



**Module 2**

**Physical, Human and Latent Causes**



### Physical, Human and Latent Causes :

- **Physical Cause**, this is the physical reason why the parts failed. This is the technical explanation on why things broke or failed
- **Human Cause**, the human errors of omission or commission that resulted in the physical roots. Someone did something wrong or did the wrong thing
- **Latent Cause**, the deficiencies in the management systems or the management approaches that allows the human errors to continue unchecked. Flaws in the systems & procedures



***All physical failures are triggered by humans. But humans are negatively influenced by latent forces. The goal is to identify and improve these latent forces***

## Physical, Human and Latent Causes :

**PROBLEM**



LEVEL 1

**PHYSICAL  
CAUSE**

- How did the incident occurred ? The Physics of the incident. This usually explains how the failure had occurred, example a bearing failed due to fatigue, this mostly explains the metallurgical factor why the failure occur

LEVEL 2

**HUMAN  
CAUSE**

- What is the error committed that lead to the physical cause ? Either someone did something wrong or did the wrong thing We asked what caused the person to commit this mistake

LEVEL 3

**LATENT  
CAUSE**

- These are the management system weaknesses. These includes training, policies, procedures & specifications. People make decision based on these and if the system is flawed, the decision will be in error and will be the triggering mechanism that causes the mechanical failure to occur

### RCFA LOGIC TREE DIAGRAM

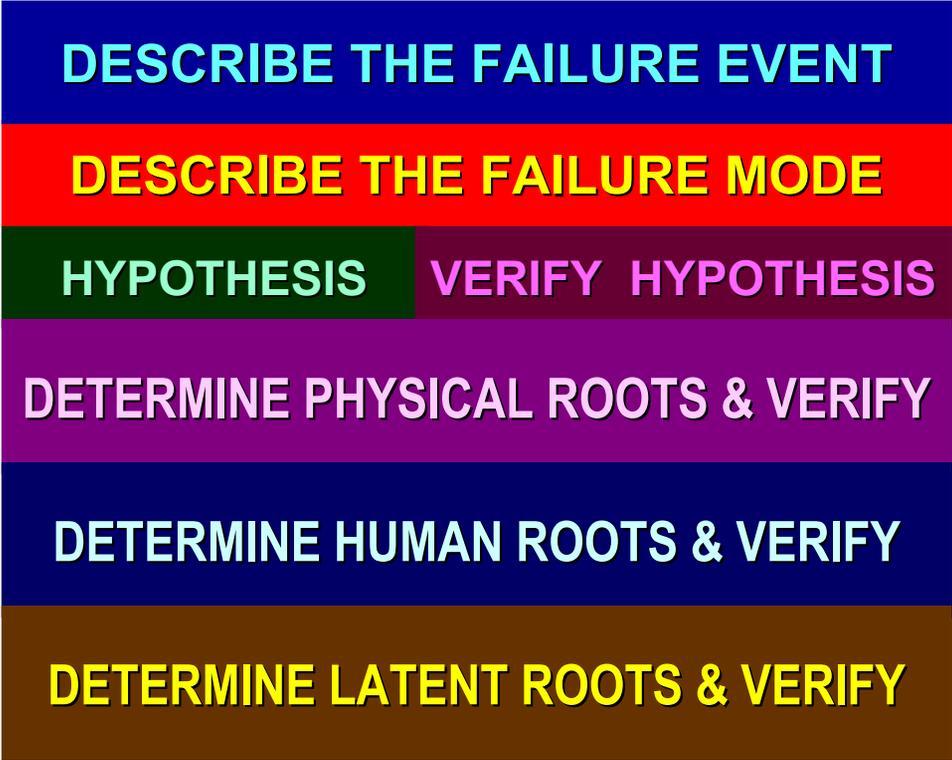
- **A Logic Tree**, is a tool that uses deductive logic to guide thought process used to draw correct conclusions. Therefore, a logic tree is a disciplined methodology that prompts the user to answer questions that will eventually identify the root cause of a failure event
- The first step in building a logic tree is to properly define the failure event to ensure that the analyst is truly working on the problem & not on the symptoms of the problem. The Failure Event is the Top Block and the cause or failure modes on the second level of the tree
- The analyst will follow the Failure Modes and verify if it actually occur or not, if it occur the analyst will continue to proceed until the final root cause of the problem is revealed





