Unclear Communications
- ✎ Stress
- ✎ High Workload
- ✎ Time Pressure
- ✎ Distractions
- ✎ End of Shift or work cycle or extended shift
- ✎ First Day back after > 4 days away

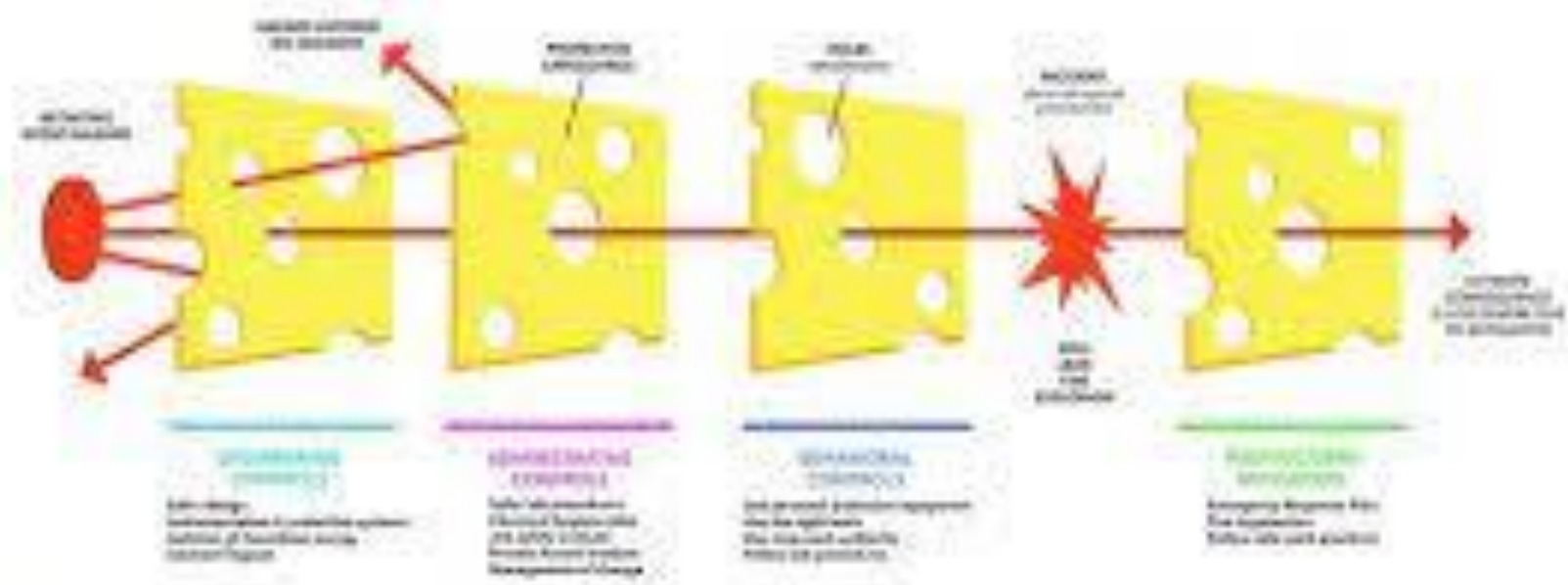
Hand Injuries

Sanitation
Tasks

Corrective & Preventative Actions



EXPECT THE UNEXPECTED. ASSESS YOUR RISKS. PREVENT INCIDENTS.

