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TapRooT® as a Proactive Process Safety Management Tool

Gas Processors Association

GCC Chapter

November 3, 2010

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Presentation Overview

- Need for an expert system
- System overview
- System uses
- System description
- Case study

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The Need for an Expert System

The Need for an Expert System

- Not everyone is an expert
- We tend to focus on what we know
- We tend to have operational biases

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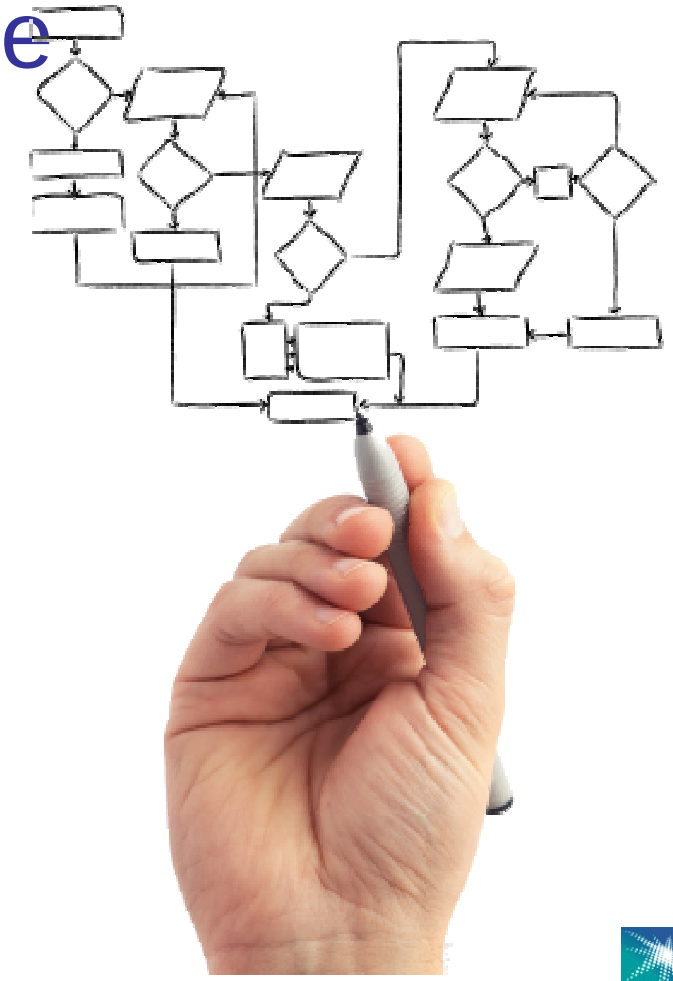
Characteristics of a Root Cause Analysis Expert System

- It is a closed loop process
- It is time-based
- It is well structured

Characteristics of a Cause Analysis Expert System

- Produces actionable root causes
- Identifies generic causes
- Includes corrective actions
- Based in human factors theory



Immediate vs. Root vs. Generic Causes

Immediate Causes: Deal with specific issues

Root Causes: Deal with specific issues across the department

Generic Causes: Deal with issues across the entire organization

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System Overview

System Overview

- Event flow chart
- Human performance guide
- Root cause dictionary
- Corrective action helper

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System Uses

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System Uses

- Process incident investigation
- HAZOP
- Process Review

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System Description

System Overview
Incident Investigation

- Chart events
- Select causal factors
- Select root causes
- Select generic causes
- Select corrective actions
- Implement

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System Overview
Process Review

- Chart events
- Plan audit
- Select causal factors
- Factors audit
- Select root causes
- Identify significant causes
- Select generic causes
- Select corrective actions
- Implement

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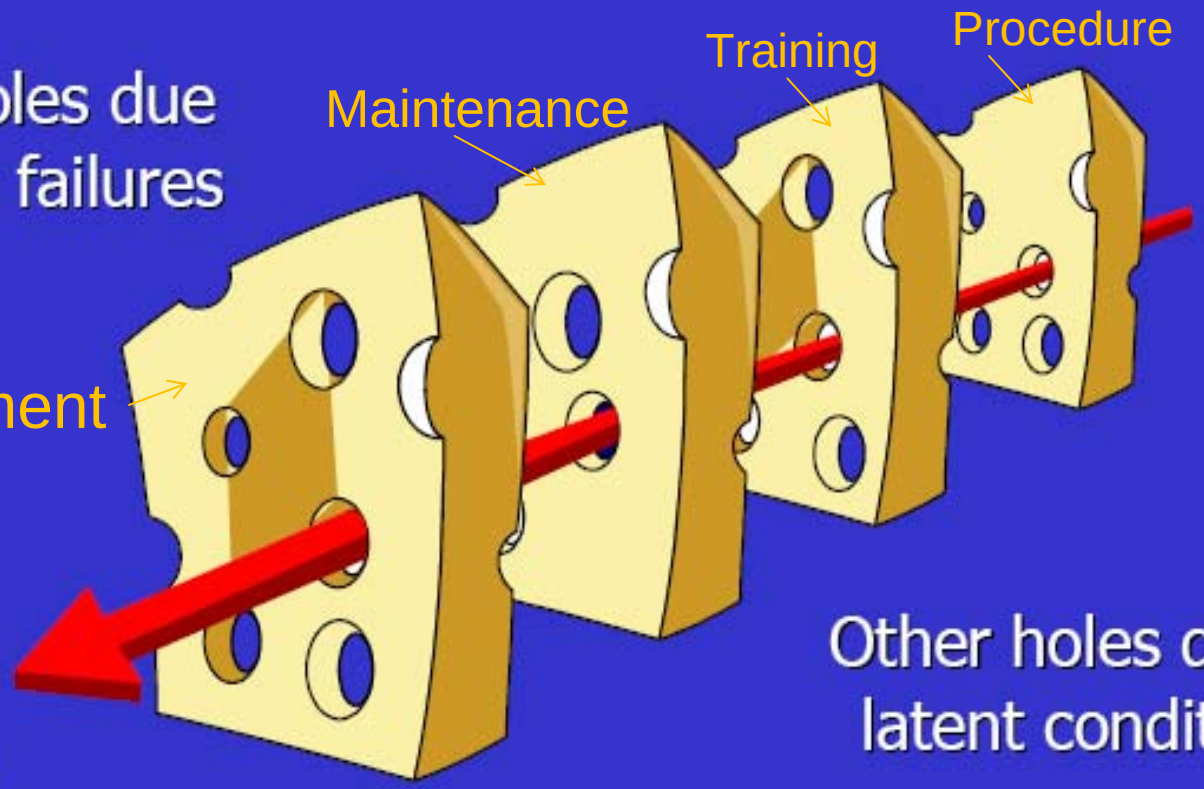
The 'Swiss cheese' model of accident causation



