

Asset Plans and Right Decisions to Improve Asset Performance

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EVOLUTION OF ASSET MAINTENANCE MANAGEMENT



EVOLUTION OF MAINTENANCE MANAGEMENT

Until 40's



Simple equipment

Reparation in case of breakdown



Until 80's



Failure related to downtime

Work control systems

Cyclical interventions

Focused on execution

Working groups by trade



Until 80's



Computerization

Cost reduction

Consumption-based spare parts inventories

Emphasis on statistics.

Maintenance separate from internal clients

Present

Present



Concept of failure related to:

- Downtime
- Cost
- Quality
- Safety
- Risk
- Impact on the environment



Present



Dedication and tasks assignment to:

- Execution
- Management
- Definition of strategies



Present



Maintenance integration with:

- **Operations / Production**
- **Supply**
- **Projects / Engineering**



Present



Condition-based monitoring

Integration of computer and automation systems



Present



Spare parts inventories based on failure impact and sourcing effectiveness

Design for reliability and maintainability

Present



Risk analysis studies.

Application of management models.

Cause and effect analysis



WHAT DO WE EXPECT FROM ASSETS?

ASSET PERFORMANCE OBJECTIVES

Quality defects reduction

Knowledge of failure causes and risks

Downtime reduction

Failure reduction

Optimal operating cost



ASSET PERFORMANCE OBJECTIVES

Risk reduction

Improved productivity

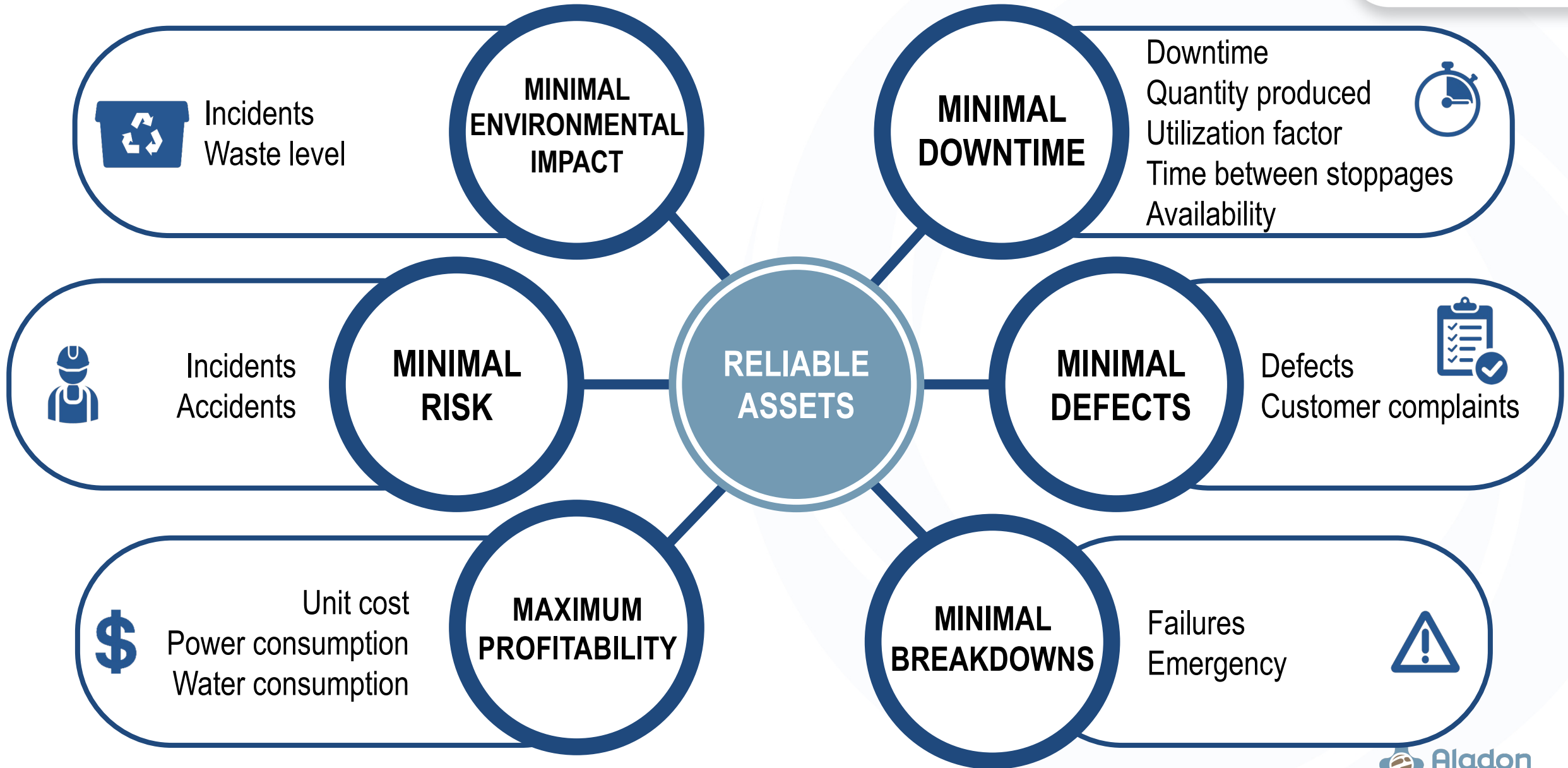
Smarter spare parts inventory

Better contingency response capability



THE CONCEPT OF RELIABILITY





RELIABILITY RESPONSIBILITIES

- Design
- Selection
- Manufacturing
- Installation

- Operation
- Maintenance
- Suppliers
- Contractors

- Purchasing
- Warehouses
- Environment
- Users

IMPACT OF ASSET FAILURES

IMPACT OF ASSET FAILURES



India – Bhopal
December 3, 1984



Scotland - North Sea
July 6, 1988



United States - Kansas City
July 17, 1981

IMPACT OF ASSET FAILURES



United States – Texas
March 23, 2005



United States - Gulf of Mexico
April 20, 2010



Peru- Pacific Ocean
October 2, 1996

IMPACT OF ASSET FAILURES



**United States – Alaska
March 24, 1989**



**United States - Florida
January 28, 1986**



**Germany - Eschede
June 3, 1998**

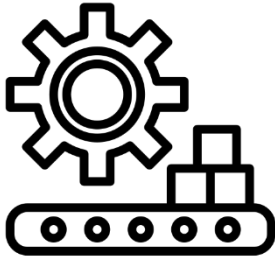
ASSETS MANAGEMENT

Coordinate activities with the aim of generating the greatest value from the assets with a balance between:



Asset Management Model

Production
model



Maintenance
model



Sourcing model



Financial model



Project model



Management
model



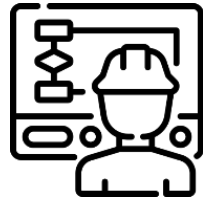
Projects



- Life cycle cost
- Acquisition cost
- Time

- Failure causes
- Risks

Operation and maintenance



- Operation
- Quality
- Inventories
- Availability

- Failure causes
- Risks

Safety and environment



- Vulnerability
- Controls

- Failure causes
- Risks

Financial / Accounting



- Yield
- Costs
- Depreciation

- Failure causes
- Risks

Shareholders



- Success
- Image
- Profit

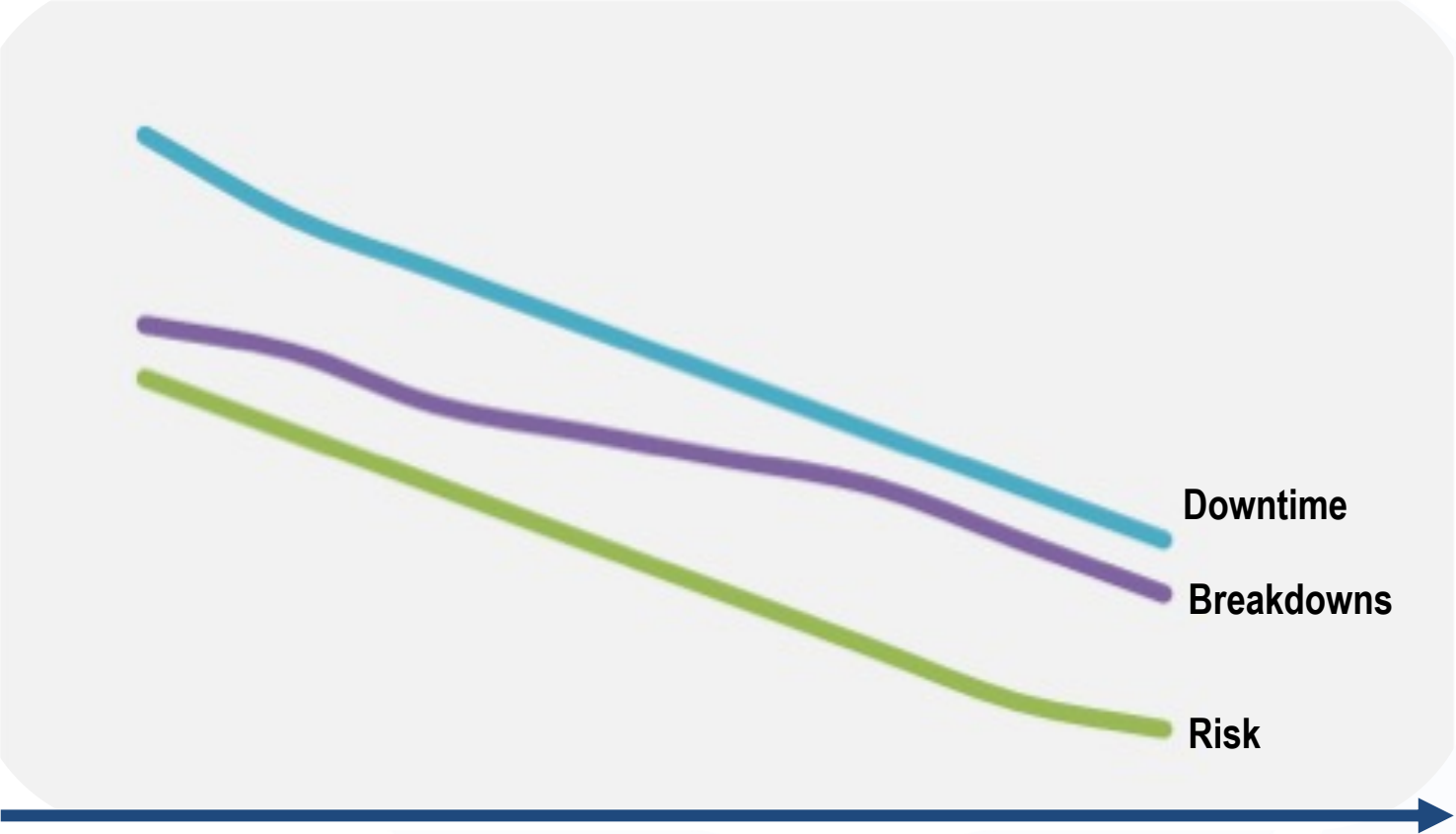
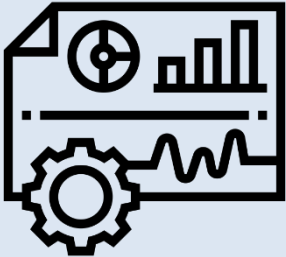
- Failure causes
- Risks

ASSET PERFORMANCE

RELIABLE ASSETS – BETTER PERFORMANCE

A reliable asset...

Fail less.



