



# **FUSE HEADS INCIDENTS**

## **Poor initial investigation and use of Root Cause Analysis**

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**XVII SAFEX Congress  
Istanbul, May 25th – 28th**



# Fuseheads ( FH's)

are known to be sensitive to  
(amongst other stimuli)

- friction
- impact
- static discharge



## What happened?

three accidents without and with injuries have occurred during manufacturing of FH's at three different workplaces

## When did it happen ?

During relatively short period of time

- on Jun 2th 2005,
- on Feb 9th 2006
- on Feb 17th 2006

Everything without obvious causes !



# Injuries

- The first incident happened without injury
- During the second and the third incident the line operators suffered burns to face, neck and right hand requiring hospitalization of 1 and 3 weeks.



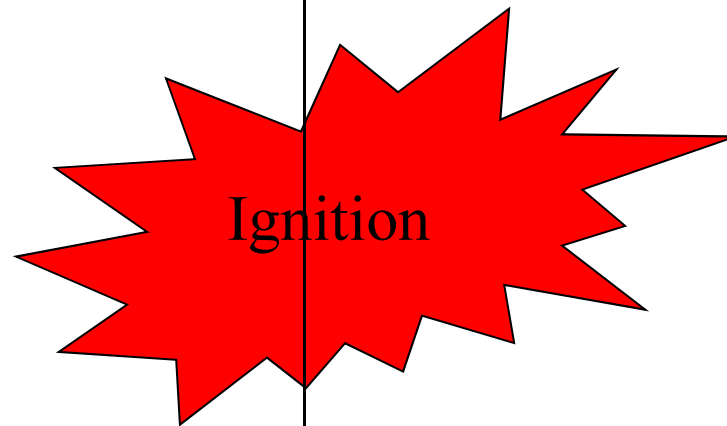
Incident 1  
JUN 2, 2005 – ASSEMBLY LINE