Successive layers of defences, barriers, & safeguards

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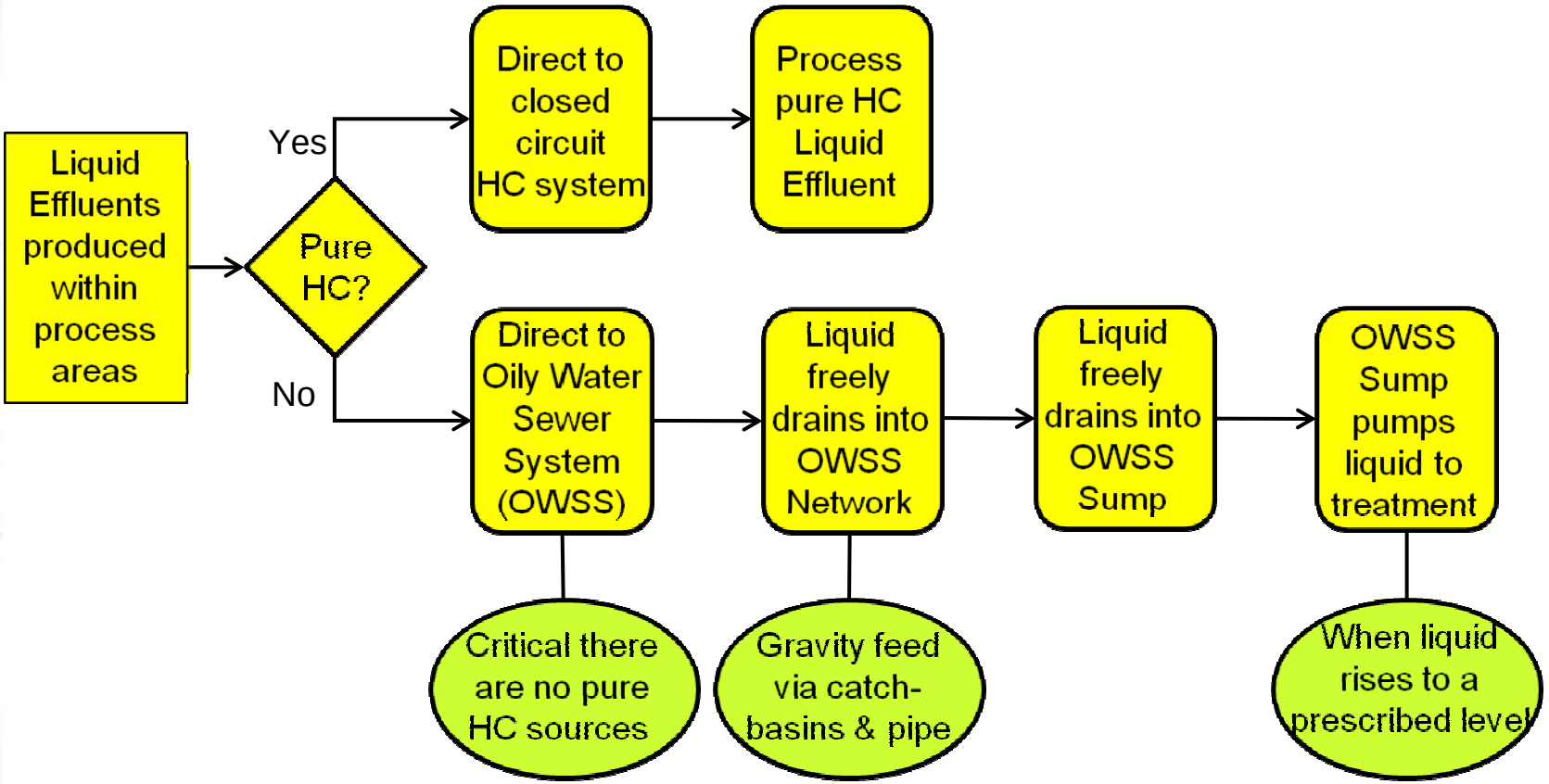
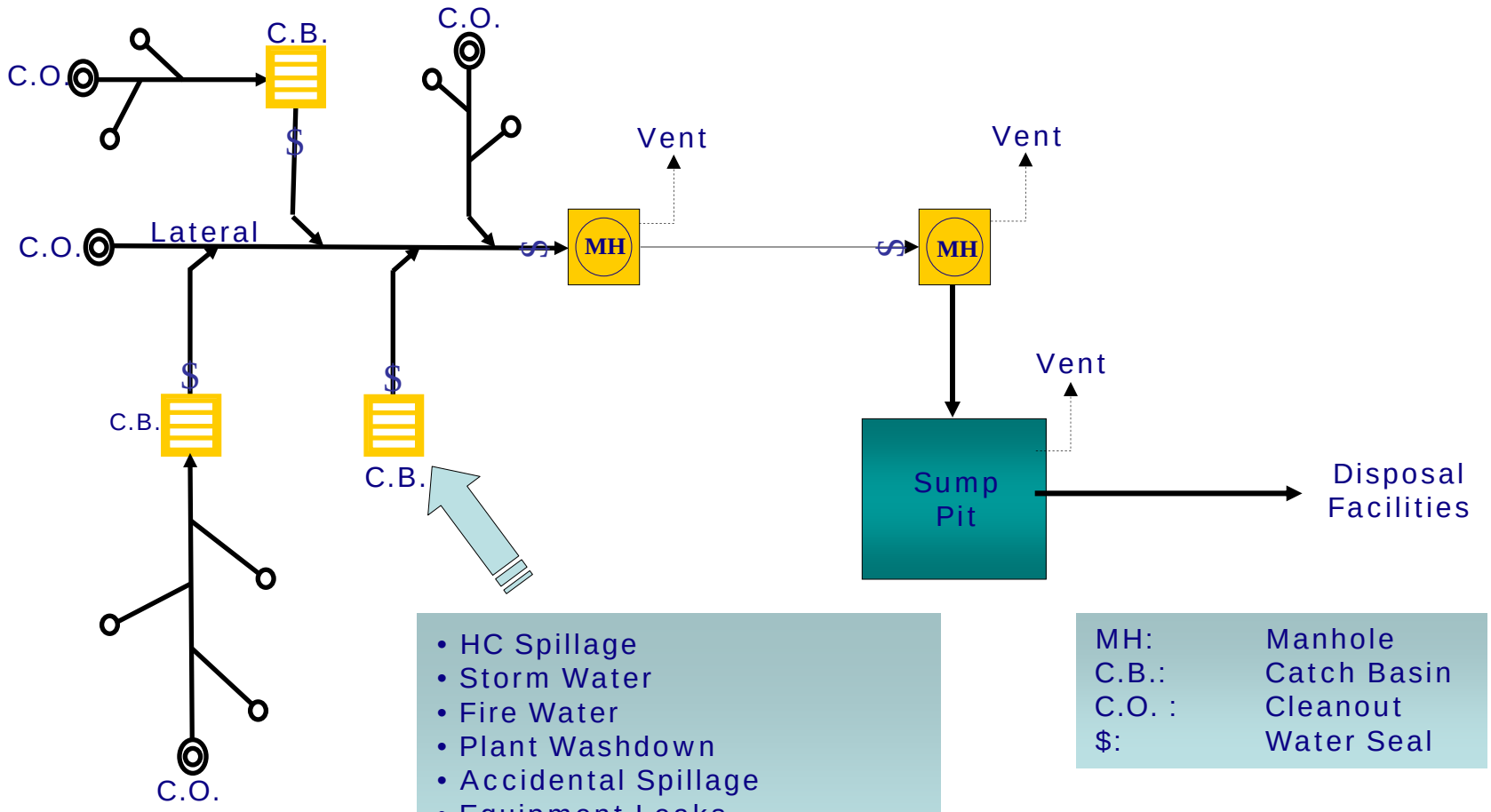
Case Study