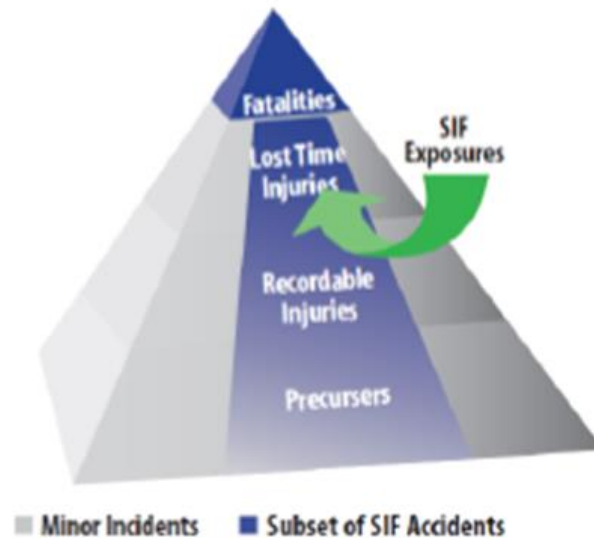
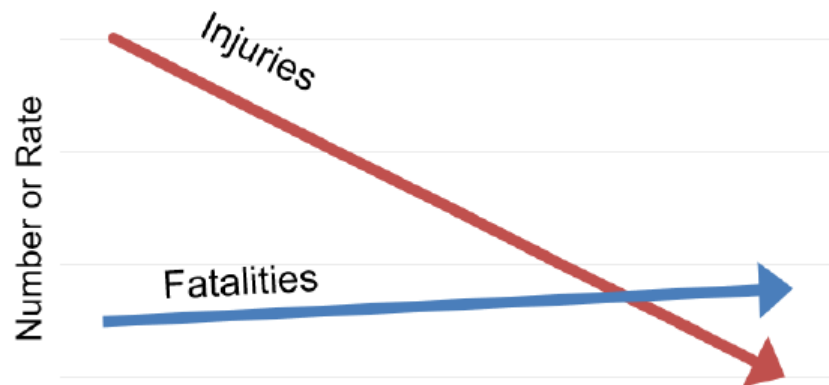


Severe Injury Fatality (SIF)



Leadership drives SIF prevention

A serious injury or fatality (SIF) is a life-threatening or life-altering work-related injury or illness.



We are getting better at preventing the "bee strings", but what about the life-altering events?

Leadership drives SIF prevention

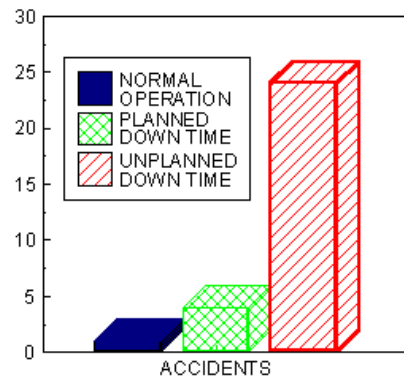
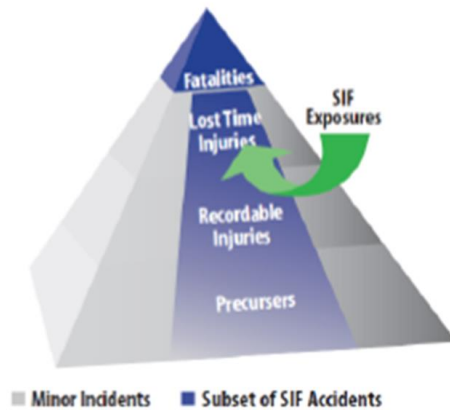
Serious injury and fatality (SIF) potential involves situations that could have been worse if 1 (or 2) factors changed **and** that rank high from a severity and probability.

A factor could be a control, the weather, a time of day, or a person's location.

Near misses and minor incidents with a potential to have serious consequences are “free lessons”, and just because an incident has not occurred does not mean danger does not exist.



Leadership drives SIF prevention



- Work On/Near Hazardous Energy
- Machine Safety
- Electrical Work
- Confined Space Entry
- Elevated Work
- Mobile Equipment / Pedestrian Segregation
- Use of Cleaners & Sanitizers



Critical Behaviors

- Equipment Isolation
- Work Permitting
- Barriers/Safeguards
- Vehicle Use
- Line of Fire
- Critical PPE Use

