CHALLENGES IN THE FIELD OF SAFETY

Personal safety vs. technology safety

- Is there a difference between personal safety and technological safety?
- Do the same basic concepts apply for both?
- Leadership for personal safety vs. leadership for technological safety

Christian Kapp

Major Incident Investigation and Return on Experience

Health, Safety, Environment Division

European HSE management forum – Berlin 28 & 29th September 2017

TOPICS

- OUR AMBITION IN THE FIELD OF SAFETY
- MEANING OF OCCUPATIONAL HEALTH AND SAFETY
- MAJOR ACCIDENT – RESPONSE AND CHALLENGE
- KEY ISSUES RELATED TO TECHNOLOGICAL RISK MANAGEMENT
- WHAT CAN YOU DO AS MANAGER/LEADER?

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OVERVIEW OF THE « HSE » CHALLENGES

Occupational Health and Safety

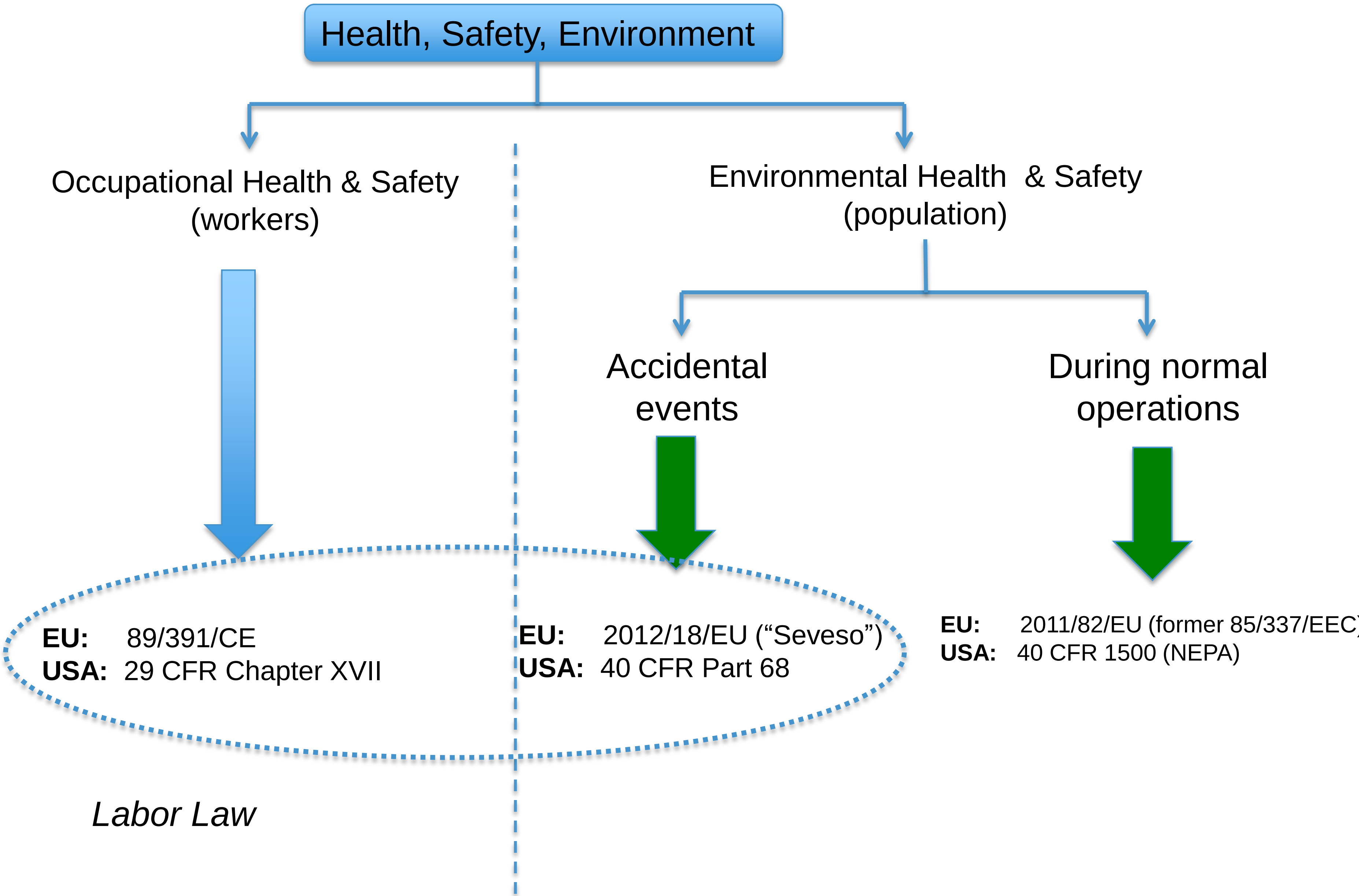
SAFETY

- PERSONAL SAFETY — Physical Integrity of the workers
- TECHNOLOGICAL SAFETY (PROCESS SAFETY) — Physical Integrity of workers, population, fixed and mobile installations

HEALTH

- HEALTH OF WORKERS — Welfare of the workers
- HEALTH OF POPULATION — Welfare of the society

ENVIRONMENT — SUSTAINABLE DEVELOPMENT — Environmental footprint



NEPA = National Environmental Policy Act

DARREN TAYLOR (° 1961)

I love my job, my life and my family.
I want to go home safe every day. That is why safety is more important than everything else.
Before executing my task I always do a proper risk assessment.
I check every single detail prior to starting the task.