Oily Water Sewer System (OWSS) Process



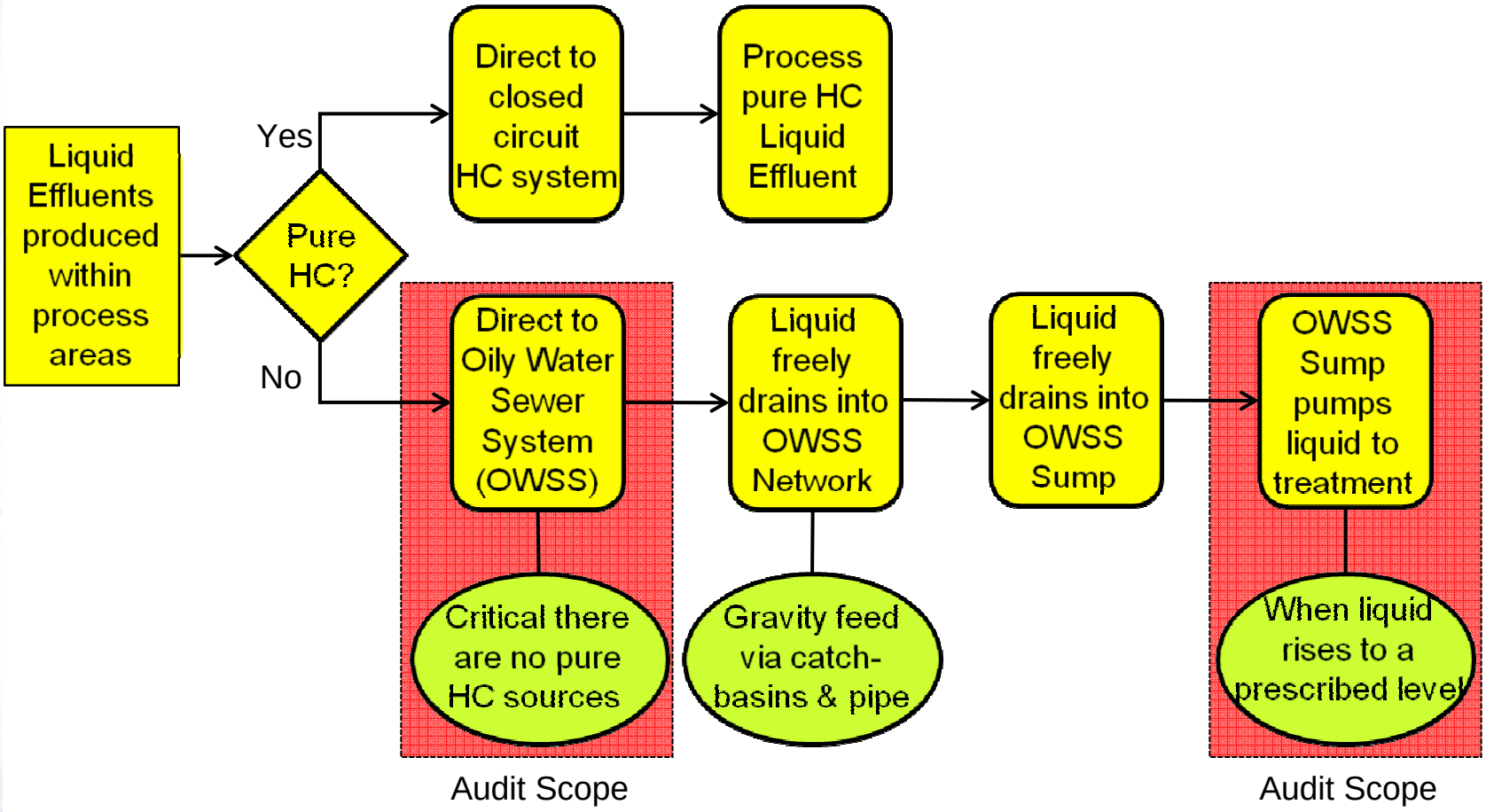
Oily Water Sewer System Schematic



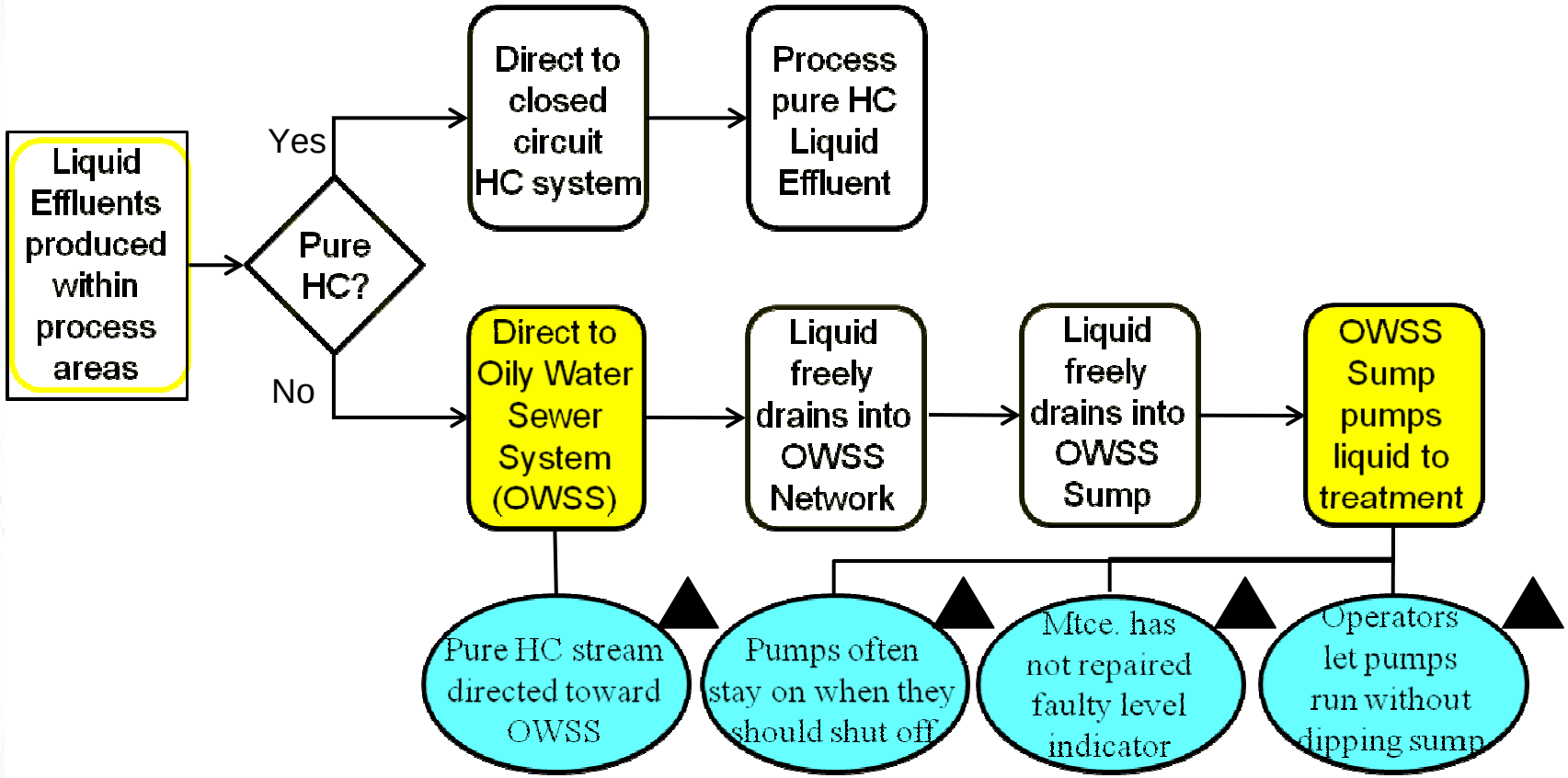
- HC Spillage
- Storm Water
- Fire Water
- Plant Washdown
- Accidental Spillage
- Equipment Leaks
- Equipment Drain Points
- Fluid Sample Collection Points