Downtime = Increased Probability

Planned vs. Normal Operation – 4x

Unplanned vs. Normal Operation – 24x

- Work Pace
- Eyes on Task
- SPA
- Observations
- Communication

SIF Potential Automatic Criteria

Table 1: SIF Potential Automatic Determination Criteria

Motor Vehicle-Traffic Safety	Fall From Elevation	Lockout/Tagout (Hazardous Energy)
<ul style="list-style-type: none"> - Vehicle tip over/rollover - Any collision rendering vehicle inoperative - Collision head-on - Collision broad-side at intersection - Contact with people while moving - Any motorcycle collision or tip over/rollover during operation 	<ul style="list-style-type: none"> - Actual Falls > 1.2 m (4 ft.) - Potential Falls > 1.2 m (4 ft.) (Exposure to unprotected work surfaces or edges) - Exposure to Fall > 1.2 m (4 ft.) using fall protection without designed or engineered anchorage point 	<ul style="list-style-type: none"> - Failure to identify and isolate all energy source (s) - Disconnect labeled incorrectly allowing potential for isolation of wrong equipment - Improper use of emergency stops for isolation - Damaged or not functioning interlock or energy isolation point
Mobile Powered Industrial Equipment & Pedestrians	Combustible Dust	Ammonia (follow PSM Inc. Investigation)
<ul style="list-style-type: none"> - Equipment tip over/rollover - Early departure from loading dock - Contact with people (Pedestrians) while moving - Collision with other powered truck - Driver body part contacts rack/pallets during operation 	<ul style="list-style-type: none"> - Equipment failure in combustible dust area causing upset condition - Improper use of tools in combustible dust area - Improper completion of line break activities 	<ul style="list-style-type: none"> - Ammonia release requiring evacuation - Shut down of ammonia equipment due to safety device activation - Improper completion of line break activities
Electrical Safe Work Practices	Machine/Conveyor Guarding	Equipment Failure
<ul style="list-style-type: none"> - Electrical Shock > 50V circuit - Arc flash or blast - Use of portable equipment without portable GFCI/RCD - Exposure to live electrical (unintended) - "Touching before testing" circuit 	<ul style="list-style-type: none"> - Exposure to unprotected hazards or point of operation or moving equipment - Unguarded belt head and tail pulley - Unprotected rotary valve opening - Cleaning moving belt without the use of the proper tool 	<ul style="list-style-type: none"> - Rupture or explosion or steam release - Significant fire or smolder - Unintended release of energy - Contact to face/torso with hot liquid > 55C (131 F) - Pressure relief device activation on pressure vessel
Hazardous Materials	Oven safety	Confined Space
<ul style="list-style-type: none"> - Explosion or fire - Hazardous chemical inhalation or contact with face/torso - Chemical burn (improper PPE use) - Significant hazardous chemical spill or release 	<ul style="list-style-type: none"> - Accumulation of fines/product inside oven or associated equipment with the potential to cause property damage or harm to employees - Activation of fire suppression system or alarm 	<ul style="list-style-type: none"> - Entry without required permit - Condition requiring evacuation (e.g. entry without testing, hazard identified in space) - Lack of retrieval plan
Excavation Trench Work	Hot Work/Fire	Lifting and Rigging
<ul style="list-style-type: none"> - Trench/Excavation collapse - Unapproved entry into excavation - Condition requiring evacuation 	<ul style="list-style-type: none"> - Hot work performed without required permit - Unexpected fire or smolder produced by hot work. - Activation of fire suppression system or alarm - Use of 2 or more fire extinguishers to put out fire 	<ul style="list-style-type: none"> - Crane tip over - Dropped load - Walking under suspend load - load not properly rigged - Permit not utilized for critical lift
Other		
<ul style="list-style-type: none"> -Struck by object falling > 2m (6.5 ft.) -Significant puncture/laceration 	<ul style="list-style-type: none"> -Unintended injection of material under the skin - Roof, structure, or overhead equipment collapse 	<ul style="list-style-type: none"> -Violence incident with gun, knife or other potential lethal weapon

Near Misses, Close Calls, Near Hits



Aviation Safety Reporting System

- 37 Years – over 1.1 million near misses reported
 - 6,700 reported per month
- <http://asrs.arc.nasa.gov/index.html>
- How safe do you think the airline industry is?



Are Near Misses Important?