THE JOB OF PROFESSOR SPLASH

THREE RELATED BUT DIFFERENT SUBJECTS

- Avoidance of accidents
  - Skill to perform a task without having an accident
  - Performance is measured with **lagging indicators**
- Safety activities
  - Refers to pro-active activities that decrease the probability of an undesired event
  - Effect and efficiency are measured with **leading indicators**
- Risk assessment
  - Intellectual reflection about uncertainties associated with a task or with a situation
  - Mathematical expression of the level of uncertainty

Our ambition is of course about avoiding accidents !

But it is also about excelling in safety activities and in risk assessments

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OCCUPATIONAL HEALTH AND SAFETY

- Evolved over time
- Regional differences
- Cultural differences

- ❑ A well-preserved Babylonian law code of ancient Mesopotamia, dating back to about 1754 BC.
- ❑ The sixth Babylonian king, Hammurabi, enacted the code.
- ❑ The code consists of 282 laws, with scaled punishments. Article 229 states that

If a builder builds a house for someone, and does not construct it properly, and the house which he built falls in and kills its owner, then that builder shall be put to death.


Code of Hammurabi

« UPSTAIR, DOWNSTAIRS » LIFE IN THE 19TH CENTURY


Child work at machine


Young coal miners


Child « hurriers »

- ➢ The International Workingmen's Association (IWA, 1864–1876) aimed at uniting a variety of different socialist, communist and trade organizations that were based on the working class.
- ➢ Founded in 1864 in a workmen's meeting held in Saint Martin's Hall, London.
- ➢ 5-8 million members
- ➢ IWA was dissolved in 1976

- The Treaty of Versailles, which ended the state of war between Germany and the Allied Powers was signed on 28 June 1919.
- An important outcome of the Treaty of Versailles was the League of Nations an intergovernmental organization founded on 10 January 1920 to maintain harmony between countries.
- Widespread labour unrest had a notable influence on the Paris Peace Conference of 1919. The Allied Powers put in place the International Labour Office (article 392 of the Treaty of Versailles)
- The first International Labour Conference held in Washington in October 1919 adopted six International Labour Conventions, which dealt with hours of work in industry, unemployment, maternity protection, night work for women, minimum age and night work for young persons in industry.

OCCUPATIONAL HEALTH AND SAFETY AT WORK: A WORLDWIDE CONCERN

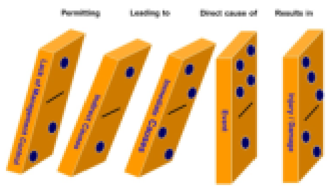
- 185 member States !
- Unique "tripartite" structure, which brings together representatives of governments, employers, and workers on an equal footing.
- The ILO's broad policies are set by the International Labour Conference, which meets once a year and brings together its constituents.
- The ILO's Secretariat, the International Labour Office, has its headquarters in Geneva
  - 1700 people
  - 320 million US$ budget
- field offices in more than 40 countries.
- Some key dates:
  - 1919 Creation of ILO by the Paris Peace Convention
  - 1946 ILO becomes a Specialized Agency of the United Nations
  - 1969 ILO receives the Nobel Peace Prize

20th century: more understanding of causes of work related accidents

Herbert William Heinrich (1886 - 1962):
- 75,000 accidents
- Heinrich's Law (1-29-300)
- 88:10:2 ratio (unsafe acts-unsafe conditions-)

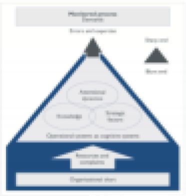
The Heinrich 300-29-1 Model

Frank Bird (1921 - 2007):
- 1 753 498 accidents, 297 companies
- Rule 1:10:30:600
- Loss Causation Model



James Reason (1938 -):
- Aviation industry
- Importance of Human Error and Organizational accidents

Organizational Behavior Managemen
- Psychological approaches
- Sociological approaches



Holnagel (2004)
- Functional Resonance Accident Model (FRAM)

Man-made technological disasters

Steam boiler explosions
- 31 July 1815 (England) explosion of experimental railway locomotive Brutnn's Mechanical Traveller suffered a boiler explosion. The first railway accident causing major loss of life, as 16 people were killed
- On 13 June 1858, the boiler of the *Pennsylvania* exploded. Estimates at the time put the passenger manifest at 450 with an initial loss of life of 250
- On 27 April 1865, the 3 of the 4 boilers of the Sultana exploded. An estimated 1,800 of her 2,427 passengers died.
- ….

Gunpowder factory explosions
- 19 March 1818. A major explosion killed 36 people at DuPont Eleutherian Mills site used for the manufacture of explosives
- On 14 July 1847 a serious explosion killed 18 staff at Faversham's Marsh Works.
- On 2 April 1916, a huge explosion ripped through the gunpowder mill at Uplees, near Faversham, when a store of 200 tons of TNTdetonated following some empty sacks catching fire. 115 people were killed.
- ….

Other industrial disasters
- 10 March 1906. The Courrières mine disaster (France), caused the death of 1,099 miners.
- On 14 April 1912. Titanic disaster. 1514 people killed.
- 21 September 1921. Oppau explosion. 500-600 people are killed by explosion of 4,500 tons of a mixture of A-sulfate and A-nitrate fertilizer
- ….