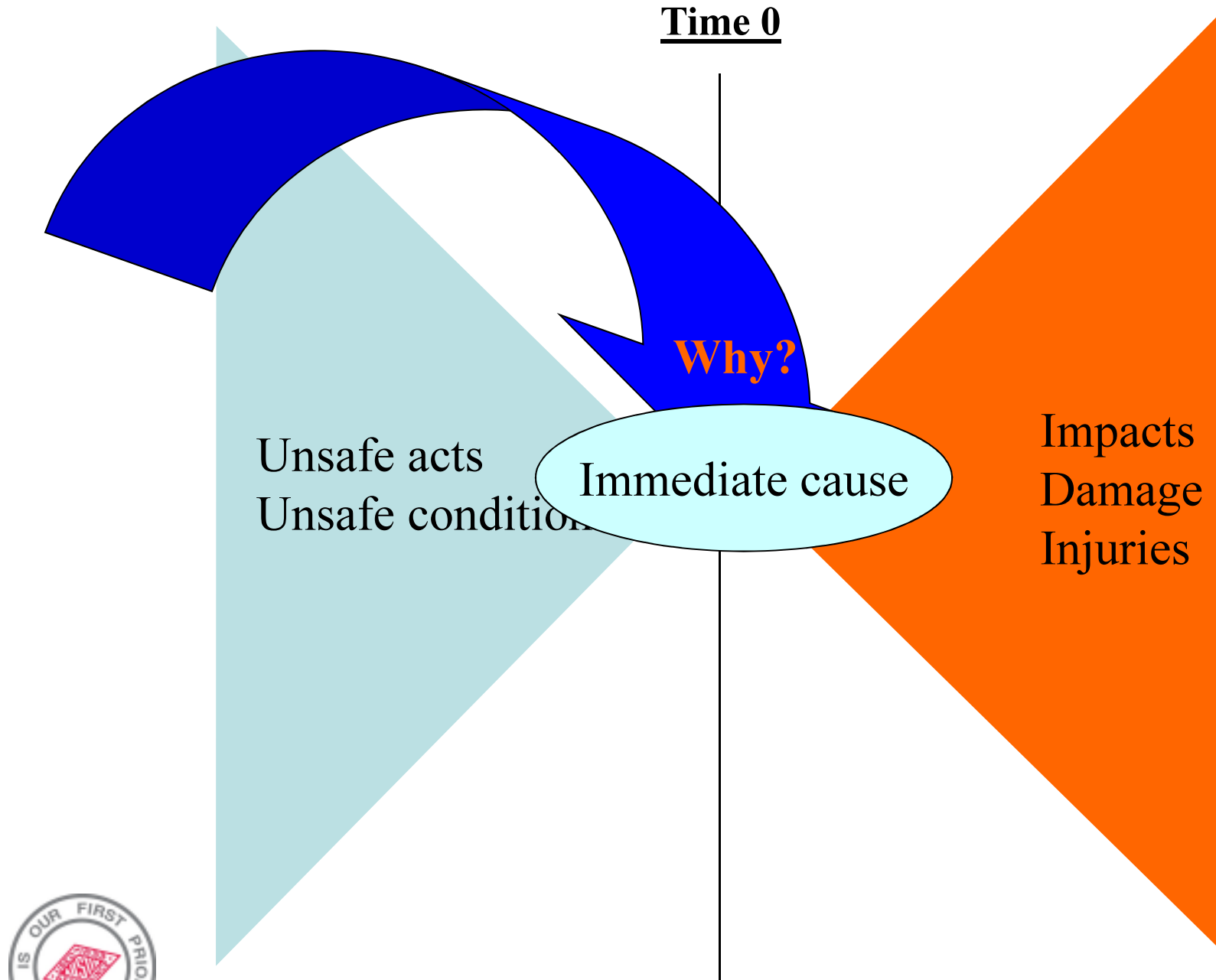


Incident 1  
JUN 2, 2005 – ASSEMBLY LINE



**Time 0**





# To avoid recurrence

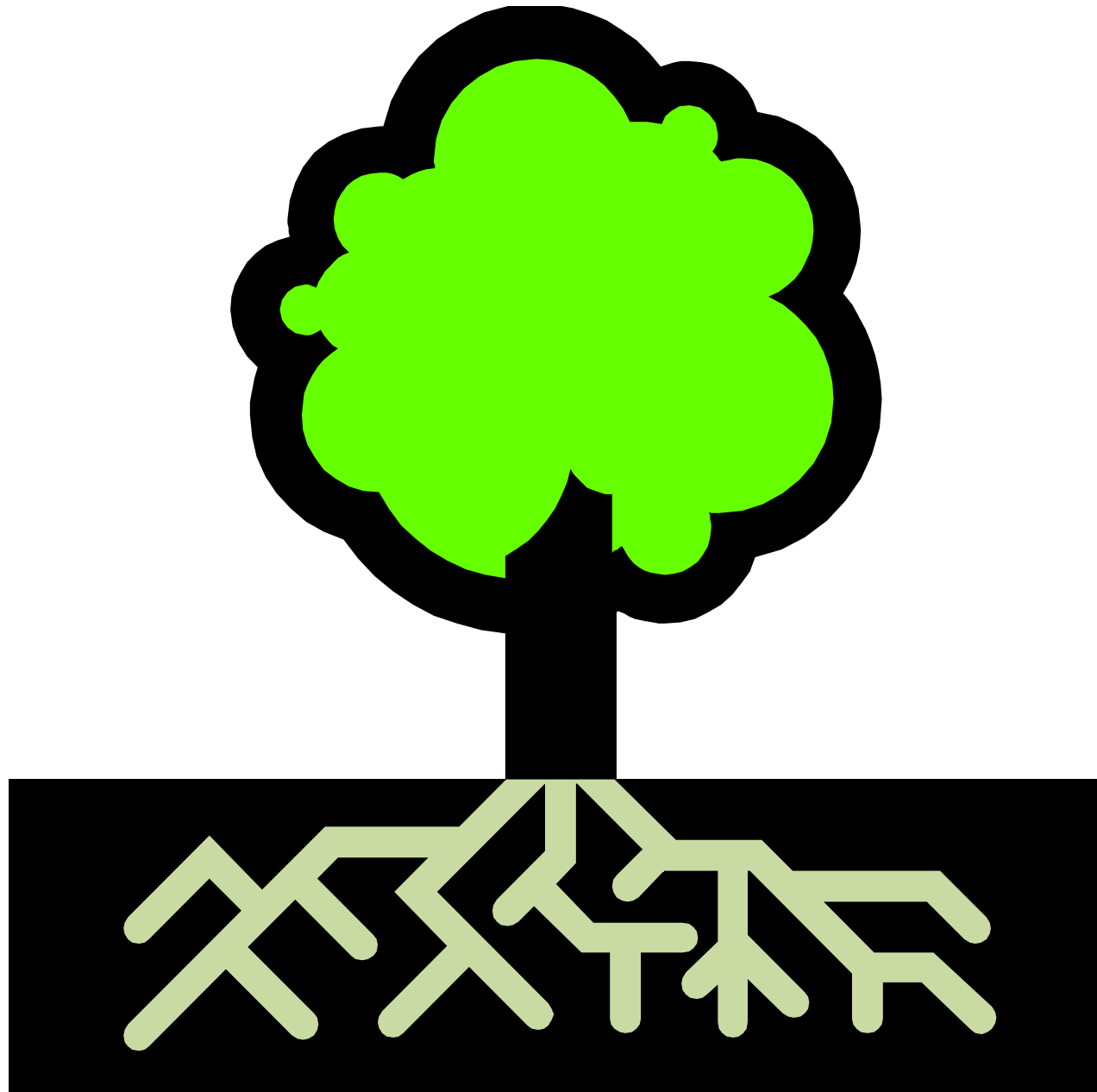
- Investigate to find
  - Immediate cause(s) – usually an event
  - Root or Underlying causes – usually several “conditions or situations”
- Define corrective actions
  - Immediate to avoid immediate cause
  - Systemic to avoid unsafe conditions developing in future