- Do you look at them as a good thing or bad thing?
 - What color are they on your scorecard?
 - What is a near miss?
 - Why aren't they reported?
 - Why are they important?
-
- SIF Potential

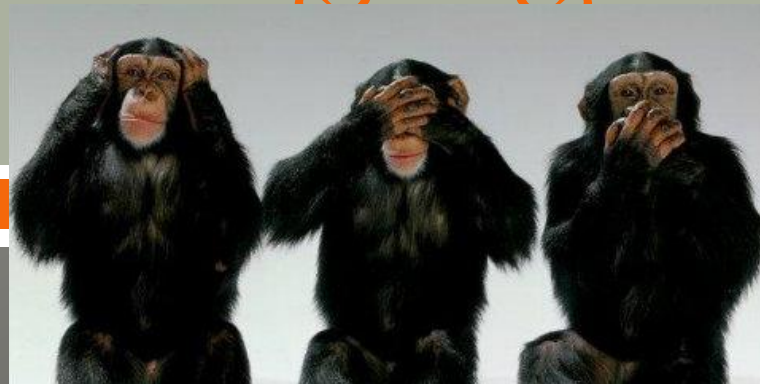
Why Near Misses Aren't Reported

- ✂ **Complacency (#1 Enemy of Safety)**
- ✂ **Concerns about blame/complaints/punishment**
- ✂ **Complicated process**
- ✂ **Peer Pressure**
- ✂ **Concern about reputation/embarrassing**
- ✂ **Red Tape Bureaucracy**
- ✂ **Lack of Recognition/Feedback**
- ✂ **Follow-up lacking**

Chronic Unease

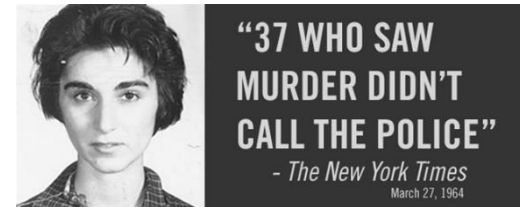
Five attributes of chronic unease	
Vigilance	Being alert to weak indicators of risks like near misses, process upsets and localised failures
Propensity to worry	An emotional tendency to worry about risk and safety
Pessimism	A personal tendency to resist complacency and anticipate failure
Requisite imagination	Ability to imagine and visualise possible worst-case scenarios
Flexible thinking	Ability to question assumptions, considering many aspects of a problem and not jumping to conclusions

What's Holding us Back from Intervening for Safety?



Possible Answers

- ☞ Fear of negative response
- ☞ Deadlines and pressures
- ☞ We want to finish something before moving to next task
- ☞ Fear of punishment
- ☞ Deference to Authority
- ☞ Bystander Effect – more of us there, less likely to speak up. Kitty Genovese 1964
- ☞ Defensiveness
- ☞ Tension
- ☞ Rationalization
- ☞ Context Effect - exercise



EHS Lessons from Chernobyl



- ∞ Importance of Safety Culture
 - Stop and regroup – continued through a test
 - Complacency and Over Confidence – Respect the hazard and risks
 - MOC – Test plan thoroughness
- ∞ Importance of knowledge and training
- ∞ Do Emergency Shutdown's work? Tested?
- ∞ Coordination with Emergency Responders
- ∞ Prepared to handle worst case scenario – environmental and community impact
- ∞ Bad news can never wait

- ∞ *Don't Forget about Deepwater Horizon and Dark Waters Movies*

What Other EHS Data Do/Could you Analyze?



Other Data to Analyze

- ✂ Behavior Based Observations
 - Are your Unsafe Observation Percentages high enough?
- ✂ OSHA Complaints
- ✂ Internal Audit Findings (Insurance Provider Visits)
- ✂ Health Checks/Self-Assessments
- ✂ Internal Complaint/Concern Reporting Processes
- ✂ Culture/Morale Surveys
- ✂ Inspection Data – PPE, Ladders, Electrical, etc.
- ✂ Work Orders, Preventative Maintenance
 - Corrective/Preventative Action Status
- ✂ Other Data?
- ✂ Don't forget about Benchmarking with others

Questions