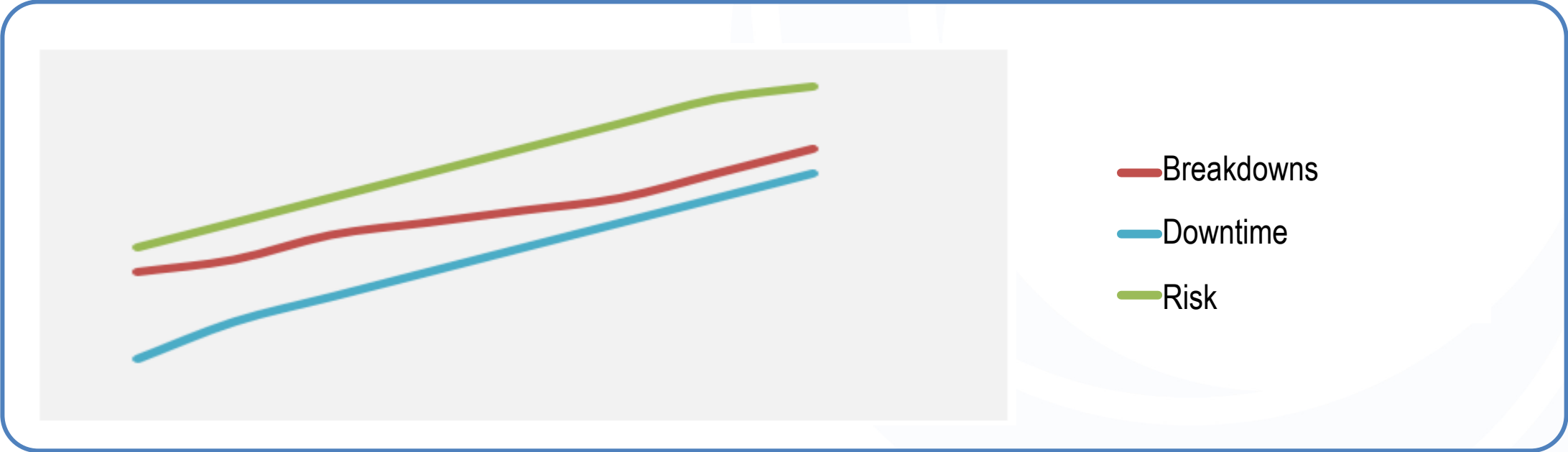
Reliability

Downtime
Breakdowns
Risk

RELIABLE ASSETS – BETTER PERFORMANCE

A less reliable asset...

↑ increases the risk.



Risk

RELIABLE ASSETS – BETTER PERFORMANCE



RISK

Set of circumstances that represent a possibility of loss



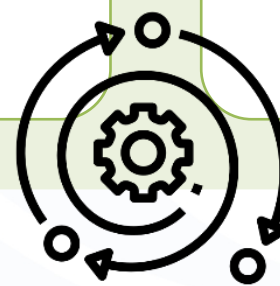
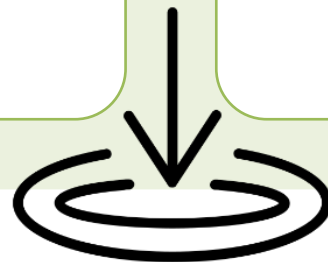
Effect of uncertainty on objectives (ISO 31000)

It can generate negative or positive impacts on:

Safety

The fulfillment of
objectives

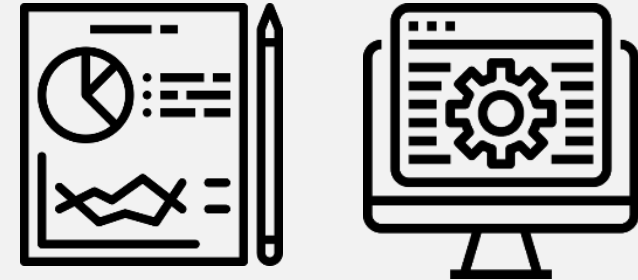
Strategies and
business plans



Good asset management requires:

- Identification
- Assessment
- Management
- Mitigation

of the organization risks and its consequences.



Risk management is an important business function, and it is directly impacted by asset management.