MH:	Manhole
C.B.:	Catch Basin
C.O. :	Cleanout
$:	Water Seal

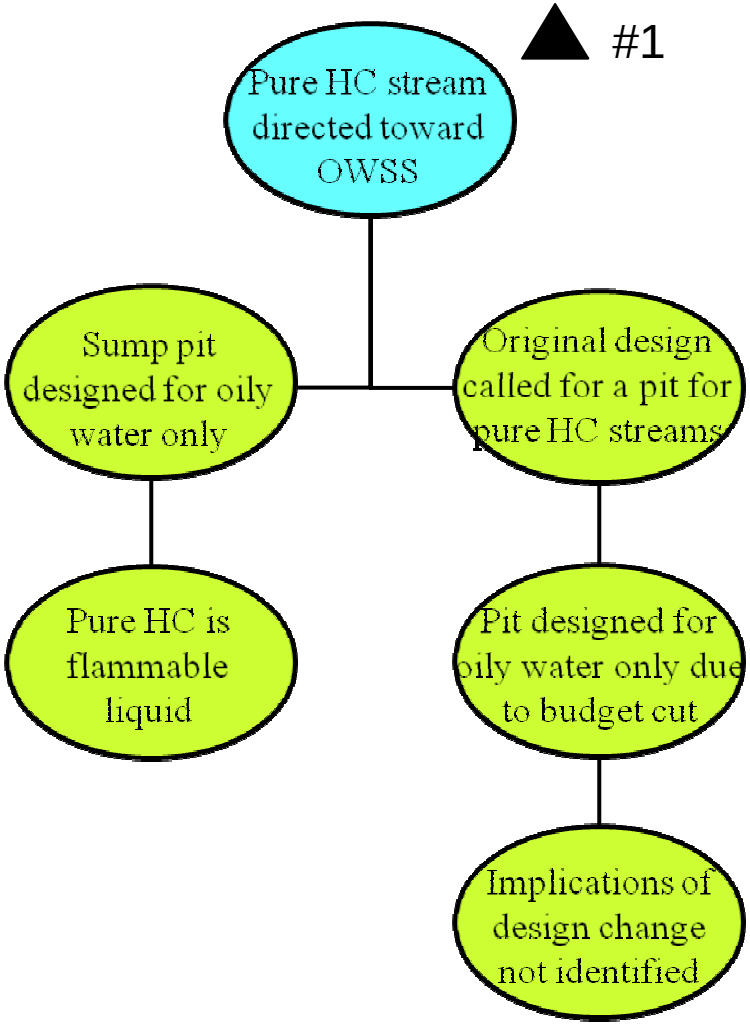
Oily Water Sewer System Process Audit



OWSS Audit – Significant Issues



OWSS Audit – Significant Issue and Supporting Data/Facts



