

WELCOME!



... A LITTLE MORE COMPLEX?



HAZARDOUS MATERIALS INCIDENT INVESTIGATION & ROOT CAUSE ANALYSIS

Hazmat Seminar Billings 2013
Ernie Sirotek - FRA
Hazmat Specialist – Sacramento, CA

HAZARDOUS MATERIAL INCIDENT INVESTIGATION

- ✘ Why do we investigate incidents?
 - + To recognize unsafe acts or conditions that caused the incident
 - + To identify management systems that failed to prevent the incident from happening
 - + To reduce the potential for injuries / fatalities
 - + To reduce the potential for property loss
 - + To reduce the potential for environmental damage
 - + To reduce the likely-hood for reoccurrences

PURPOSE OF HM INVESTIGATIONS

- ✘ Gather information on the causes of the incident
- ✘ Make recommendations to prevent future occurrences
- ✘ Implement effective corrective measures
 - ✘ Fact Finding
 - ✘ Analysis
 - ✘ Corrective Action

INCIDENT REPORTING

Encourage Incident Reporting

What is not reported, cannot be investigated

What is not investigated, cannot be changed

What is not changed, cannot be improved, and
therefore.....

WILL HAPPEN AGAIN

INVESTIGATION GUIDELINES

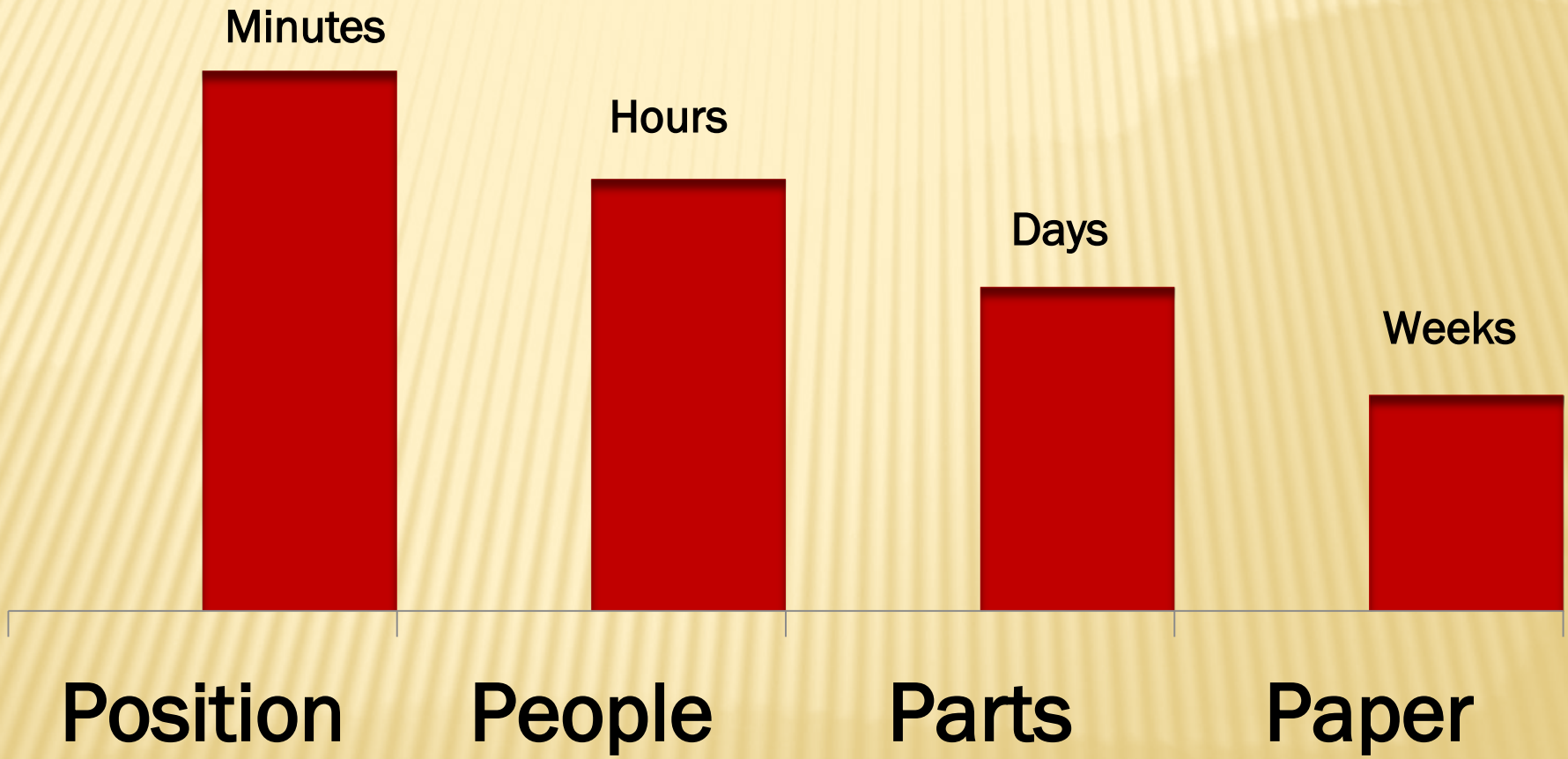
- ✘ **Initiate the investigation process ASAP**
 - + Memories and evidence fresh
 - + Focus on evidence preservation
- ✘ **Remove any immediate hazards or dangers that have the potential to cause injury or escalate the incident**
- ✘ **Gather Information**
 - + Interview people involved
 - + Determine exactly what happened
 - + Photographs
 - + Documentation

