Root Cause Analysis

2024 WSC Annual Conference

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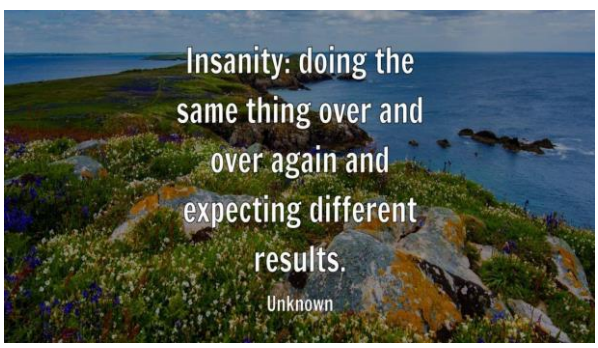

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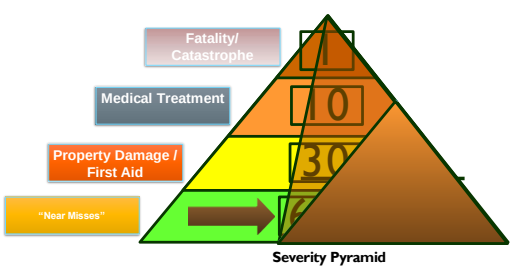

3

OSHA Compliance Directives- Agenda

- Why is Root Cause Analysis Important?
- Root Cause Analysis Techniques
  - 5 Whys
  - Fishbone
  - FMEA
- Next steps / summary.

4

Why is Root Cause Analysis Important?

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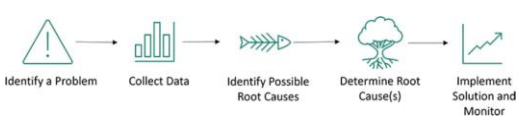
5

Why is Root Cause Analysis Important

- "Structured Approach"
- Treat the "problem", not the "symptoms"



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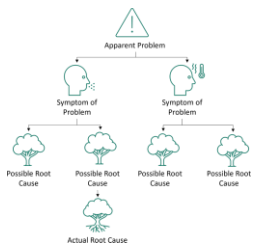
Why is Root Cause Analysis Important

- Identifying "Underlying Reasons"



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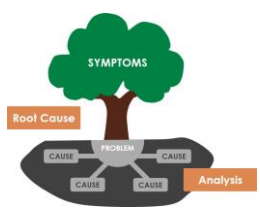
Why is Root Cause Analysis Important

- "Long term solutions" vs "short term fixes"



8

Corrective Actions

9

*Corrective Action(s)

- **Each root cause must be followed by it's own corrective action.**
- The corrective actions must be reflected in documentation.
- A closure date and responsible person must be assigned.

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10

*Corrective Action(s)

- Look beyond the immediate incident. Are there similar applications where these corrective actions can also applied?

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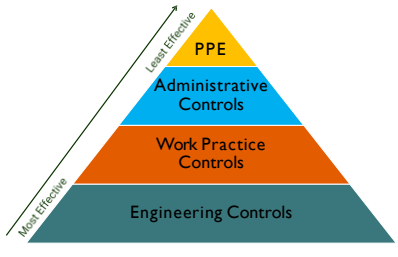
11

*Hierarchy of Controls



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12

*Engineering Controls

- ***If . . .***
  - The machine or work environment can be physically changed to prevent employee exposure to the potential hazard,
- ***Then . . .***
  - The hazard can be eliminated with an engineering control.

13

*Engineering Controls

- ***Examples . . .***
  - Initial design specifications
  - Substitute less harmful material
  - Change process
  - Enclose process
  - Isolate process
  - Ventilation

14

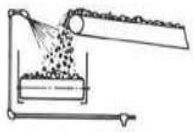
*Work Practice Controls

- ***If . . .***
  - Employees can be removed from exposure to the potential hazard by changing the way they do their jobs,
- ***Then . . .***
  - The hazard can be eliminated with a work practice control.

15

*Work Practice Controls

- ***Examples . . .***
  - Use of wet methods to suppress dust
  - Personal hygiene
  - Housekeeping and maintenance
  - Job rotation of workers



Wet Dust Suppression System

*Administrative Controls

- ***If . . .***
  - Employees can be protected from exposure to the potential hazard by following policies and procedures,
- ***Then . . .***
  - The hazard can be controlled with an administrative control.

*Administrative Controls

- ***Examples . . .***
  - Signs and barricades
  - Policies and procedures
  - Training and supervision

*Personal Protective Equipment

- ***If . . .***
  - Employees cannot be protected by **any other method,**
- ***Then . . .***
  - The hazard **must** be controlled personal protective equipment.