# ROOTCAUSE FAILURE ANALYSIS

## RCFA LOGIC TREE DIAGRAM



- In RCFA Analysis a Logic Tree is used to work through a failure
- The failure event is placed on top followed by all failure modes or possible causes of breakdowns
- Each of the causes are hypothesis that needs to be verified so that we have an understanding on w/c of the causes actually led to the problem
- The next step consists of determining and verifying the physical roots, human roots and latent roots behind the failure. The final cause will always have to do with the latent cause of failures]

### Physical, Human and Latent Cause :

**Problem : Cylinder does not operate smoothly**

**WHY 1 : Why is it that the cylinder don't not operate smoothly ?**

Strainer was clogged

**WHY 2 : Why is the strainer clogged ?**

Oil was dirty

**WHY 3 : Why is the oil dirty ?**

Dirt enter the tank

**WHY 4 : Why did the dirt enter the tank ?**

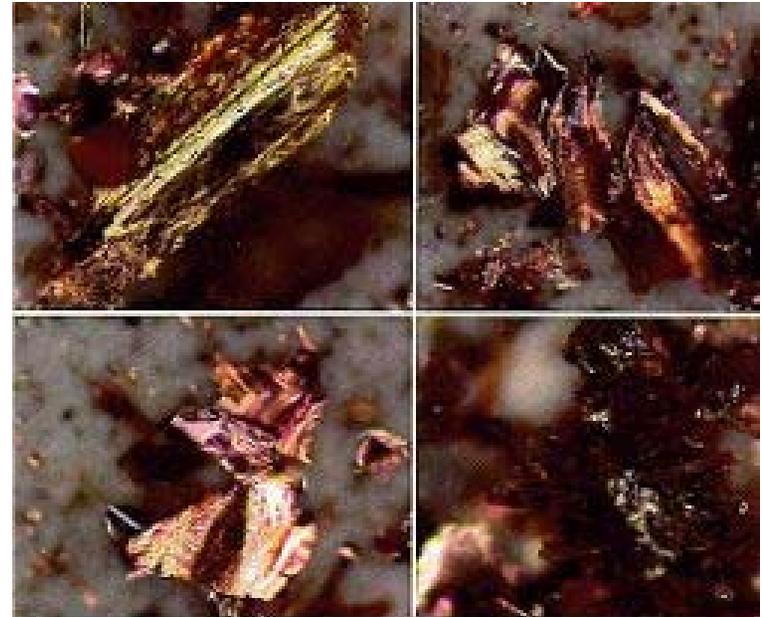
Upper plate in the tank had a hole and gap - **Physical Cause**