INVESTIGATION GUIDELINES

- ✘ **Analyze the information**
 - + List in chronological order the sequence of events that led up to the incident
- ✘ **Determine the cause(s) of the incident**
 - + Identify all contributing factors
- ✘ **Make recommendations**
 - + Focus on prevention of a repeat incident
- ✘ **Follow up to ensure recommendations are implemented and effective**

EVIDENCE SEQUENCE (4 P'S)

IN ORDER OF IMPORTANCE



POTENTIAL QUESTIONS DURING AN INVESTIGATION: (EQUIPMENT)

- ✘ Were there any defects in equipment, tools or materials that contributed to the incident?
- ✘ Was the equipment known to be faulty prior to the incident? Why was it not reported, repaired or replaced?
- ✘ Was the equipment appropriate for the job and readily available for the task?
- ✘ Have employees been trained in the use of the equipment?
- ✘ Are effective written work procedures in place to operate equipment / tools?

POTENTIAL QUESTIONS DURING AN INVESTIGATION: (ENVIRONMENT)

- ✘ Was the location or position of the equipment, material or employee a contributing factor?
- ✘ Was the hazardous condition / area identified previously and reported? If not, Why?
- ✘ Was there sufficient work space?
- ✘ Were environmental conditions a contributing factor? (Lighting, Noise, Ventilation, Wet, Hot, Cold etc.)

POTENTIAL QUESTIONS DURING AN INVESTIGATION: (PEOPLE)

- ✘ Was there a written work procedure for the task? Is it adequate and current?
- ✘ Was the employee trained on the procedure and did they follow it?
- ✘ Was the employee distracted or rushed? If so why?
- ✘ Did the employee have all the required materials / tools on hand to perform the task? If not why?
- ✘ If assistance was needed for the task did the employee request it and was it available?

POTENTIAL QUESTIONS DURING AN INVESTIGATION: (SUPERVISION)

- ✘ Was there a failure to detect, anticipate or report a hazardous condition?
- ✘ Was there a failure to detect or correct deviations from safe work procedures?
- ✘ Were responsibilities adequately defined and understood by the employee?
- ✘ Was there a failure to initiate corrective actions for a known hazardous condition?
- ✘ Was the employee informed about potential job hazards?

POTENTIAL INVESTIGATION RECOMMENDATIONS / OUTCOMES

- ✘ Equipment repairs, evaluations or purchases
- ✘ Policy / procedure / process revisions or updates
- ✘ Discussions / communications with employee(s) involved
- ✘ Risk assessment of area / concern
- ✘ Work area enhancements / design
- ✘ Training or re-training required
- ✘ Evaluation of work load, work rotation or work activity