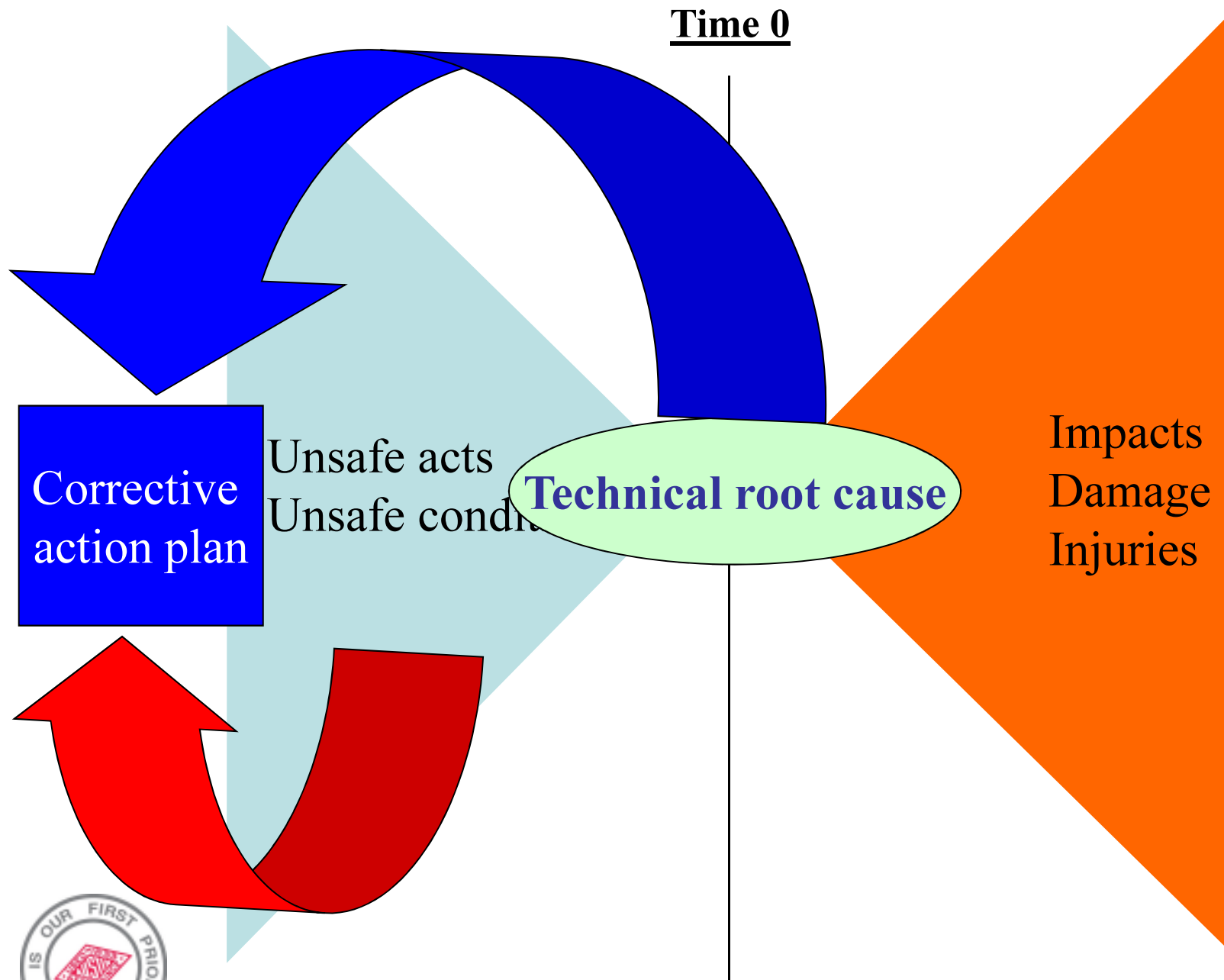


# An incident doesn't just happen for no reason

- It often happens suddenly
- But there will normally have been signs
- Signs may not been seen - or they have been ignored.
- The role of the investigation process is to identify the signs and why they were not acted upon
- What is the “story” leading up to the incident?



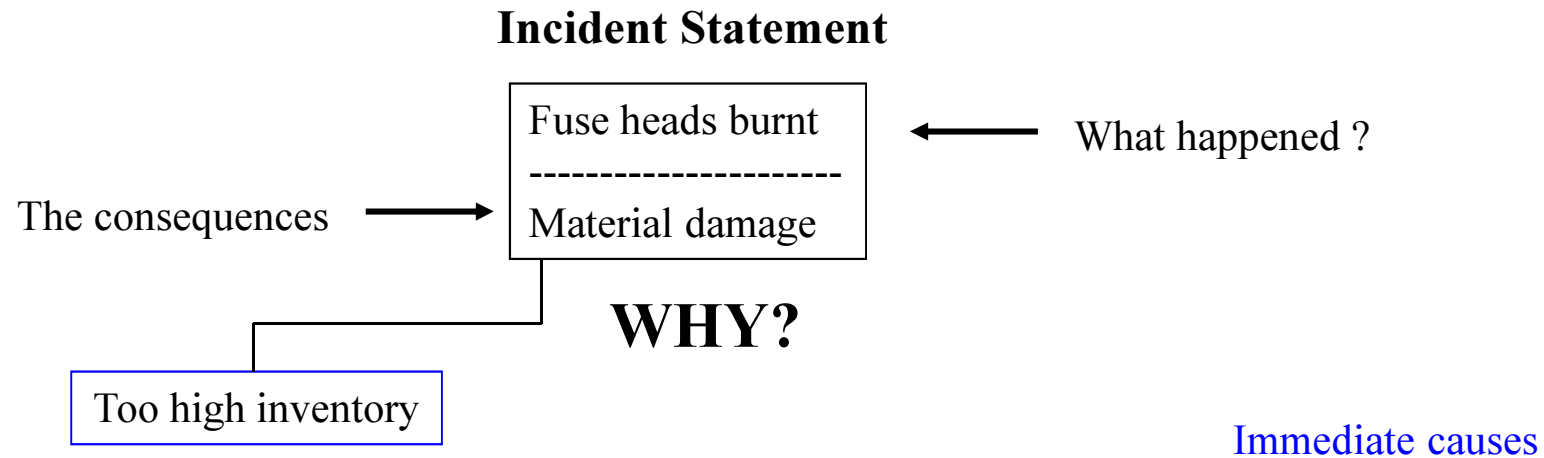




# Where did the investigation stop?



# Root Cause Analysis – Incident Tree



## PACKING – BEFORE INCIDENT

1x 5000 pcs FUSEHEADS



## PACKING – AFTER INCIDENT

4x 1000 pcs FUSEHEADS



# What information is in the story?

*Hazard Study*

*Design*

*Plant or process modifications*

*Maintenance records*

*Training records*

*Material quality*

*Inspection/audit reports*

*Who was present?*

*What was being done?*

- *Operating instructions*
- *Production plan*
- *PTW*
- *Materials present*
- *Data recording*
- *Shift logbook*