Less frequent, less analysed

Major accidents

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MAJOR ACCIDENT DEFINITION - SOME EXAMPLES

Seveso III Directive (2012) defines "major accident" as

"an occurrence such as a major emission, fire or explosion, resulting from uncontrolled developments in the course of operation of any establishment covered by this Directive (Seveso Directive), and leading to serious danger to human health or the environment, inside or outside the establishment, and involving one or more dangerous substances"

RESPONSE OF THE INDUSTRY AND THE COMMUNITY

- Installation of a new legal framework
  - Seveso Legislation (EU) in 1982 (Directive 82/501/CE)
  - OSHA 1910.119 (USA)
- Improvement of knowledge
  - Comprehensive accident investigations (e.g. Flixborough);
  - Impressive research programs on physical phenomena (dispersion, UVCE, BLEVE, etc.);
  - Elaboration of databases for accidents in different parts of the world;
  - New consulting industry to assist Authorities and Indusrty
- Development of new tools
  - risk assessment techniques (e.g. Green Book, Yellow Book and Red Book from TNO);
  - development of software tools (e.g. FLACS);
- HSE approach by Industry evolved
  - Systematic Hazard identification and Risk Assessments;
  - Implementation of Comprehensive Safety management Systems

The number of major accidents decreased in the nineties which fed the belief the Western world that industry started to get control on major accidents

THE CHALLENGE STILL EXIST…

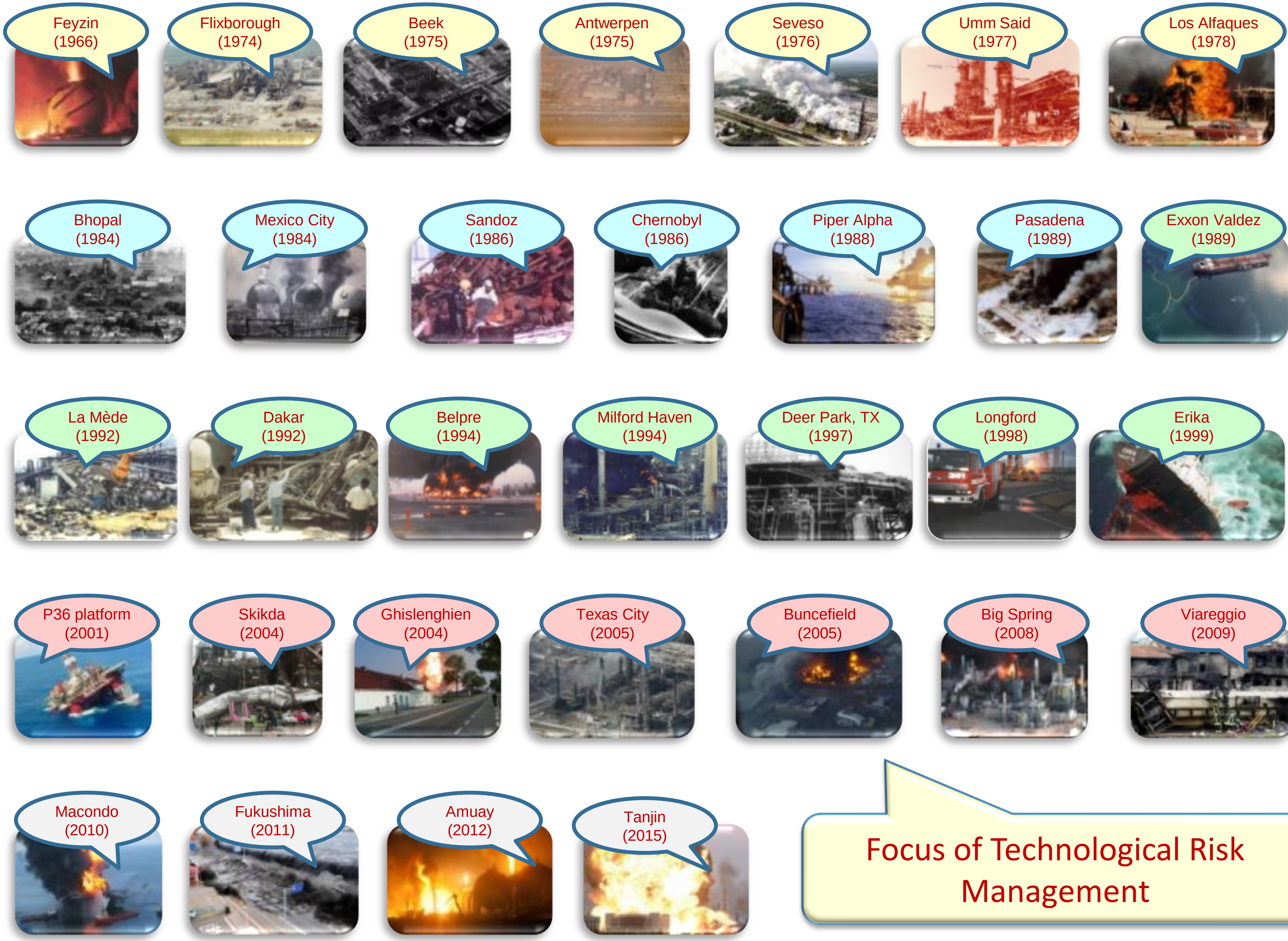
Toulouse, 2001

Accidents happened in sites that are subjected to stringent Major Hazard Regulations