RECIPE FOR FAILURE

Contributing Factors for an Incident Inducing Work Environment

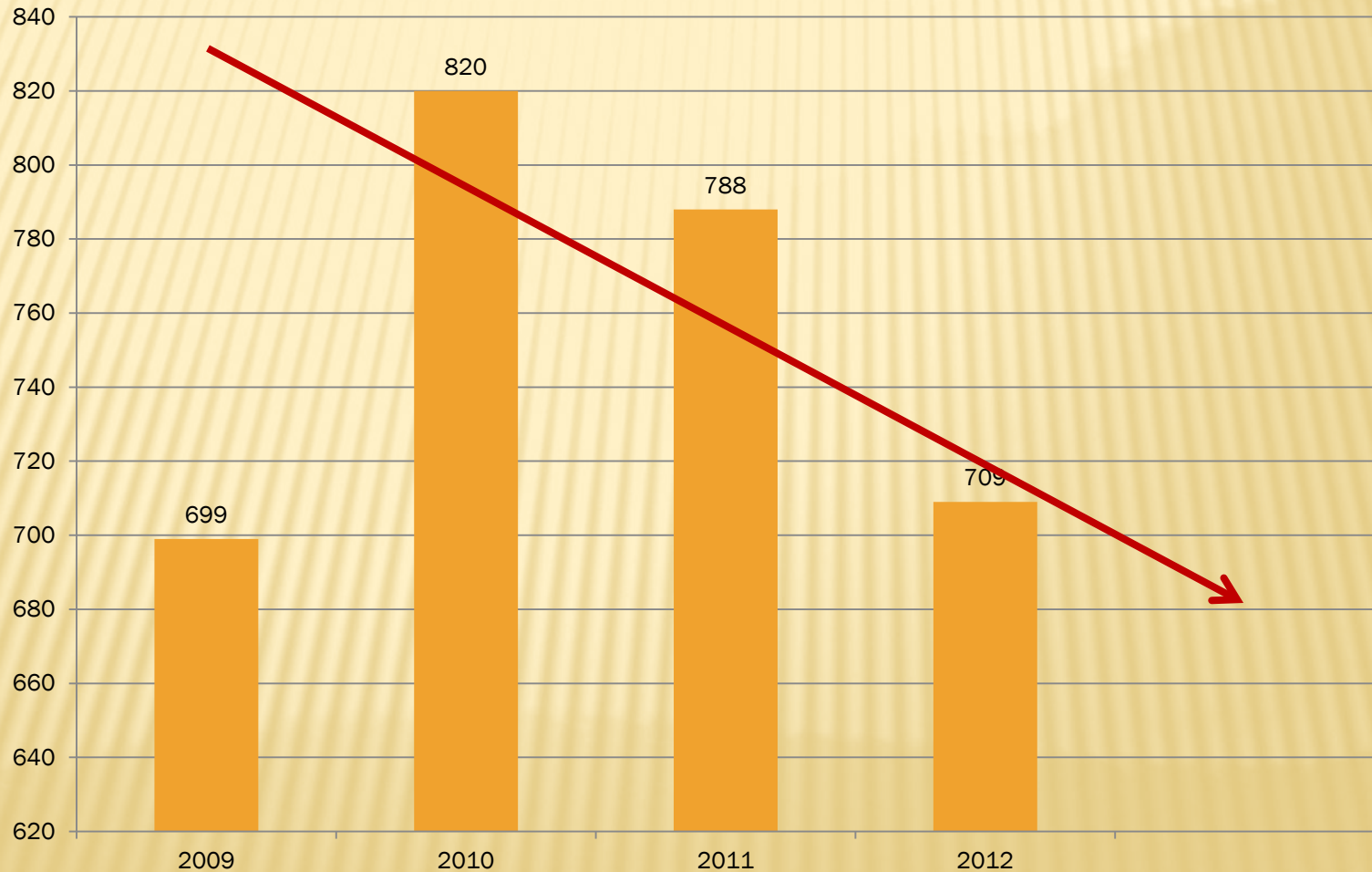
- ✘ Lack of management commitment
- ✘ Management systems failures
- ✘ Inadequate processes and/or procedures
- ✘ Substandard physical work environment
- ✘ Ineffective protective measures
- ✘ No proactive approach / preparation
- ✘ Result – Inadequate defense