19

*Corrective Action(s)

- **Immediate Action**
  - Recovery Steps
  - Containment Items
  - "Stop Gap" Measures
- **Permanent Action**
  - Procedures & Plans initiated to prevent recurrence

- **Example:**

  Incident- person falls off of elevated surface because of a slippery surface caused by oil.

  - *Immediate Action* -

    Clean oily residue on work surface.

  - *Permanent Action* -

    Investigate oil source and address to prevent build-up. Establish routine PM schedule

Each concern identified in the investigation process must be addressed!

20

Root Cause Analysis Tools / Processes

21

The 5 Whys

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22

*Basic "5 Why's" Technique

- By repeating asking the question **"Why"** (five is a good rule of thumb), you can peel layers of symptoms which can lead to the root cause of a problem
- Very often the perceived reason for a problem will lead you to another question
- Although this technique is called "5 Whys," you may find that you will need to ask the question fewer or more times than five before you find the issue related to a problem.

23

*Basic "5 Why's" Technique

- **Benefits of the 5 Whys**
  - Help identify the root cause of a problem
  - Determine the relationship between different root causes of a problem
  - One of the simplest tools; easy to complete without statistical analysis

24

*Basic "5 Why's" Technique

- **When Are The 5 Whys Most Useful**
  - When problems involve human factors or interactions
  - In "day-to-day" business life.

25

Let's Try Your Luck @The 5 Whys

- **Problem Statement:** You are on your way home from work and your car stops in the middle of the road causing you to be late for an appointment.

1. Why did your car stop? - Because it ran out of gas.

2. Why did it run out of gas? - Because I didn't buy any gas on my way to work this morning.

3. Why didn't you buy any gas this morning? - Because I didn't have any money.

4. Why didn't you have any money? - Because I lost it all last night in a poker game.

5. Why did you lose your money in last night's poker game? **- Because I'm not very good at "bluffing" when I don't have a good hand.**

Root Cause- Your inability to "bluff" in poker caused you to be late for your appointment.

26

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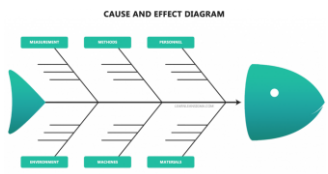
Fishbone Diagram

27

Fishbone Diagram

- Fishbone Diagram (Ishikawa)



28

Fishbone Diagram

- **Head**: The fish's head represents the **problem or effect** you're analyzing.
- **Spine**: The long, horizontal line connecting to the head serves as the **timeline or sequence of the problem**.
- **Bones**: These are the **categories of potential causes**. They branch off the spine, leading towards the head.
- **Sub-Bones**: These are the **more specific factors or sub-causes** that stem from the main categories.

29

Fishbone Diagram (Why)

1. Easy Visualization:

- One of the primary advantages of using a Fishbone Diagram is its **ability to simplify complex problems**. With all potential causes visually represented in one place, it becomes easier to analyze and discuss the issues.

30

Fishbone Diagram (Why)

Team Collaboration:

- The Fishbone Diagram is **excellent for brainstorming sessions**. It encourages team members to think critically and contributes to a shared understanding of the problem. It's collaborative by design, allowing for the collective intelligence of the group to shine.

31

Fishbone Diagram (Why)

Root Cause Analysis:

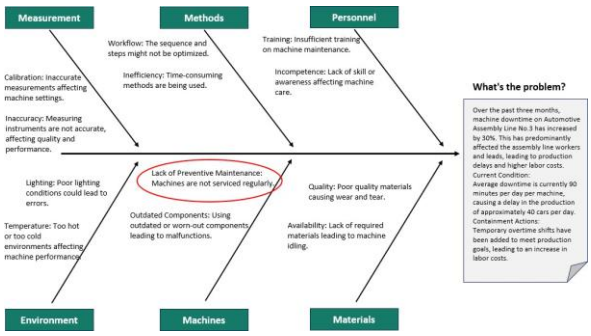
- Identifying symptoms of a problem is one thing; uncovering the root cause is another. The Fishbone Diagram excels at this by **forcing you to dig deep into various contributing factors**. By isolating these causes, you're better positioned to find a lasting solution.
- By using a Fishbone Diagram, you're not just addressing a problem with a short-term fix; you're **conducting a thorough investigation to eliminate issues from the root up**.

32

Fishbone Diagram (How)

- **Step 1: Identify the Problem (Head)**
- **Step 2: Determine the Main Categories (Spine/Bones)**
- **Step 3: Brainstorm Causes (Bones)**
- **Step 4: Dig Deeper with Sub-Causes (5 Whys)**
- **Step 5: Analyze and Take Action (Corrective Actions)**
- Guide: Fishbone Diagram - Learn Lean Sigma

33



34

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Failure Modes and Effects Analysis (FMEA)

35

Failure Mode and Effects Analysis (FMEA)

- FMEA is a **systematic and proactive risk management technique** for identifying and mitigating potential system, process, or product failures.
- The technique is widely used across industries **to analyze potential failure modes, their causes, and their effects on overall operation**.
- FMEA allows businesses to **prioritize and address the most critical risks** by assessing the severity, occurrence likelihood, and detectability of each failure mode.
- FMEA can also help businesses **improve product quality, reliability, and safety by implementing targeted actions** to prevent or reduce the impact of failures.