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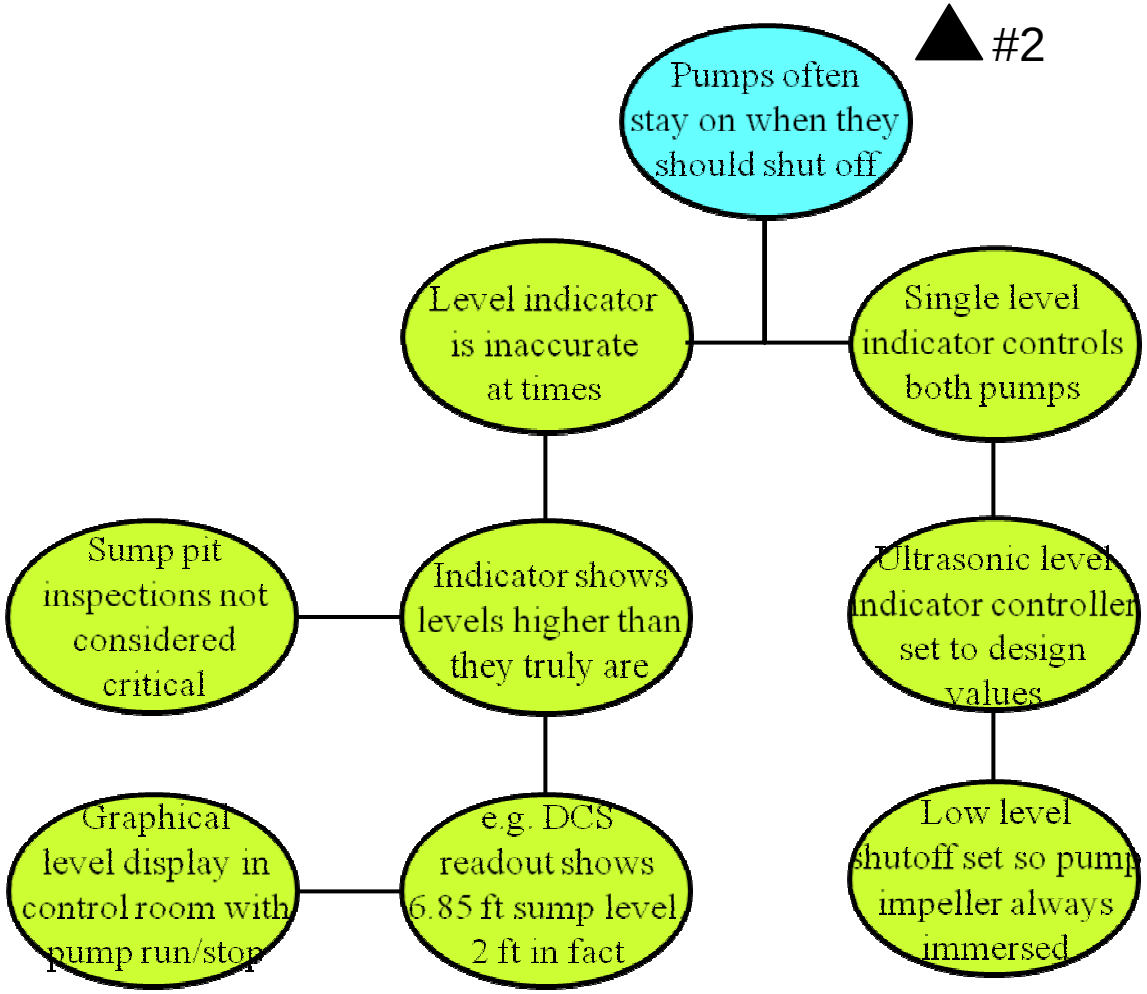

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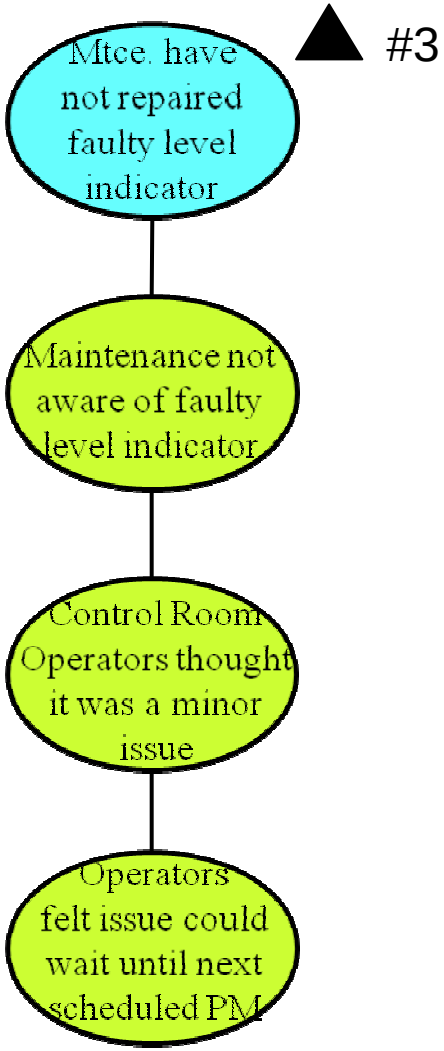
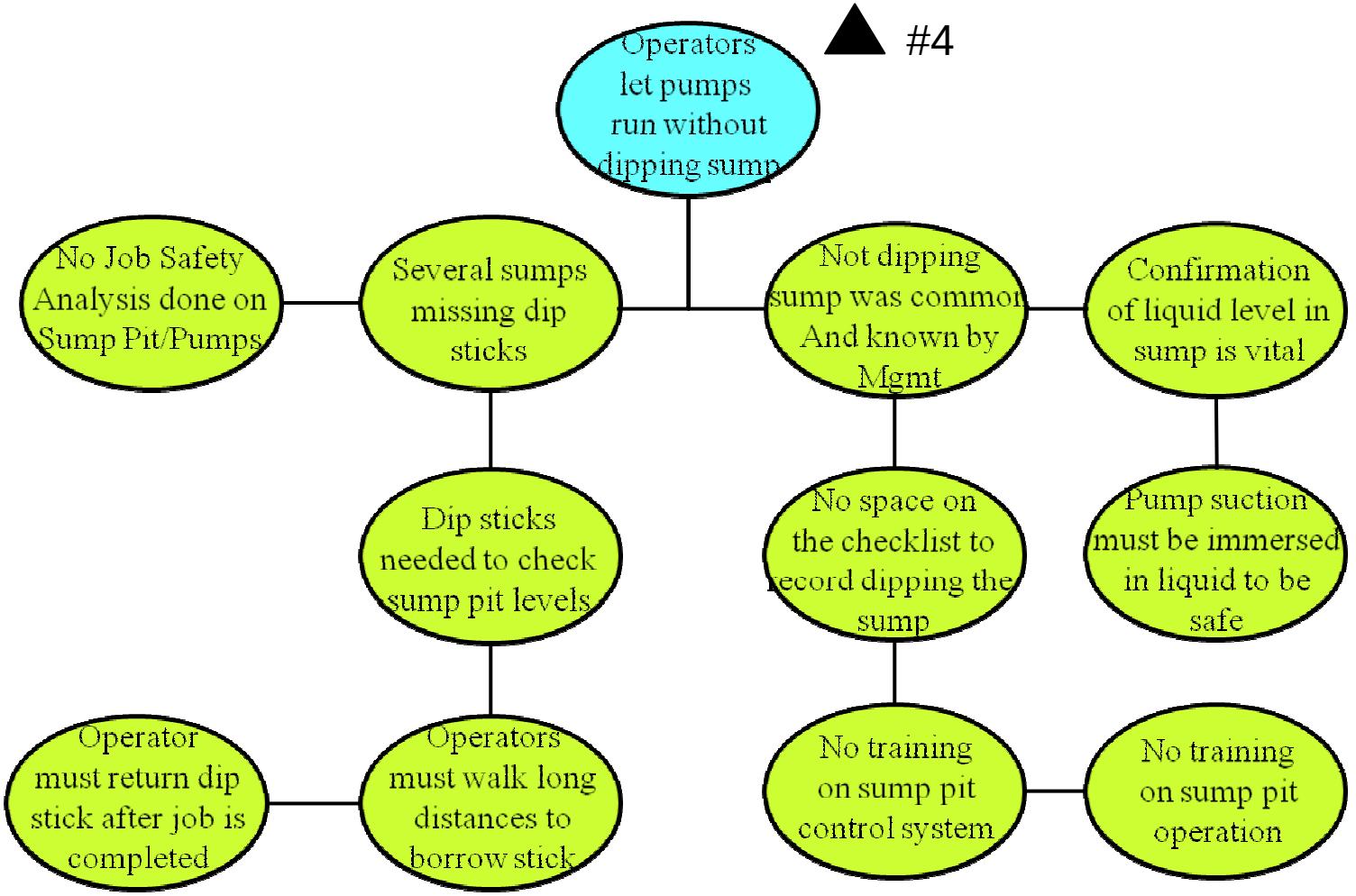