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NAR'S ROOT CAUSE ANALYSIS

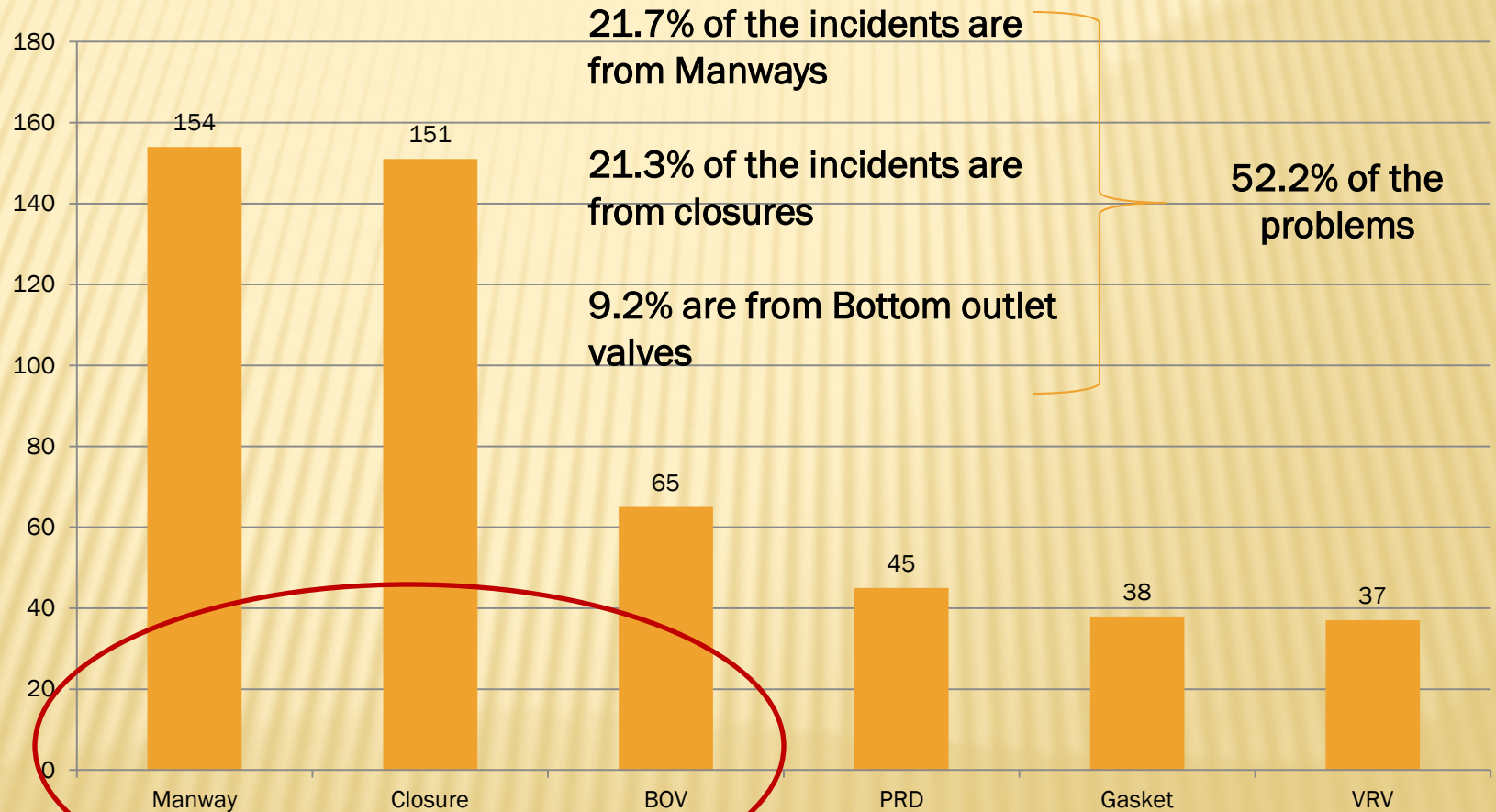
TOTAL NAR'S BY RAIL 2009 - 2012

Total NAR's by Rail



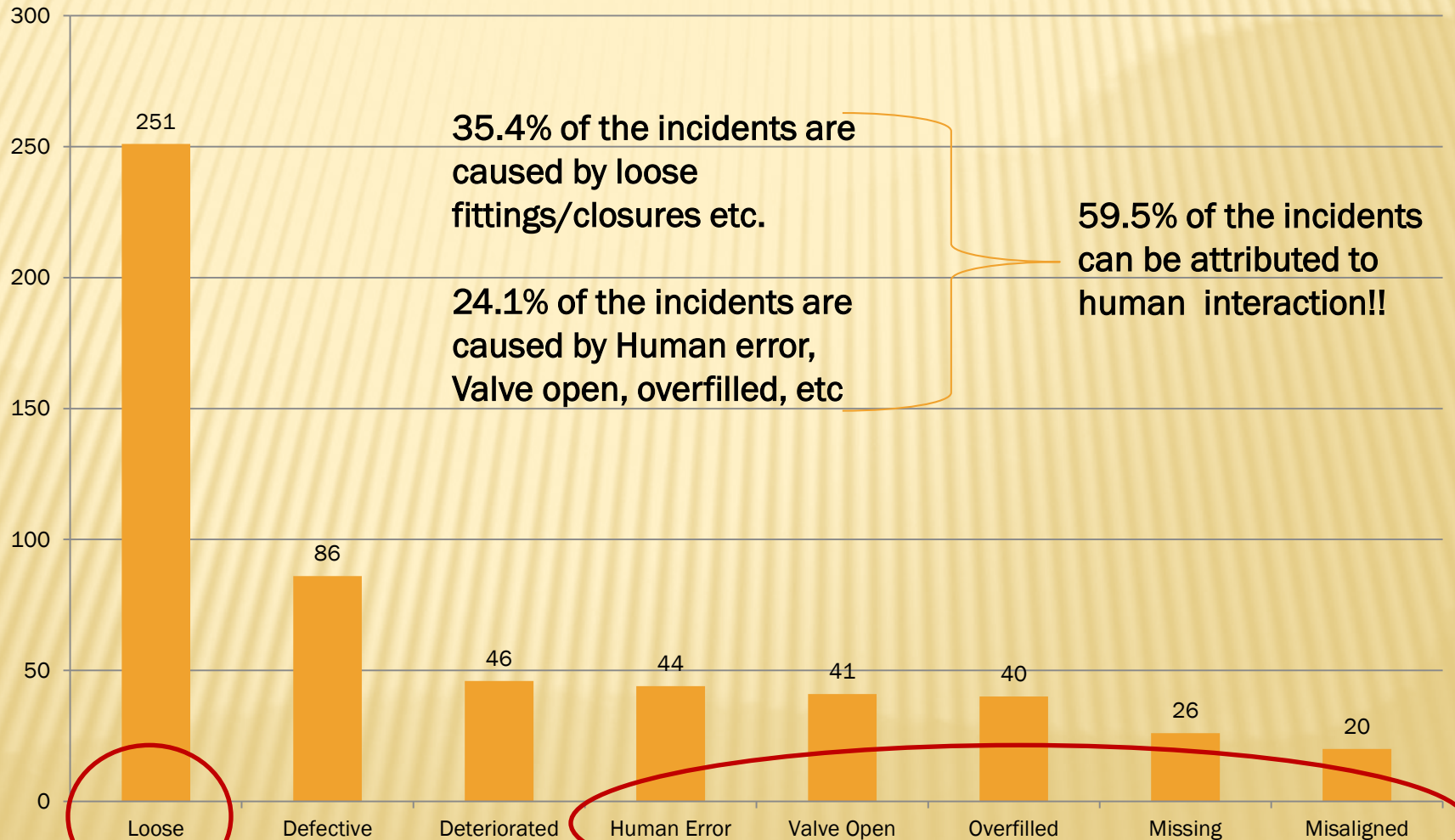
TOP SOURCES OF NAR'S 2012

Top Sources of NAR's



TOP CAUSES OF NAR'S 2012

Top Causes of NAR's



WHY?!

COMMON CAUSES OF NAR'S

- × Lack of Training
- × Lack of Effective Procedures
- × Lack of Tools / Materials
- × Lack of Resources
- × Lack of Quality Controls
- × Lack of Qualifications
- × Lack of Accountability
- × Lack of Communication
- × Lack of Understanding of Tank Cars
- × Inspection Criteria
- × Defective Equipment
- × Deteriorated Gaskets
- × Missing Parts
- × Loose Closures
- × Understanding of Regulations
- × Incompatible Materials
- × No Root Cause Analysis

ROOT CAUSE

As defined by the American Society of Quality (ASQ)

A root cause is a factor that caused a nonconformance and should be permanently eliminated through process improvement.

A root cause analysis is a collective term that describes a wide range of approaches, tools, and techniques used to uncover causes or problems

ROOT CAUSE ANALYSIS STATS

Studies show that when trying to prevent unacceptable events from happening again:

Alexander Dunn, Director of Assetivity Properties LTD. (Maintenance World Website)

- ✘ **10%** of participants immediately sought to place blame
- ✘ **26%** immediately expressed an opinion of the causes and offered solutions without investigating the problem
- ✘ **20%** examined the problem in sufficient detail to be able to identify an effective solution
- ✘ The other 44% had no opinion or in general did not give a hoot (Not really a statistic)

PERSONNEL PROBLEMS ?

Research has repeatedly proven that unwanted situations within organizations are about 95 percent related to process problems and only 5 percent related to personnel problems. Yet, too many organizations spend far more time looking for culprits than causes and because of this misdirected effort, seldom really gain the benefits they could get from understanding the foundation of the unwanted situation.....

(ROOT CAUSE)

The Five Why's!

**Six Sigma DMAIC
Methodology**

FIVE WHY'S!