Buncefield, 2005

Skikda, 2004

BP Texas, 2005



Focus of Technological Risk Management

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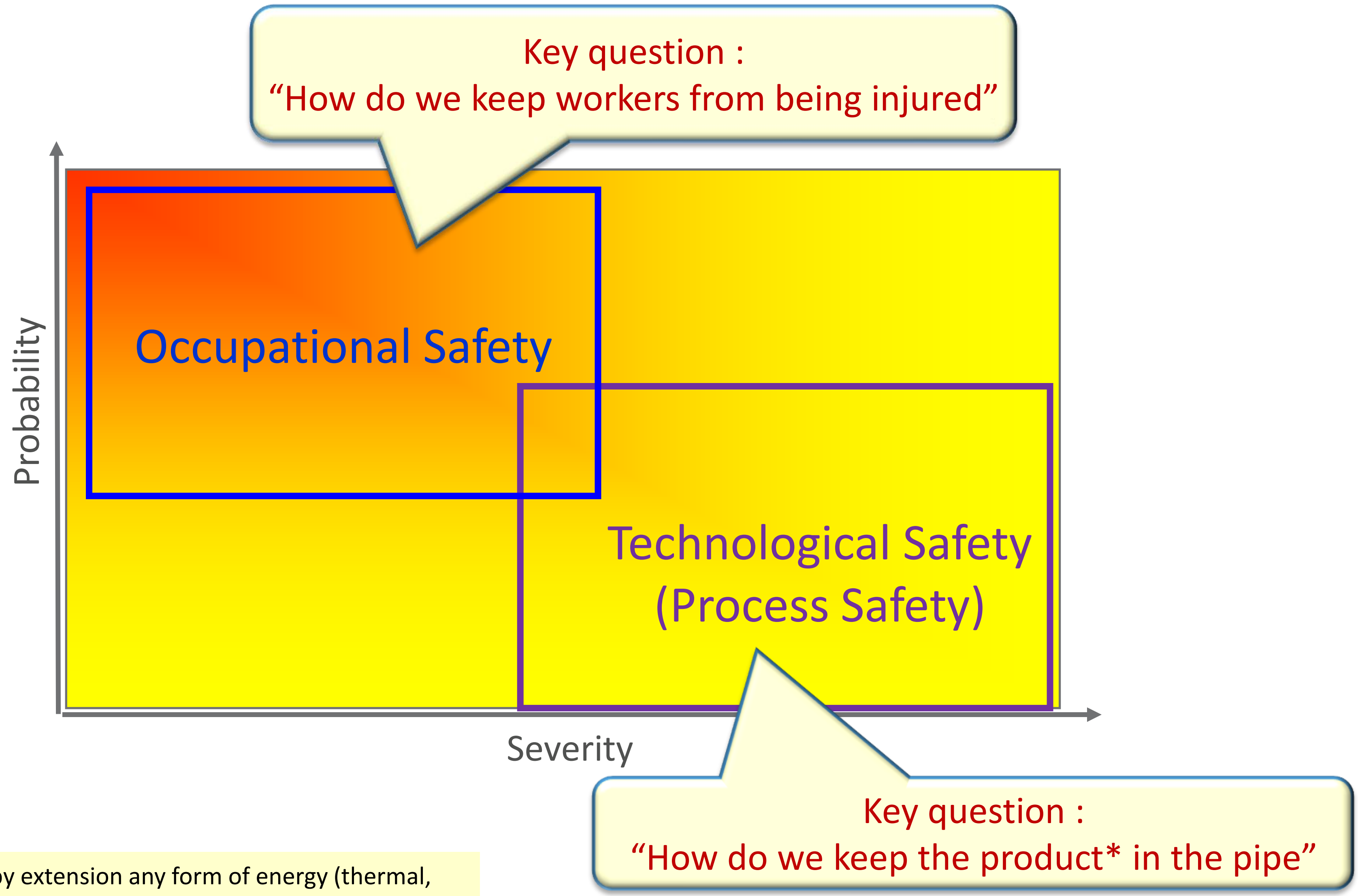
Context



* And by extension any form of energy (thermal, pressure, chemical, mechanical)

Context

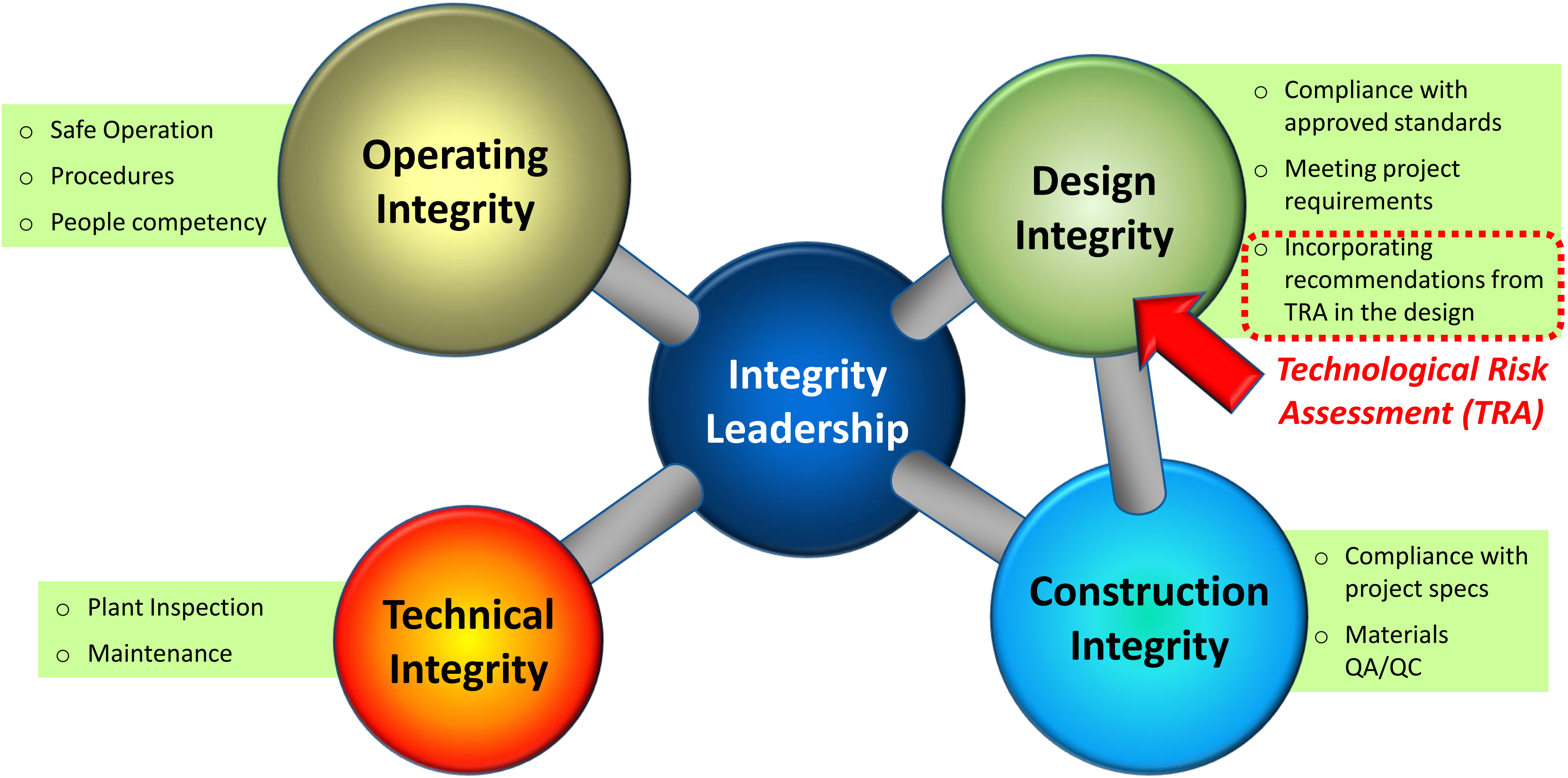
- Many major process accidents in the oil & gas industry could have been avoided:
  - if the occurrence of these events were properly identified and assessed;
  - if their associated prevention, mitigation and protection barriers were properly designed, adequately inspected and kept in a good state.