OWSS Audit – Significant Issue and Supporting Data/Facts



Significant Issue (CF) #4 - Operators run pumps more than 10 minutes without dipping sump

Root Causes

- *Arrangement/Placement NI* - Poor situation of equipment contributed to the CF;
- *Enforcement NI* – Operators routinely failed to dip sumps on long pump operation and mgmt tacitly condoned
- *Procedures NI - Situation not covered* - Procedure does not require dipping sump and recording value. Nor is there space on the checklist to record levels;
- *Work Package NI* – No JSA done on this task;
- *No training* - No Operator training is carried out on sump pit operation or control system;

Significant Issue (CF) #4 - Operators run pumps more than 10 minutes without dipping sump

Root Causes	Action Recommendations
• *Enforcement NI*	• Add checking sumps to dept KPI and EBS; include checking sumps in reward/celebration calculations
• *Work Package NI*	• Conduct JSA on sump pit;
• *Procedures NI – Situation not covered*	• Revise procedure to reflect policy. Add a space in the procedure for operators to record dip values;
• *No Training*	• Develop and carry out operator training on OWSS. Ensure training is consistent with procedures and JSA;
• *Arrangement & Placement NI*	• Arrange for each sump to have a suitable dip stick;

GENERIC CAUSES

Summary

An expert system meeting the criteria outlined can be used to audit the human performance side of PSM proactively, identify significant issues, provide the structure to uncover both specific and generic root causes, and assist with the development of corrective actions to prevent and/or minimize process safety-related incidents. TapRooT fulfills these requirements.