DMAIC METHODOLOGY

- ✘ Developed by Sakichi Toyoda and used at Toyota Motor Corporation
- ✘ Associated with “Six Sigma” Continuous Improvement
- ✘ A question-asking technique to explore cause- and-effect of a problem
- ✘ Goal is to determine root cause of a defect or a problem
- ✘ The fifth why generally identifies Root Cause
- ✘ Why, why, why, why, why...(Why did the process fail)?
- ✘ Key concept...People generally are not the reason for failures, PROCESSES ARE

DMAIC

DEFINE AND MEASURE THE PROBLEM

**ANALYZE CAUSE-AND-EFFECT
RELATIONSHIPS**

**IMPLEMENT AND CONTROL THE BEST
SOLUTIONS**

DEFINE AND MEASURE THE PROBLEM

The first step in the process is to define the problem (Compare the result you want to the result you are getting)

- ✘ What is the problem we are having?
- ✘ Why do we need to get the problem corrected?
- ✘ Is it really a problem?
- ✘ When and where is this problem occurring?
- ✘ How many times has this problem occurred?

ANALYZE CAUSE AND EFFECT

Once the problem is defined, it is important to uncover the root causes of the problem, contributing factors that led to the problem and to identify the reasons why the problem exists.

- ✘ Training - Employees / Contractors
- ✘ Procedures - Loading / Inspection Criteria
- ✘ Suppliers - Ordering Processes / Compatibility
- ✘ Tools / Materials / Equipment