- Asset Integrity Management ***(Integrity Leadership / Technological risk management)*** is vital importance for the prevention and control of major accidents.

Asset Integrity Management Principles - Integrity Leadership

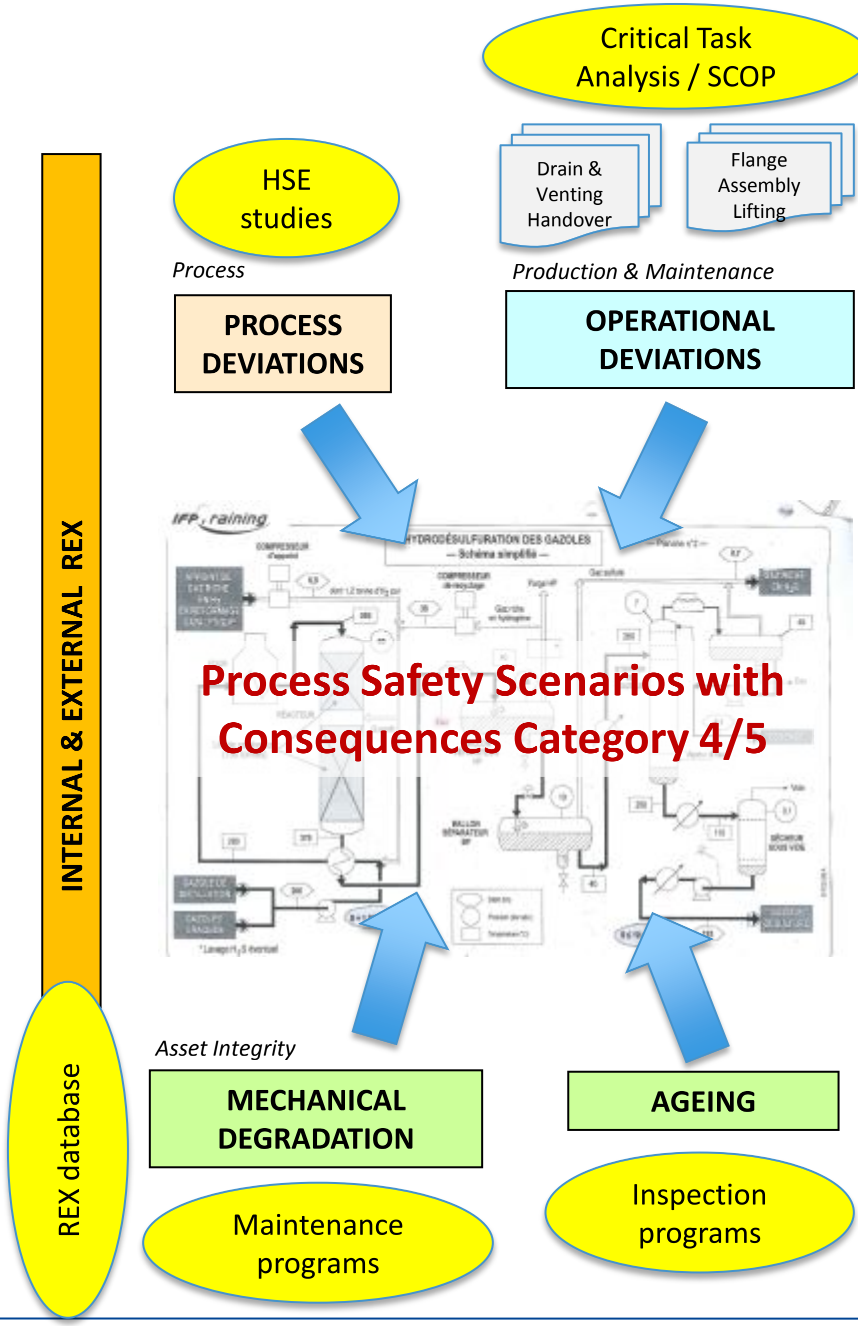
Asset integrity is the capability to operate an asset

- so that it safeguards life and environment;
- whilst meeting production objectives;
- during the operational phase of its lifecycle.