**WHY 5 : Why was there hole and gap in the tank ?**

Repair error during maintenance work - **Human Cause**

**WHY 6: Why was there repair error ?**

No procedure to follow - **Latent Cause**



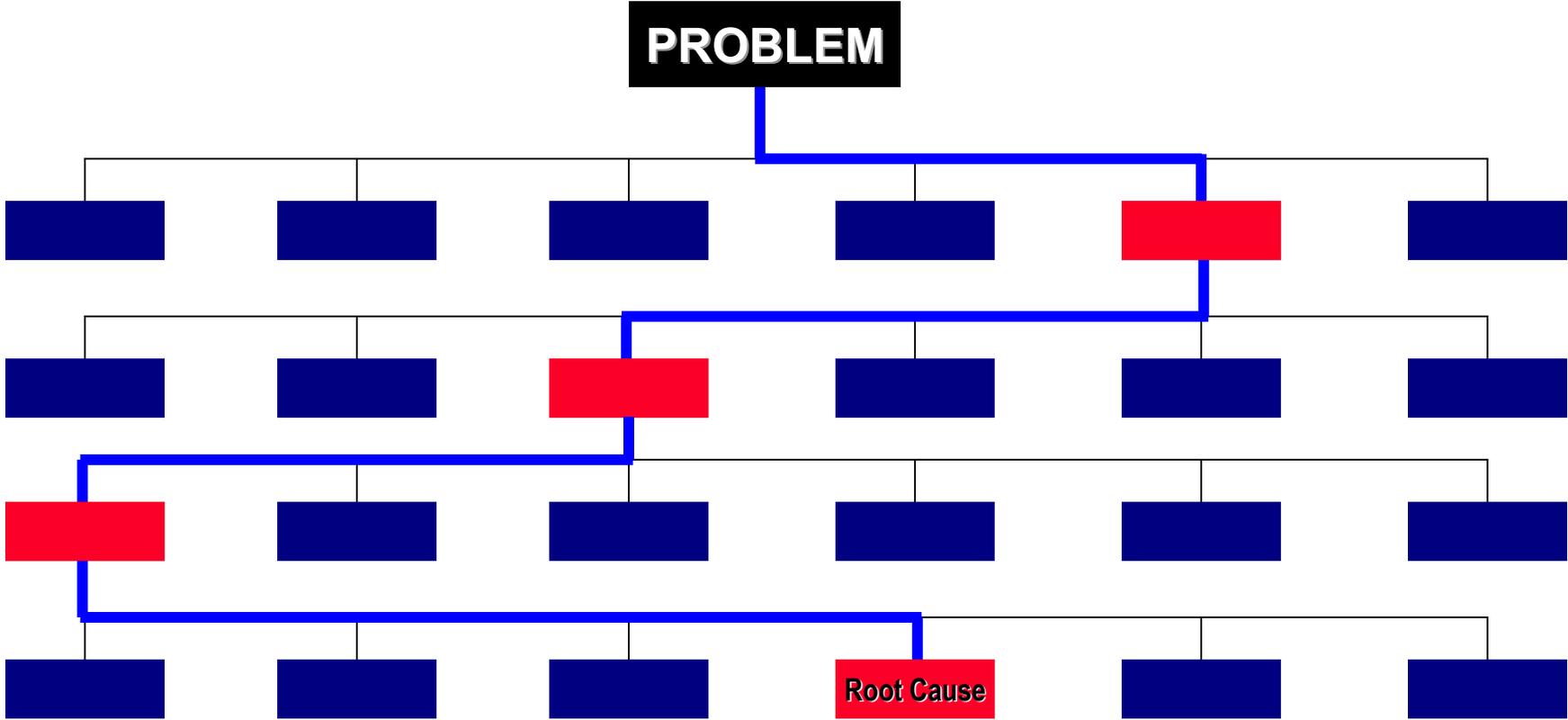
Evidence of dirt from Oil Analysis





# ROOTCAUSE FAILURE ANALYSIS

## ROOTCAUSE IS LIKE A ROADMAP

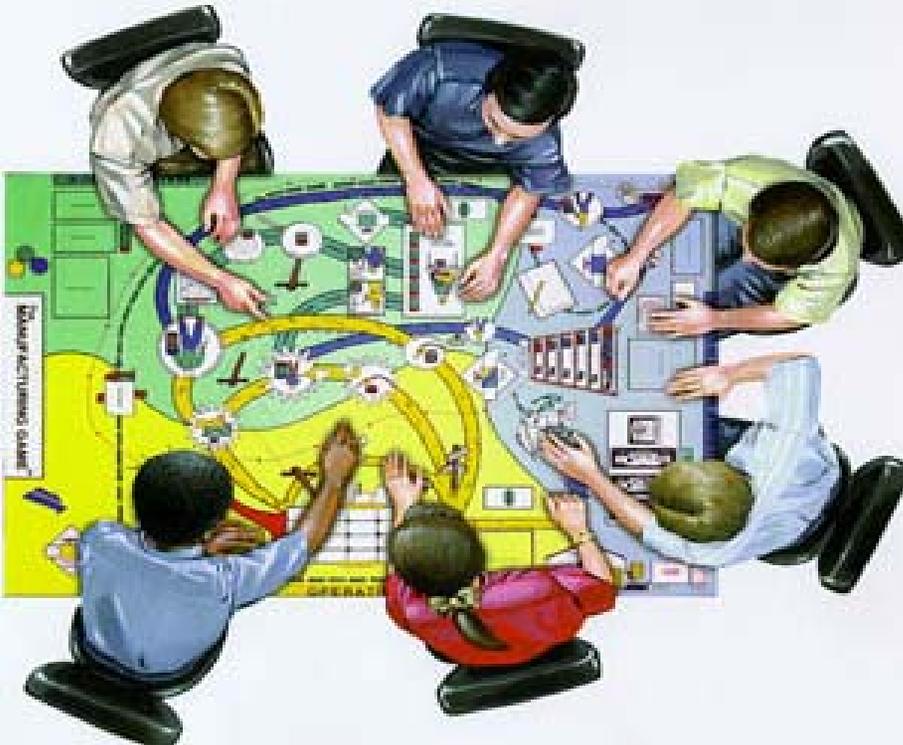


*In performing Root Cause Failure Analysis, we are interested to know the real cause of a particular failure by verifying each hypothesis until we reach the final cause of the failure . . . . .*