Months or  
years

Days/weeks

Very recent



# What information is in the story?

*Design*



## Incident 2

Feb 9, 2006 – DIPPING LINE



Incident 2  
Feb 9, 2006 – DIPPING LINE

**brass caliber gauge**



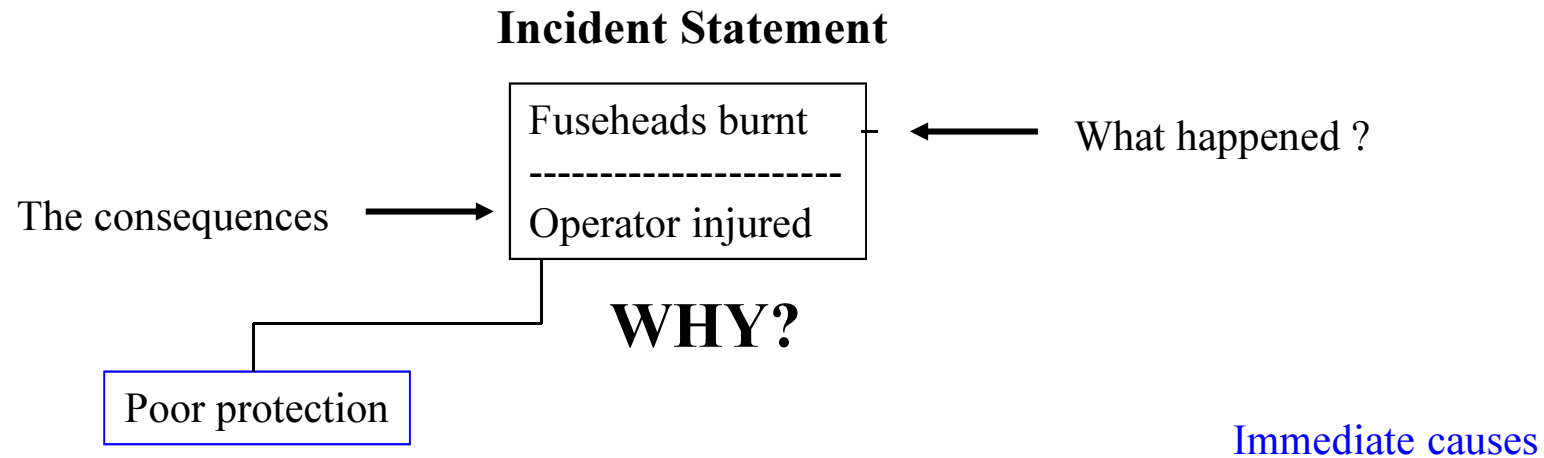
Incident 2  
Feb 9, 2006 – DIPPING LINE



# Where did the investigation stop?



# Root Cause Analysis – Incident Tree



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**WHY?**



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**WHY?**



Underlying or  
'Root' Causes



# What information is in the story?

*Hazard Study  
Design*



Incident 3  
Feb 17, 2006 – VISUAL CHECKING



# Impact

In addition to the painful injuries suffered by personnel these incidents have had operational impact of the company because after the third one the production was interrupted for 3 weeks.



# Action

## Immediate action to reduce consequences

- reduce inventory
- fit shields to protect operators at the most hazardous operations
- install protective screens where possible to avoid transmission

## Root cause analysis

- review the whole process of FH's production
- each previous and followed operation or handling was analyzed in detail (Hazard Study)
- identification of ignition sources from BOS