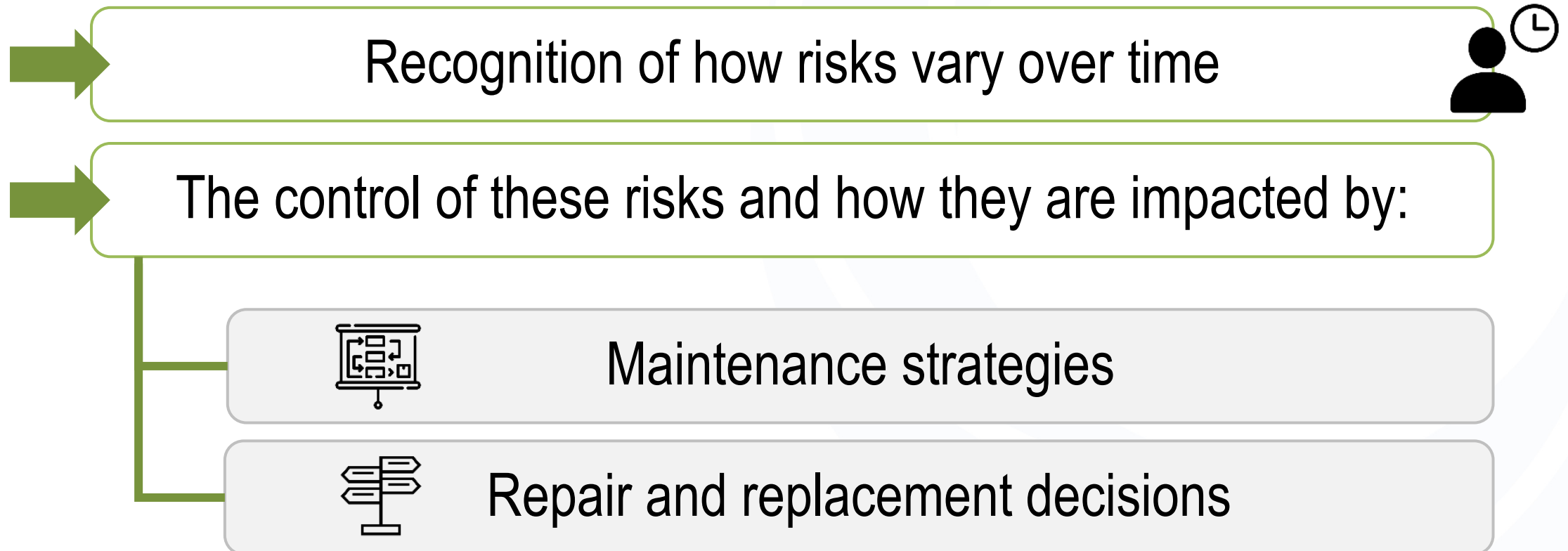
Identify risks

What risks can affect the fulfillment of the objectives?



What failure causes can occur and affect asset performance?

A good risk management system should consider:




Analyze the risks


What is the probability of the occurrence of an event?



What is the impact of the occurrence of an event?

Probability 

How much it happens

Tolerability 

How much you are willing to accept

Risk treatment



What proactive strategies are there to manage risks?

What mitigation strategies can be implemented?

Some options:

Reduce the level of
risk exposure




Accepting risk to reach an
opportunity



Change the probability.



Remove the
source of risk.



Some options:

Change the
consequences



Maintain risk with
an informed decision



Sharing risk (contracts, financing)