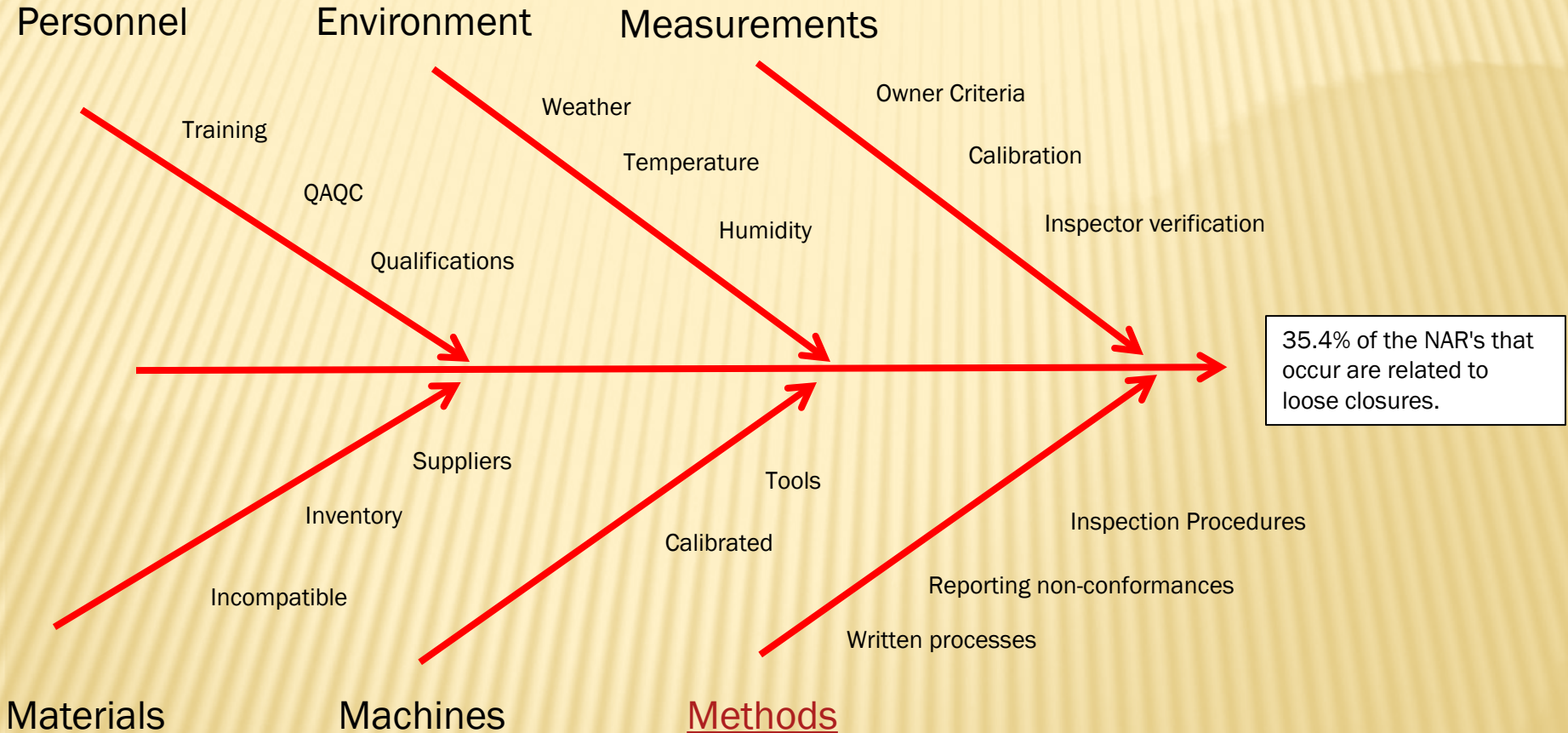
IMPLEMENT AND CONTROL SOLUTIONS

Identify and implement solutions (specific actions) based on the root cause analysis. Monitor the results of the solutions implemented. The right solutions are controllable, measurable, and generally prevent the problem from recurring.

- ✘ Inspection Points / Documentation
- ✘ Revised Training Plans / Employee Tests
- ✘ Torque Specs / Rechecking Gaskets
- ✘ Supplier Audits / Inventory Traceability

CAUSE AND EFFECT

CAUSE MAPPING



ROOT CAUSE TEMPLATE

Root Cause Analysis

Problem Statement: Tank car NAR due to leaking at the manway

Why 1	Why 2	Why 3	Why 4	Why 5	Root Cause	Corrective Action Plan
Why did the tank car leak at the Manway?	Why were the manway bolts loose?	Why are there no written procedures?	Why was the tank car owner not contacted for process for securing manway bolts?	Why did you not see if formal written procedure or training was required?	<p>This incident identified that there are no written procedures for tightening manway bolts. It also identified a gap in formal training in identifying and reporting defective or deteriorated gaskets and that there no mechanism in place for ordering new gaskets</p>	<p>Assign cross functional team of Technicians, Operators, Quality, and Compliance personnel to identify and develop written procedures for inspecting, reporting defects, and securing manway bolts and all service equipment on tank cars. Assign Operators and Compliance personnel to review and update training requirements for all hazardous material employees. Assign Operators to work with Purchasing to establish supplier and means to purchase gasket material for tank cars.</p>
Answers: 1. The manway bolts were loose.	Why was the gasket deteriorated? Answers: 1. No written procedure on securing bolts	Why are there not any replacement gaskets? Why was the employee not properly trained?	Why is there not a method for ordering gaskets? Why is there not a written training curriculum for training?			
2. The gasket was deteriorated	2. No replacement gaskets	Answers: 1. Practice passed on to new employees by using hands on procedure	Answers: 1. Assumed that securing manway bolts was an easy task and that anyone could do it without formal training	Answer: 1. Did not want to bother management with something that was perceived to be going well.		
	3. Was not properly trained	2. No method for ordering new gaskets 3. OJT training provided only	2. Never encountered this situation before. This is a first time event. 3. Assumed OJT was sufficient			