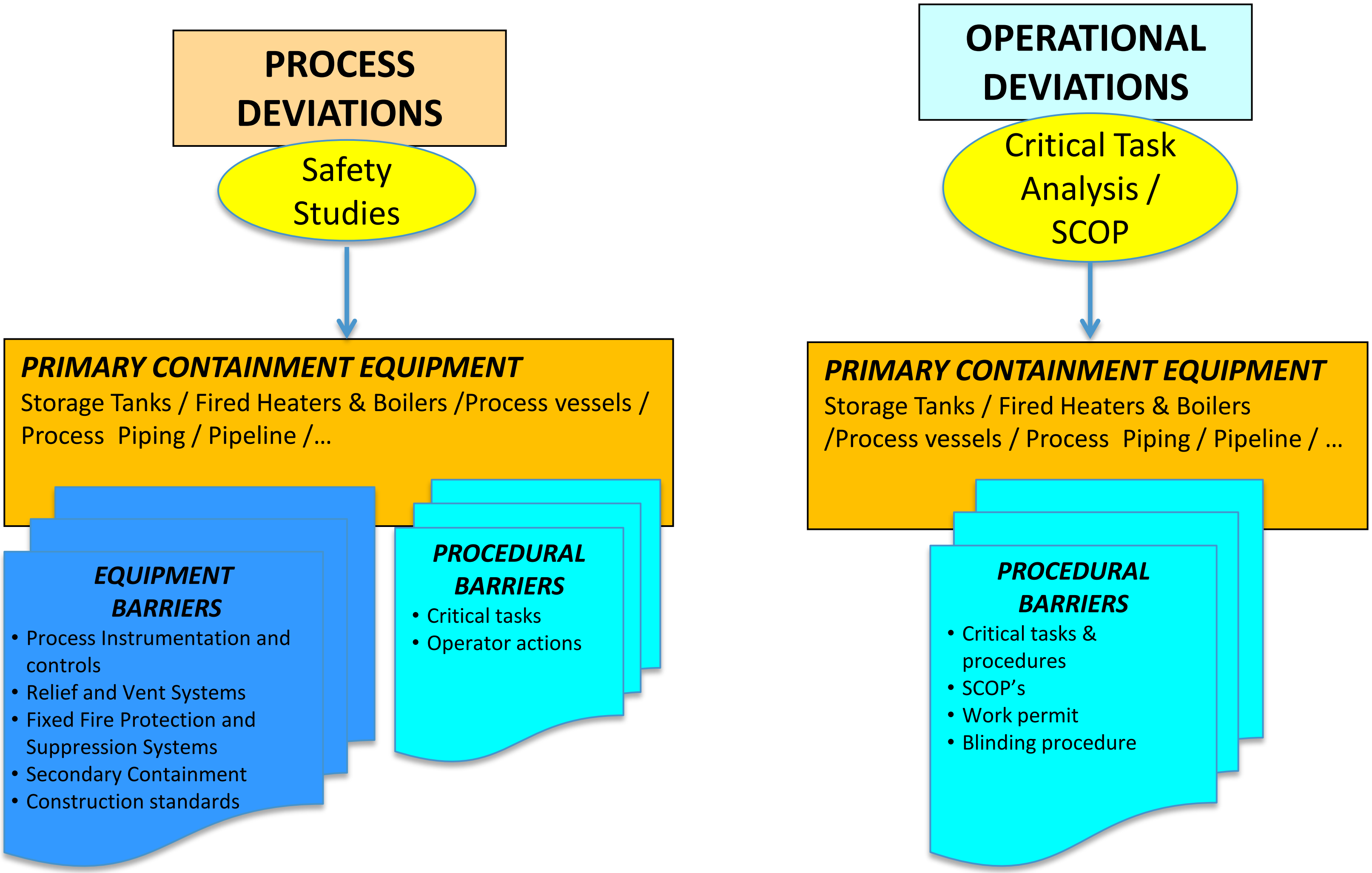
Technological Risk Assessment

- Relevant causes of process safety scenarios can be identified through a number of studies such and programs such as:
  - Quantified HAZOP, FMECA
  - LOPA studies, ERA studies
  - Risk analysis according to local legislation
  - Quantitative Risk Assessment studies
  - Critical Task Analysis / SCOPs
  - Vulnerability studies
  - Maintenance programs: RBM program, FMCEA
  - Inspection programs, RBI programs
- **To be completed with information from REX files**