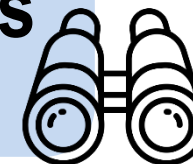
TIMELINESS OF RISK MANAGEMENT TOOLS

**Failures and known
causes**



**Failure analysis and event
investigation**

Possible failure causes

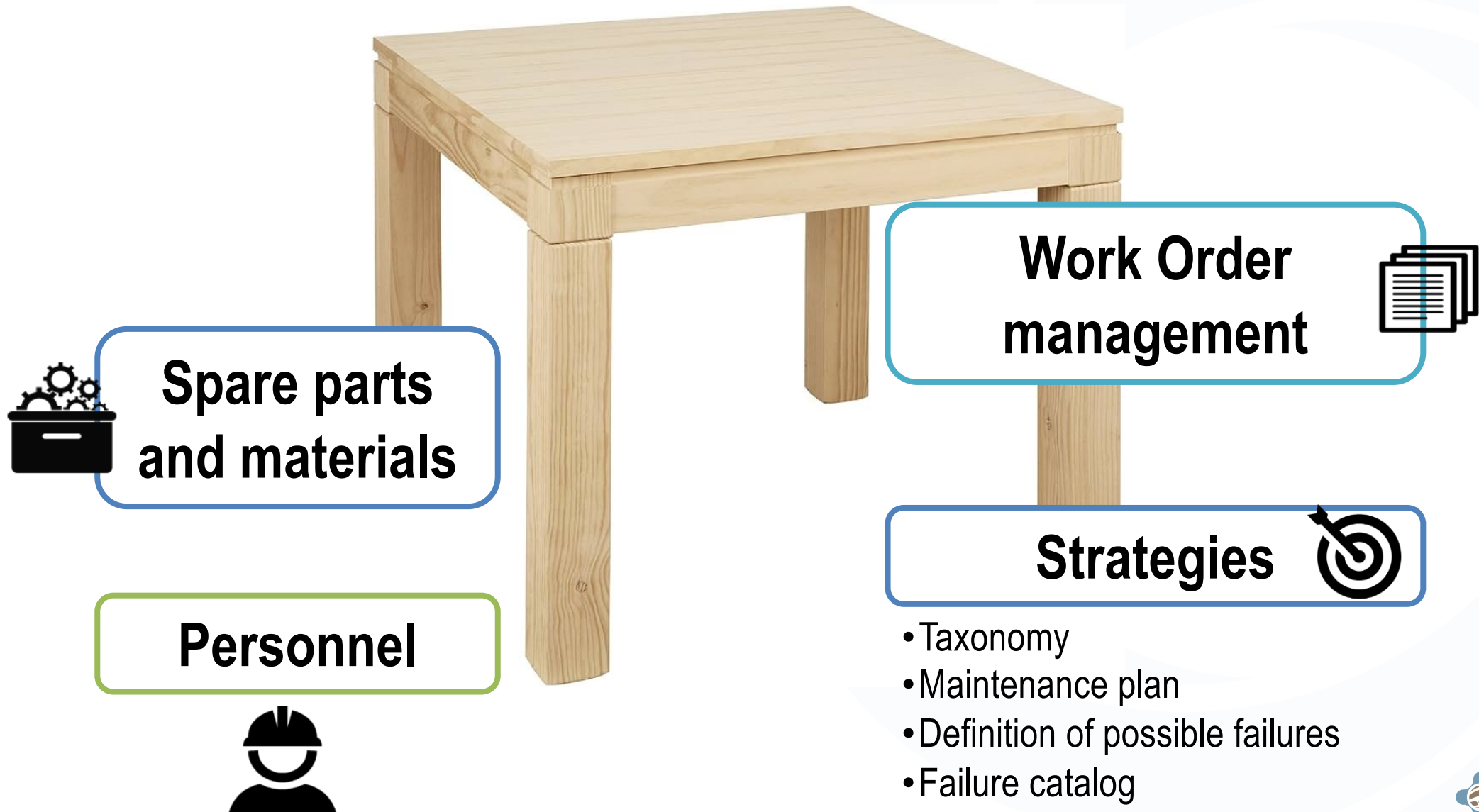


**Proactive tools – FMEA,
RCM, HAZOP**

Past

Future

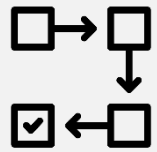
RELIABILITY STRATEGIES



To obtain a good performance it is required:



Selection, construction and proper installation



Correct and professional operation



Effective maintenance plans



Proper and effective inventory management



Effective purchases



Trained, committed and proactive staff

Improve:



Work order
management

Reliability
strategies

Resource
management

RELIABILITY CENTERED MAINTENANCE - RCM

RCM RELIABILITY CENTERED MAINTENANCE

Determine maintenance requirements

of physical assets in their operational context

to do what their users expect.

1. What are the **functions of the asset** (what the users want it to do)?
2. In what ways does it fail to fulfill its functions (**functional failures**)?
3. What causes each functional failure (**failure modes**)?
4. What happens when each failure occurs (**failure effects**)?
5. In what way does each failure matter (**failure consequences**)?
6. What can be done to predict or prevent each failure?
7. What should be done if a suitable proactive task cannot be found?