Tank car NAR due to leaking manway cover

Why

Manway cover bolts were loose

Why

No written procedures for securing manway
No formal employee training on manways

Why

Thought anyone could tighten some bolts
Thought OJT was adequate

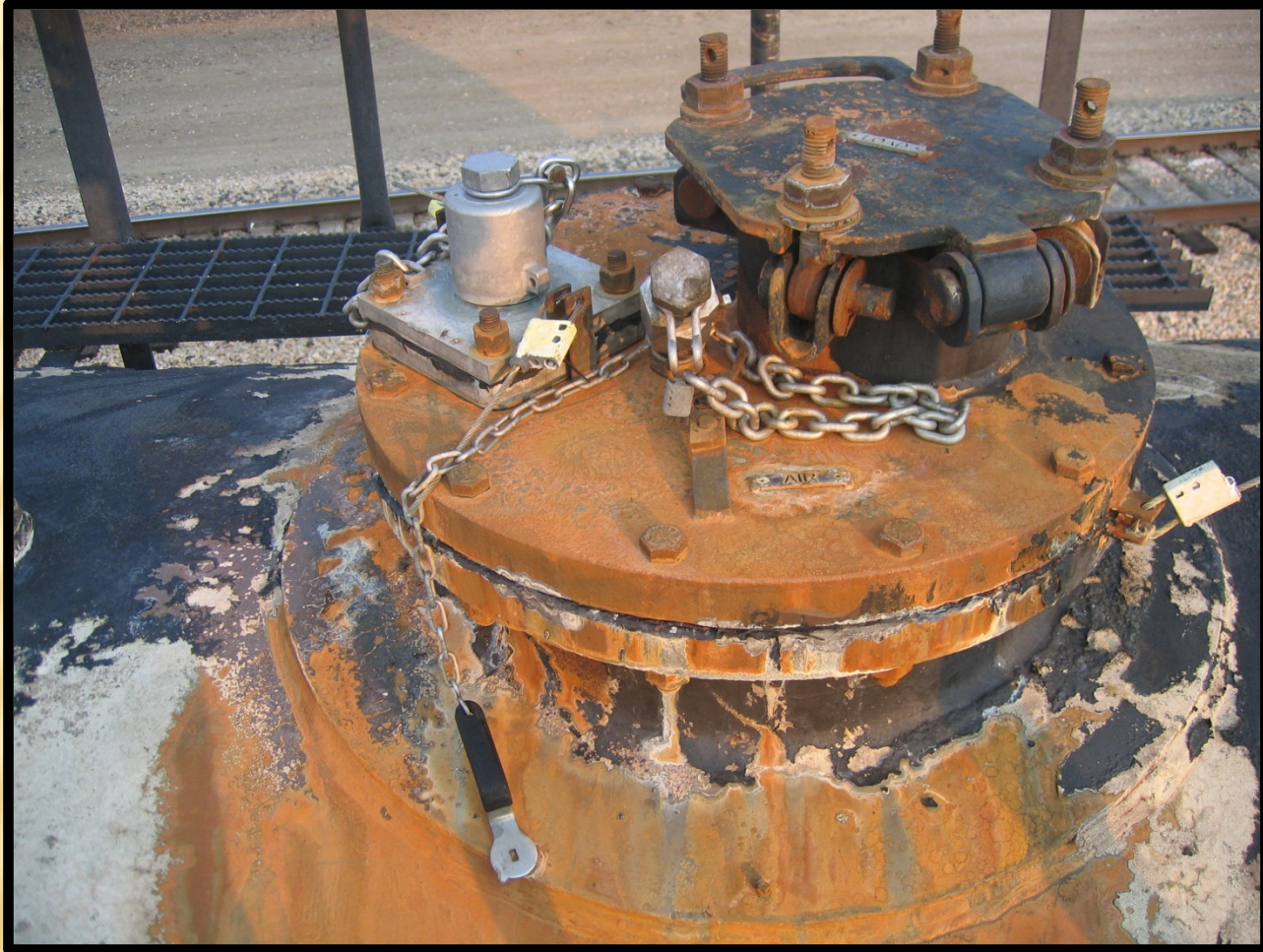
Why

Never considered specific procedures before
This is how we always did it

Why

Not sure where to get info on procedures
Never considered there to be a better way

PLUGS LOOSE / VALVES OPEN



MANWAY BOLTS LOOSE



MANWAY BOLTS LOOSE



WHEN TC INCIDENTS OCCUR...FRA WILL BE INVOLVED

- ✘ Is there an effective investigation process in place?
- ✘ Was investigation documented / reports, etc.?
- ✘ Was root cause and contributing factors clearly identified?
- ✘ Was an action plan implemented based on investigation/root cause analysis results?
- ✘ Is there a timeline for follow-up to ensure corrective actions are effective? Do not assume all is OK
- ✘ FRA documents follow-up inspection results and uses information to assist in determining enforcement action
 - + Defect
 - + Civil/criminal prosecution
 - + Compliance Order
 - ✘ Emergency Order
 - ✘ Safety Advisory



CASE STUDIES

✘ A Refining Company in NCAL

- + Pinnacle Award Winner 2012 by UPRR and AAR
- + Three NAR's and two overloads 1st quarter 2013
- + FRA Investigation
 - ✘ Excess Teflon tape on valve plugs was not removed
 - ✘ No final check for leaks after loading
 - ✘ Reference temperature not utilized to determine outage.
 - ✘ Unfamiliar with OTMA process
- + Processes revised and being monitored

✘ Tank Car Unloader in SOCAL

- + Three NAR's July and August all closure related
- + FRA Investigation
 - ✘ Company just received hazmat training by BOE June 2013
 - ✘ Although training covered inspecting and securing all closures, company's internal procedure did not
 - ✘ Discovered 17 additional tank cars with loose closures that had been released to the railroad. These were captured and corrected
- + Procedure updated and all operators re-trained. FRA monitoring situation

WORDS TO LIVE BY

- ✘ If we do not change our direction, we may end up where we are headed. (Chinese Proverb)
- ✘ Definition of Insanity: Doing the same things over and over again and expecting different results. (Albert Einstein)
- ✘ Don't find fault, find a remedy. (Henry Ford)
- ✘ What we have here is a failure to communicate. (Strother Martin) Cool Hand Luke
- ✘ Always drink up-stream from the herd. (Tom)