**Module 3 :**

**TOP REASONS WHY WE NEED RCFA**



### TOP REASONS WHY WE NEED TO PERFORM RCFA

#### 1) Failures simply won't not go away by fixing them . . . . .

- Failures struck us right in our face every-time and we deal with them to keep the equipment up for operations
- We encounter the same failures over and over again and we always perform the same thing of fixing them all the time . RCFA will eliminate the recurrence of these failures so that maintenance can focus more on improving their assets

*We can only eliminate failures if we try to analyze them through Root Cause Failure Analysis . . . . .*



### TOP REASONS WHY WE NEED TO PERFORM RCFA

#### 2) To arrive at the correct solution to our equipment problems

- RCFA is not about addressing all the probable causes but rather failures are being looked back in reverse to determine what really cause the problem .
- In performing RCFA, each hypothesis is verified until we have gathered enough evidence that these are the actual facts that lead to the failure itself. In completely eliminating the problem, it is important to address not only the Physical cause but both the Human and the Latent cause.



***In performing Root Cause Failure Analysis all Physical Failures are triggered by humans but humans are negatively influenced by latent forces the goal in RCFA is to identify and removed these latent causes . . . . .***

### TOP REASONS WHY WE NEED TO PERFORM RCFA

#### 3) Equipment Failures might induce the possibility of secondary damage

- Parts that are in the process of failing such as bearings will increase the vibration of equipment, this increase in vibration would be harmful to other parts that are directly coupled to the part that induce the vibration
- Oftentimes secondary damage will be more costly than the parts that initially failed



*RCFA is not about identifying the person who caused the failure and punishing him but understanding why he did the wrong thing and correcting it*

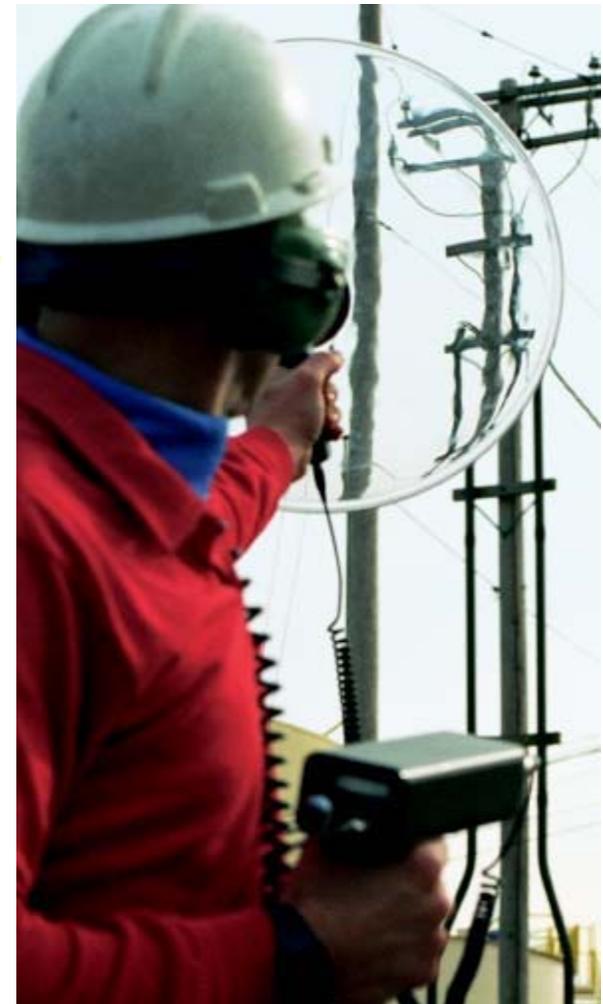


### TOP REASONS WHY WE NEED TO PERFORM RCFA

#### 4) Being proactive will give me a sense of security

- Many maintenance believe that a good backlog of maintenance work will ensure them of their job security. This is not the right mindset.

*Traditional maintenance people is confined to repairs & fixing failures but the scope of our job is beyond boundaries, Our real job is to improve our equipment reliability and the scope of maintenance is beyond boundaries CBM, Oil Analysis, Lubrication, Tribology, Coaching their Operators on Basic Equipment Condition, Oil Contamination Control, Spare Parts Management, Maintenance Cost Reduction Team, just to name a few . . . . .*



### TOP REASONS WHY WE NEED TO PERFORM RCFA

#### 5) We all learn from the failure itself

- For every failure that occurred and that had been thoroughly analyzed through RCFA, there is a learning that we can all can gained from these experience in order to prevent the recurrence of the failure itself
- Sometimes failures speak to us in a different language, it is like when we feel pain & when we don't remedy the pain it will start to get worst until the equipment finally had given up