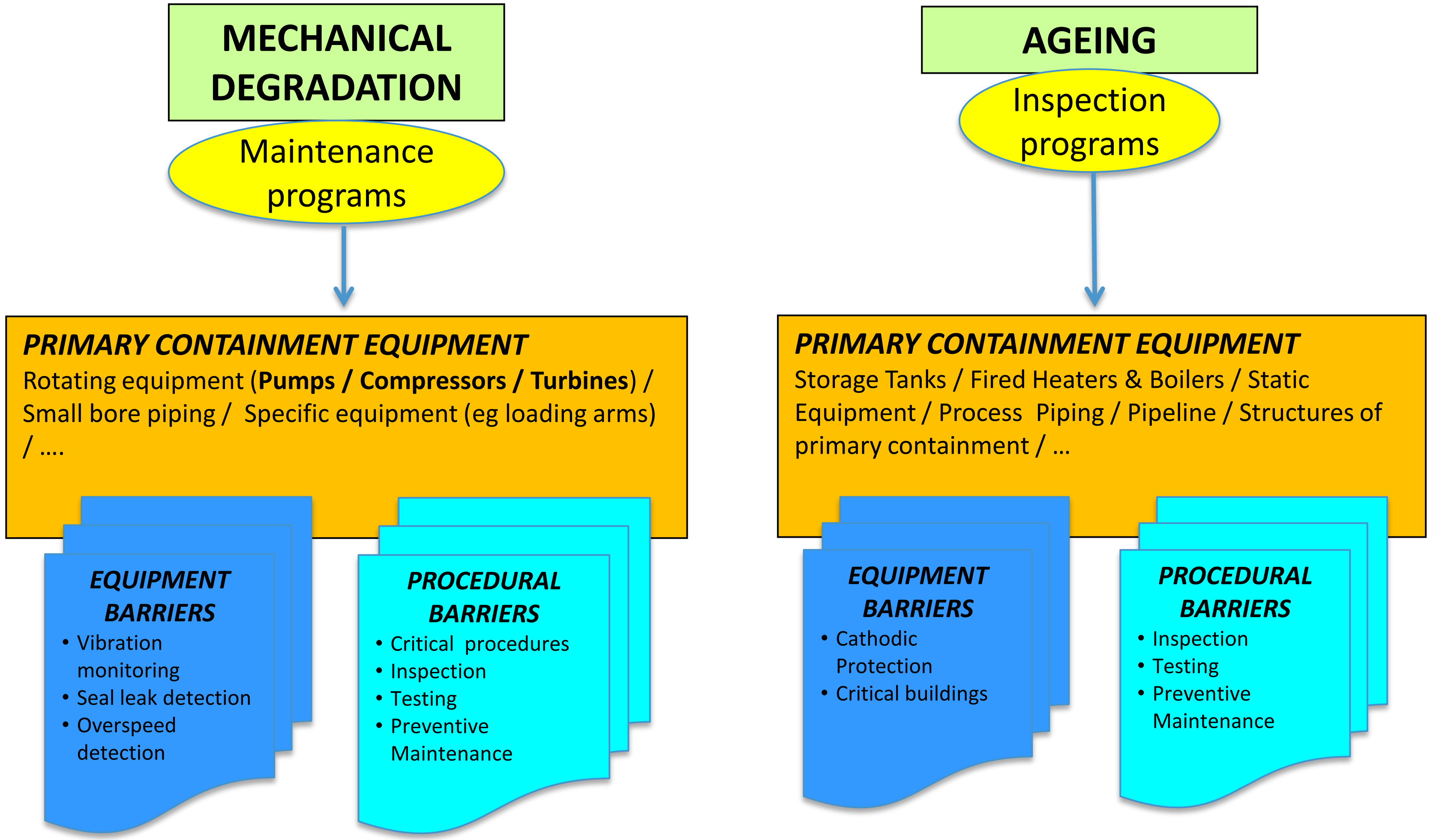
Examples of safety barriers resulting from studies

- Through theses studies, a list of relevant safety barriers, consisting of equipment barriers and procedural barriers. Examples for Process and Operational deviations are given below:



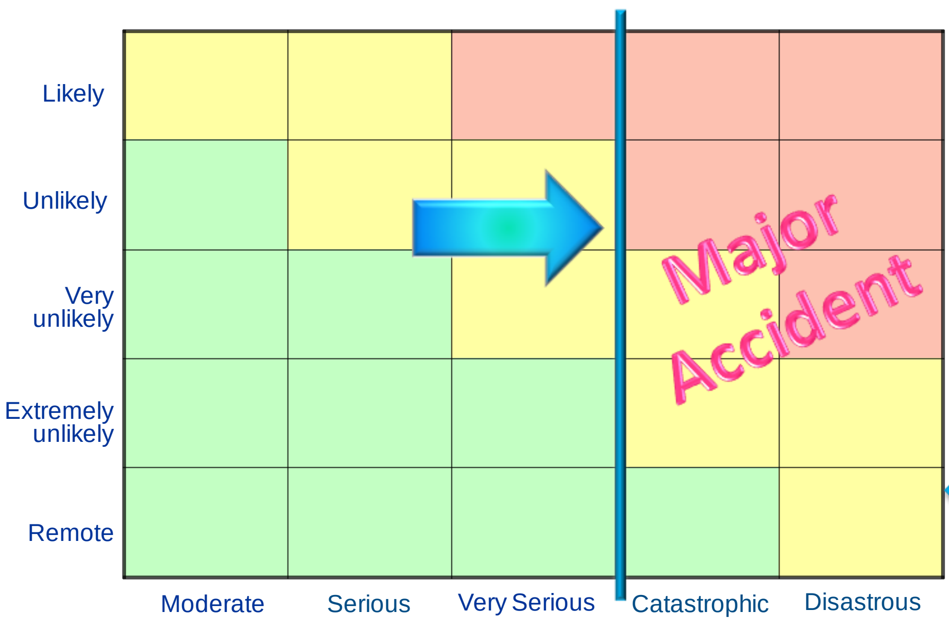
Examples of safety barriers resulting from studies