# MAJOR CAUSE

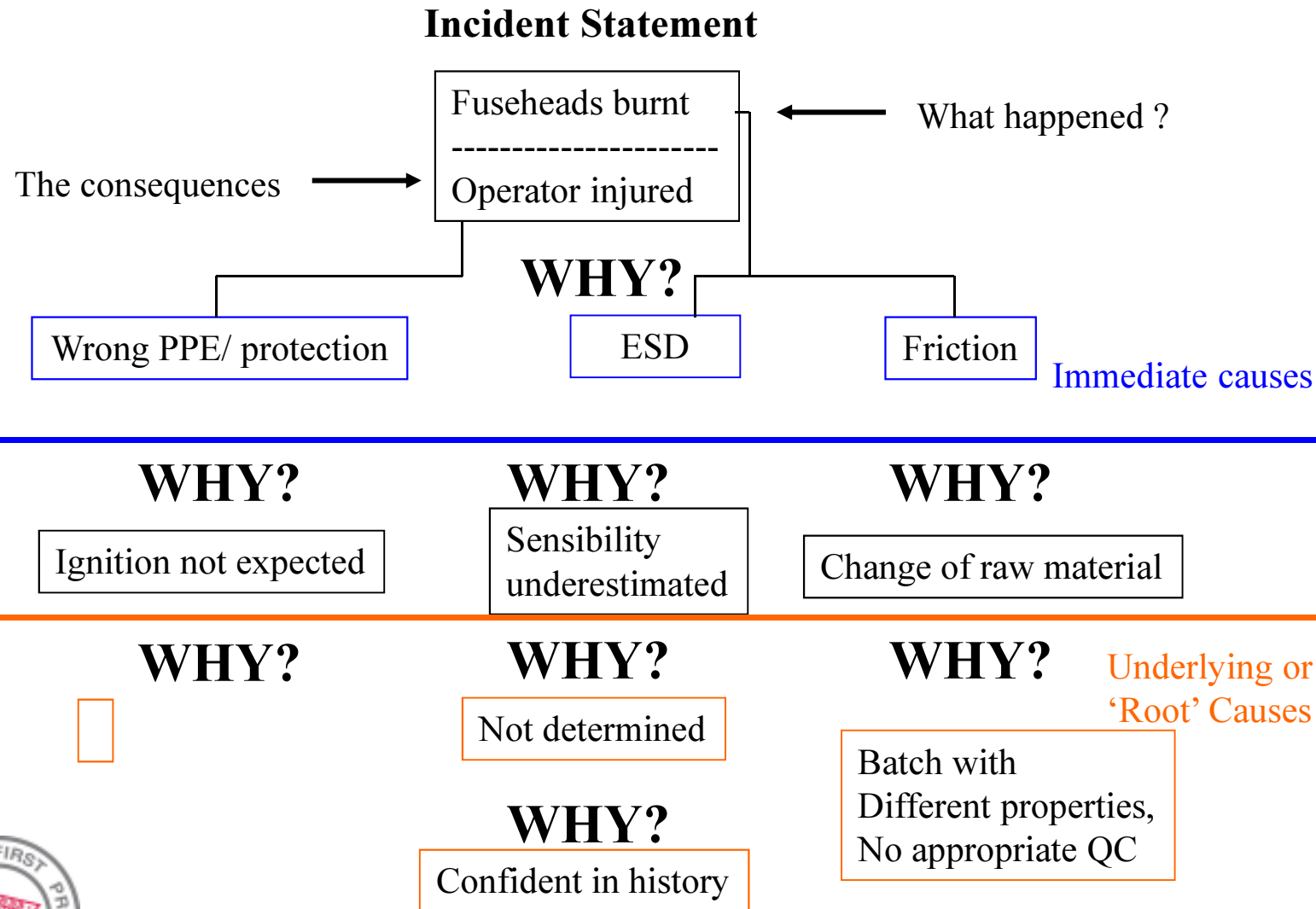
- Major cause of accidents was found after **two months** of investigation:
- The raw materials being used at the time included a batch of calcium silicide, which on detailed testing proved to be significantly coarser than normal.
- Microscopic examination indicated that the FH's made using this coarser material had “bumps” on their surface.
- It was concluded that these “bumps” could have increased the sensitivity of the fuse head composition by interfering with the robustness of the lacquer coating.