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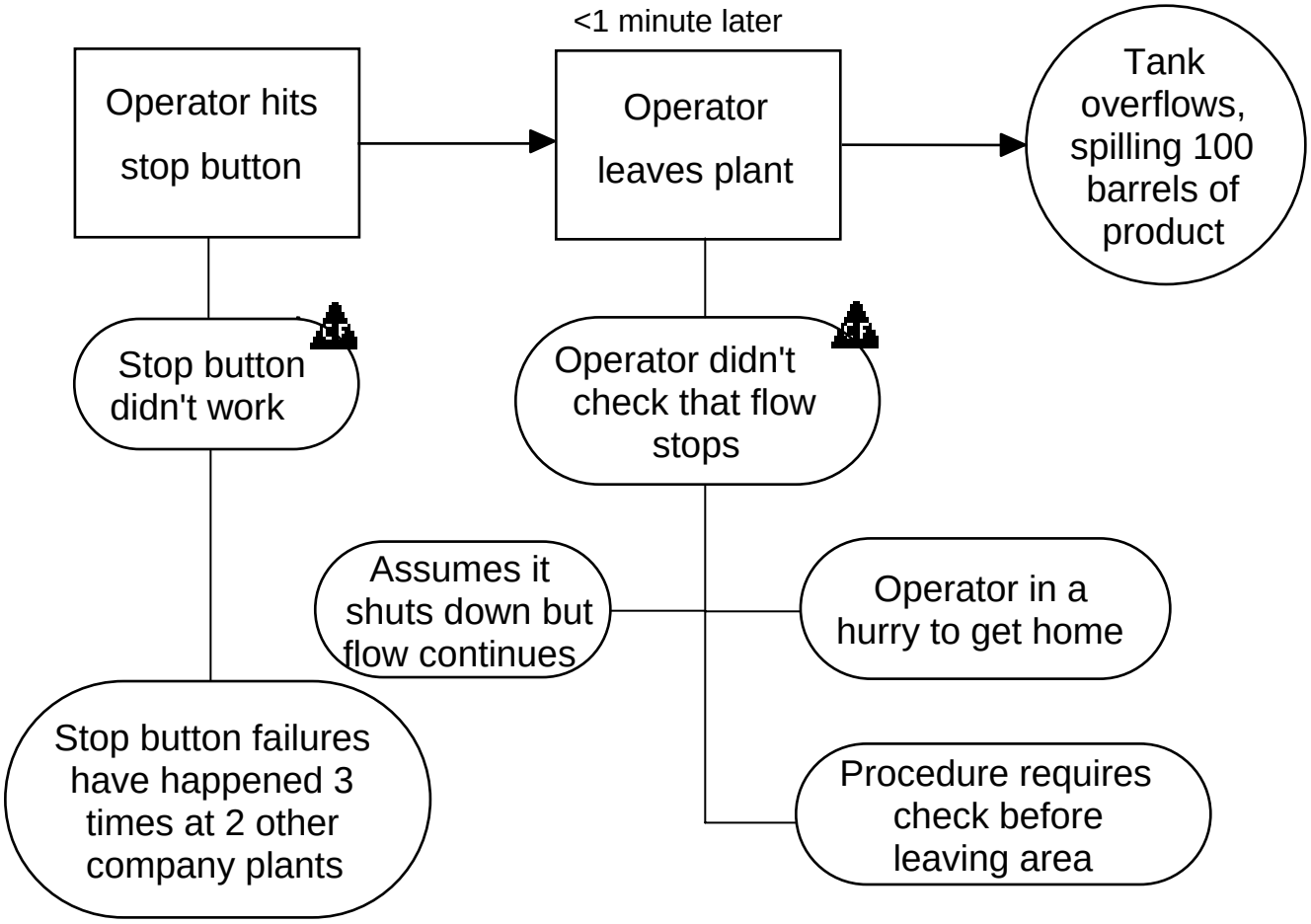
Thank you

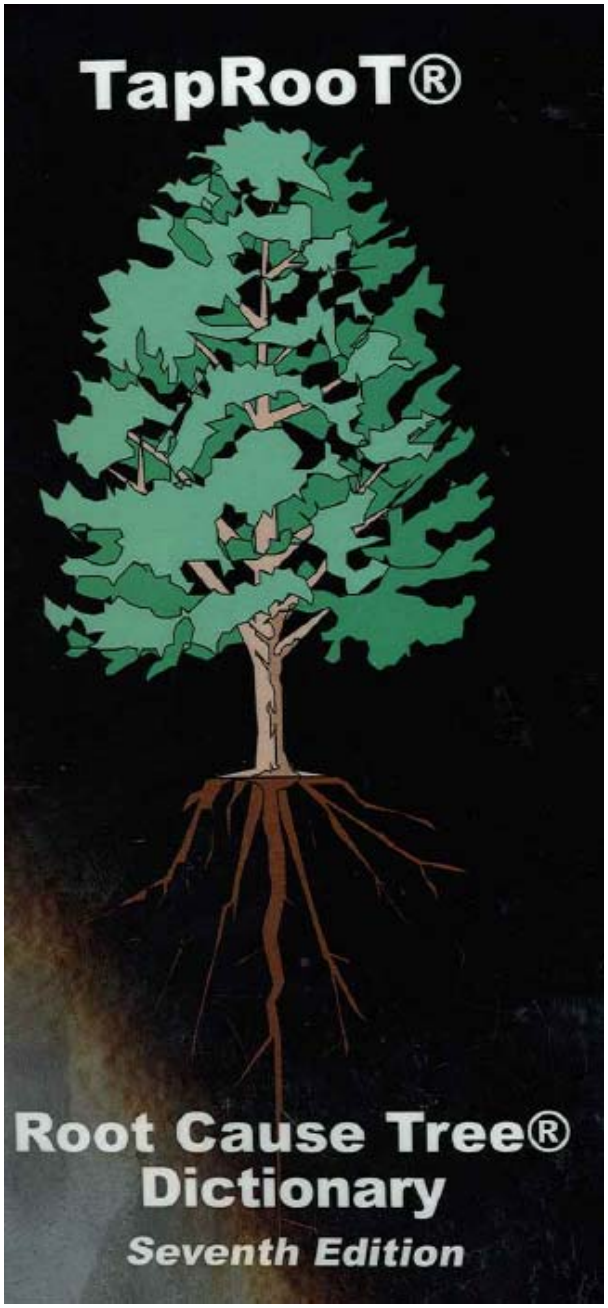

<1 minute later
Operator hits stop button
Operator leaves plant
Tank overflows, spilling 100 barrels of product
Stop button didn't work
Operator didn't check that flow stops
Assumes it shuts down but flow continues
Operator in a hurry to get home
Stop button failures have happened 3 times at 2 other company plants
Procedure requires check before leaving area

Causal Factor

An error or equipment failure that, if corrected, could have prevented the incident from occurring or would have significantly reduced its consequences

Root Cause

A root cause is the absence of best practices or the failure to apply knowledge that would have prevented the problem or significantly reduced the consequences.



A comprehensive set of definitions that helps determine definitively what root causes were involved with an issue and that ensure both internal consistency in an investigation or audit and external consistency between investigators/ auditors.

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An aid for developing useful, effective complete corrective actions; provides ideas for addressing root causes; provides ideas for addressing generic causes; provides references for more detailed, in-depth research.