FMEA

Failure
modes and
effects
analysis

MANAGING ASSETS: RISK, PERFORMANCE AND RCM

Approach to managing assets and processes

Identify the functions, performance, and conditions of asset systems and critical assets



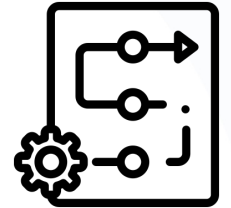
RCM Approach

RCM is based on the principle of identifying and preserving asset functionality

One of its pillars is the understanding of how the asset works and what users and stakeholders expect from it.

Approach to managing assets and processes

Clearly select the primary focus and methods by which assets and asset systems will be managed.



RCM Approach

RCM promotes management support as a fundamental pillar to improve performance.

It is an initiative that integrates operations, maintenance, quality, safety, environment and is aimed at improving the performance of the company.

Approach to managing assets and processes

Include information about the maintenance of any asset that might be needed during incidents or emergency situations.



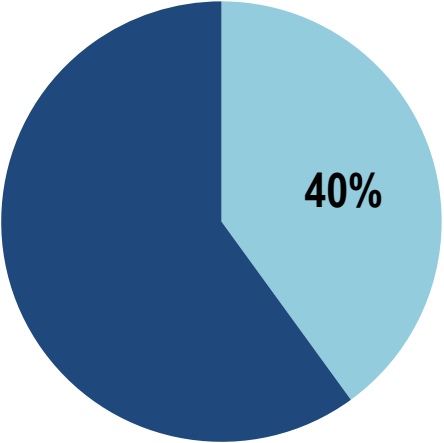
RCM Approach

Great emphasis on the preservation of protection, stand-by and emergency devices.

Functional tests are an integral part of the plan to maintain the functionality of emergency and backup equipment.

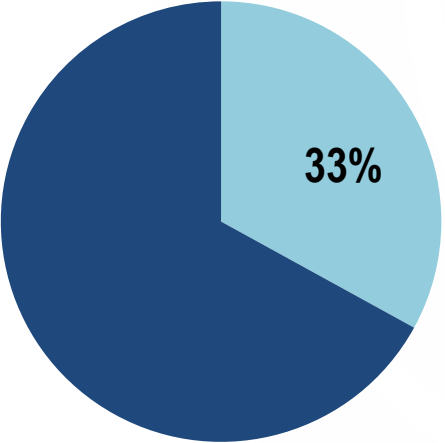
Functions

Protection



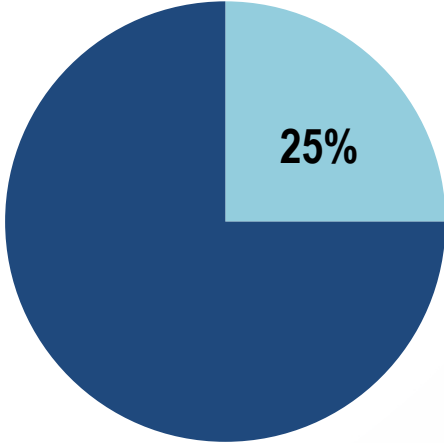
Failure modes

Hidden failures



Tasks

Failure finding tasks



Approach to managing assets and processes

The methodology for risk management should identify and classify risks that may affect asset management objectives and plans.



RCM Approach

All possible failure modes in the operational context of the asset are identified.

All failure modes are analyzed from the point of view of impact and consequence.

Approach to managing assets and processes

The methodology for risk management should identify and classify risks that may affect asset management objectives and plans.



RCM Approach

The impacts and consequences of failures are described in detail in the failure effect.

RCM gives particular attention to failure modes that have very serious consequences.

Approach to managing assets and processes

Investigation of asset-related failures, incidents and nonconformities must be carried out timely and appropriately.



RCM Approach

It is a natural candidate for improving performance when an event investigation determines that the maintenance plan was a contributing factor.

A single functional RCM failure can be used as an application of failure analysis methodology.



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iGRACIAS!

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