# Where did the investigation stop?



# Root Cause Analysis – Incident Tree







LAYOUT – AFTER INCIDENT  
better but still poor practice

# Incident initiation of fuseheads

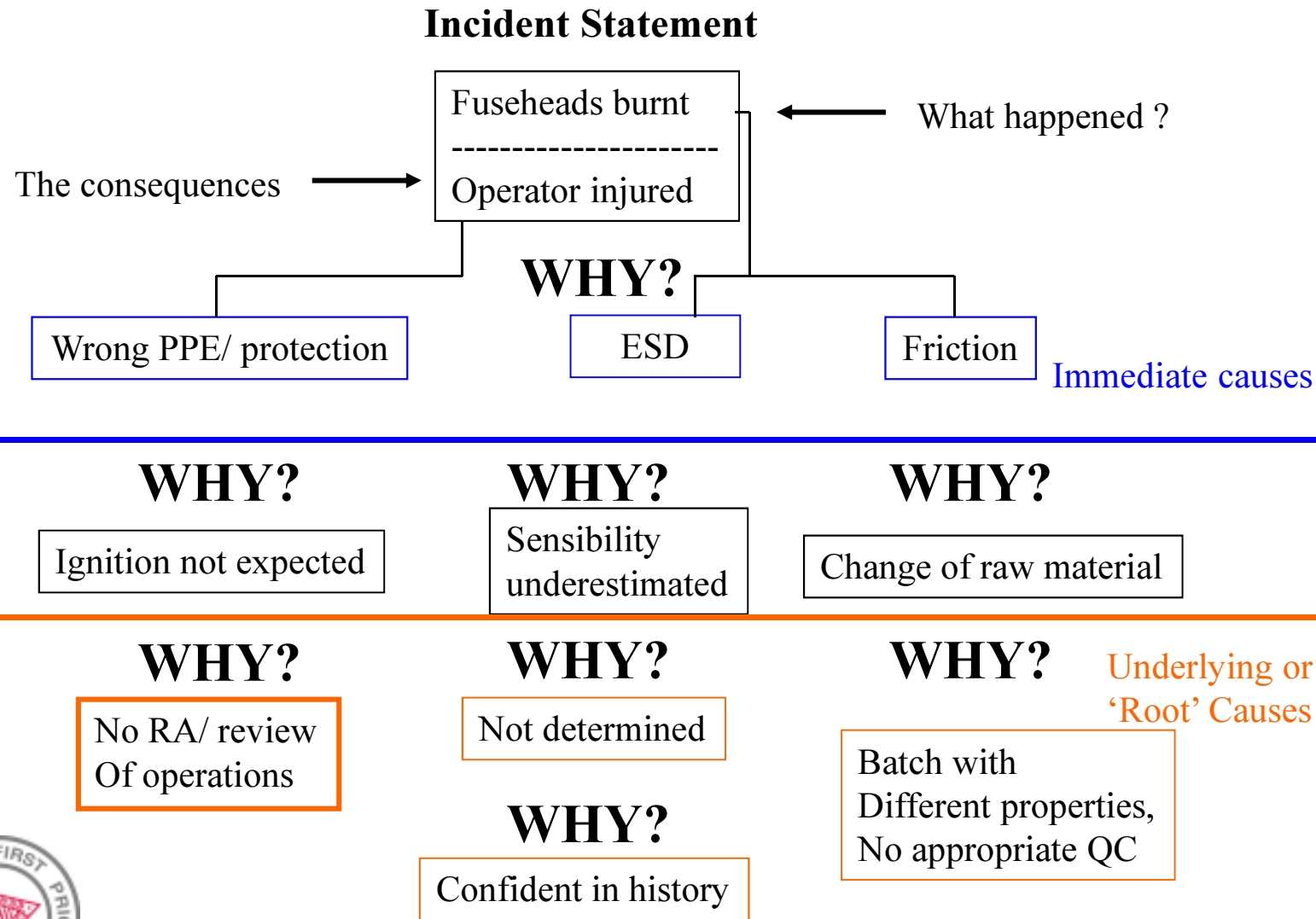
Fuseheads Burning 2.avi



# Where did the investigation stop?



# Root Cause Analysis – Incident Tree



# What information is in the story?

*Hazard Study  
Design*

*Material quality  
Inspection/audit reports*

Months or  
years

Days/weeks

Very recent





LAYOUT – AFTER INCIDENT

good practice

# Action to avoid recurrence

- At all workplaces of FH's production and assembly line operators have to wear conductive wrist straps
- requiring operators to wear gloves on both hands that do not leave wrists exposed
- minimize inventory
- packing of FH's to change
- improved Q procedures for raw material
- Change Management
- training of workers using video recording from tests



# Summary

- Ensure and reinforce the importance of a robust reporting system that catches unsafe actions and near misses and does not start as recently as a lost time or severe incident has happened.
- Near misses also require a thorough incident investigation to identify root causes and management system failures.
- A poor or superficial investigation may virtually force the next incident to happen.
- Ensure that staff conducting an investigation is competent and acting independently.
- Never have business requirements as a driver for the time line of an investigation.