36

Failure Mode and Effects Analysis (FMEA)

- **Design FMEA (DFMEA):**
  - Targets potential failures in product design.
  - Ensures that products meet design and functional specifications.
- **Process FMEA (PFMEA):**
  - Examines the manufacturing and assembly processes.
  - Aims to identify and correct potential process-related failures.
- **System FMEA (SFMEA)**:
  - Analyze the entire system's potential vulnerabilities.
  - Ensures that all components of a system work harmoniously, preventing system-wide failures.

37

Failure Mode and Effects Analysis (FMEA)

- **Step 1: Assemble a Cross-Functional Team**
- **Step 2: Define the Scope**
- **Step 3: List Potential Failure Modes**
- **Step 4: Evaluate the Potential Failure Effects, Potential Causes, and Current Controls**
- **Step 5: Evaluate Severity, Occurrence, and Detection**
- **Step 6: Calculate RPN and Prioritize**
- **Step 7: Develop Action Plans**
- **Step 8: Implement and Monitor**
- Guide: Failure Modes And Effect Analysis (FMEA) - Learn Lean Sigma

38

Process Step/Input	Potential Failure Mode	Potential Failure Effects	SEVERITY (1 - 10)	Potential Causes	OCCURRENCE (1 - 10)	Current Controls	DETECTION (1 - 10)	RPN	Action Recommended	Resp.
What is the process step, change or feature under investigation?	In what ways could the step, change or feature go wrong?	What is the impact on the customer if this failure is not prevented or corrected?		What caused the step, change or feature to go wrong? (how could it occur?)		What controls exist that either prevent or detect the failure?			What are the recommended actions for reducing the occurrence of the cause or improving detection?	Who is responsible for making sure the actions are completed?
Material Mixing	**Inconsistent Material Mixture** - The mixture of plastic pellets might not be consistent, leading to weak points in the bottle.	Bottles with weak points, prone to leaking or breaking.	7	Machine calibration error or uneven pellet distribution.	5	Regular machine calibration; Quality checks for mix consistency.	4	140	Implement automated material distribution systems to ensure consistent mixing. - Introduce periodic third-party audits to verify machine calibration accuracy.	Alex Carter
	Contamination - Foreign particles or contaminants are mixed with the plastic pellets.	Bottles with impurities, affecting appearance and safety.	8	Dirty equipment or compromised raw materials.	4	Regular equipment cleaning; Batch testing of raw materials.	3	96	Introduce more stringent equipment cleaning schedules. - Enhance raw material screening processes and work with suppliers to ensure cleaner raw materials.	Jordan Sinclair
Bottle Molding	**Incomplete Molding** - The bottle might not form completely, leading to thin walls or misshapen parts.	Bottles with thin walls or misshapen parts.	7	Machine malfunction or insufficient material feed.	6	Regular machine maintenance; Monitoring system for molding consistency.	3	126	Upgrade to more advanced molding machines with real-time feedback loops. - Train operators on early detection of machine feed issues.	Taylor Mitchell
	Overheating - Excessive heat during molding can deform the bottle or make it brittle.	Deformed or brittle bottles.	8	Temperature control malfunction.	5	Temperature monitoring and alarms; Regular machine maintenance.	2	80	Introduce a backup temperature control system to provide redundancy. - Conduct monthly drills for operators on how to respond to temperature control malfunctions.	Jordan Sinclair
Cooling	**Insufficient Cooling** - The bottle doesn't cool uniformly, causing warping or structural weaknesses.	Warped bottles with structural weaknesses.	6	Inadequate cooling system or malfunction.	6	Cooling system checks; Temperature monitoring.	4	144	Redesign the cooling chambers for better airflow and heat dissipation. - Implement IoT sensors to provide real-time cooling feedback and auto-adjustment of cooling rates.	Taylor Mitchell

39

40

Next Steps

- Don't forget WHY you are doing incident investigations in the first place!
  - Perform incident investigations with the intent to prevent future reoccurrence of similar events!

41

Next Steps

- Utilize a systematic approach to finding the root cause!
  - Select your methods and build your supporting processes and toolkits!

42

Next Steps

- Implement corrective actions and track them to completion!
  - Take action on identified risks!

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43

Tuesday, April 30 · 10:00 am - 11:00 am

ROOT CAUSE ANALYSIS

PRESENTER Chris Seider, CSP, PHR, CHST, ARM

PLEASE LEAVE FEEDBACK ON THIS SESSION

44

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45