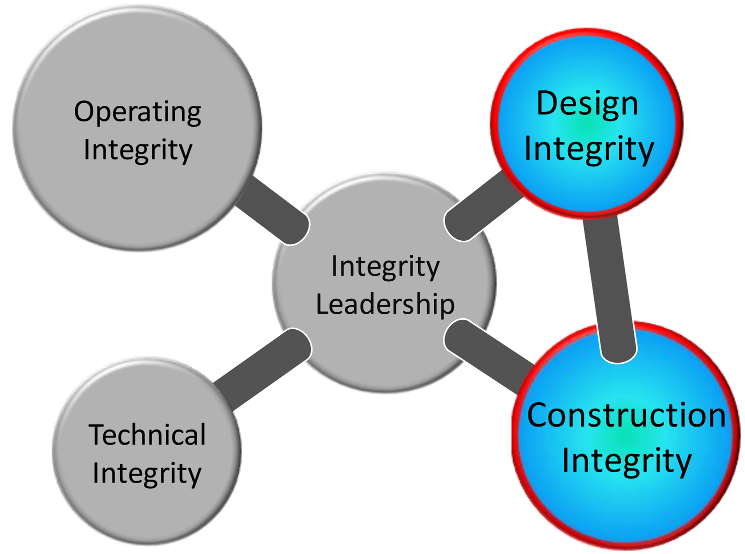
Through theses studies, a list of relevant safety barriers, consisting of equipment barriers and procedural barriers. Examples for mechanical/chemical/thermal degradation and ageing are given below



Management of Design & Construction Integrity

Technological Risk Assessment



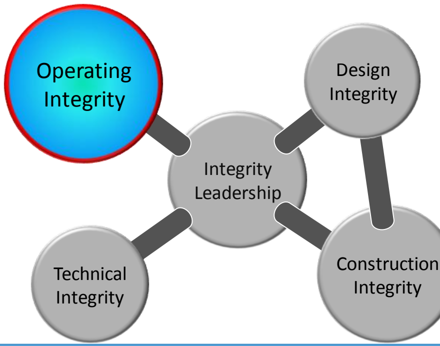


Integrity Critical Equipment

Formal verification of the correct application of the following processes :

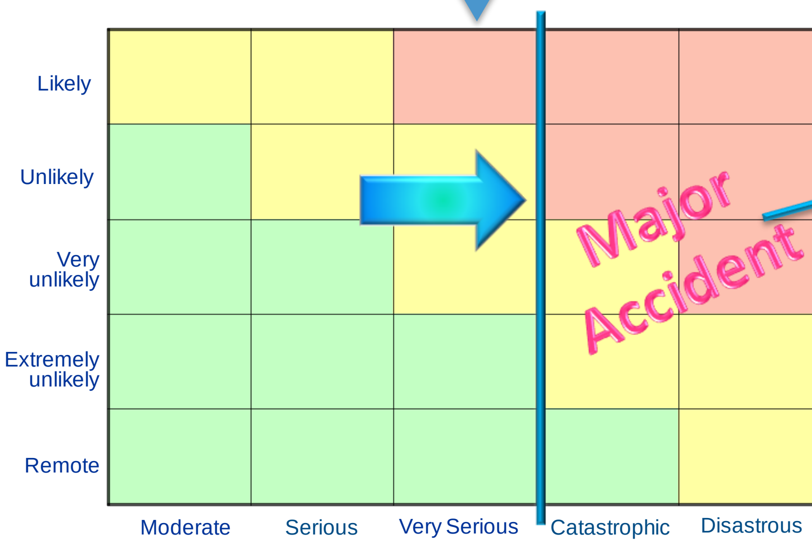
- Management of Change
- Use of design standards
- Use of construction specifications & drains

Management of Operating Integrity



Based on an analysis of ***79 important*** Loss of Containment events, following activities identified and considered as fundamental rules for the preservation of operating integrity of Integrity Critical Equipment

Critical Task Analysis



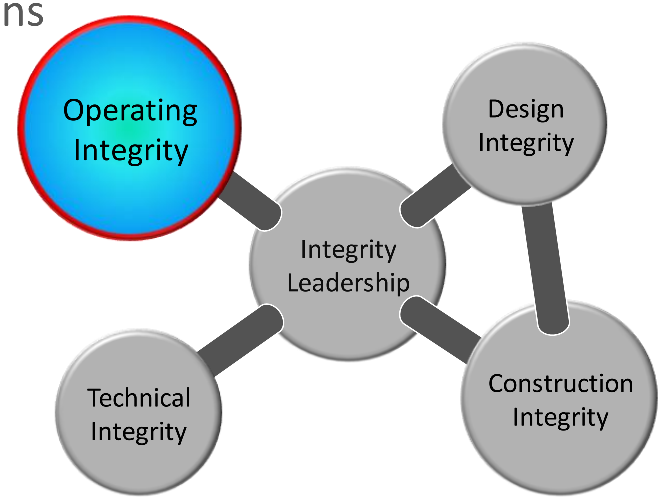
Integrity Critical Equipment (ICE)

Formal follow-up of fundamental operating integrity rules :

- Always use 2 barriers for hydrocarbon and chemical vents & drains
- Do not leave an open drain unattended
- Take interim mitigating measures in case of failure of Safety Critical Equipment
- Follow the startup and shutdown procedures and sign off after every step
- Walk-the-line : verify and validate any line up change
- Verify for completeness of tightness after maintenance work
- Always check that equipment is pressure free and provide safe isolation before starting maintenance
- Always operate within the safe operating window of the equipment

Management of Operating Integrity

- For Integrity Critical Equipment, these fundamental rules are to be formally implemented and verified
- The implementation of these rules need to be organized at local level using existing local provisions for consequence management (no separate process)
- The fundamentals rules alone are as such not sufficient but also require :
  - Management engagement with clear expectations expressed by leadership
  - Rigorous and unanimous decision on what “good enough” looks like
  - A process to identify and resolve impossibilities
  - A consequence policy in case of deviations



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LEADER-MANAGER IN HSE

- Occupational Health & Safety AT WORK

→ Ensure continuous improvement in the work conditions and work environment

OHS Leadership - Occupational Health & safety Management Principles

- ❑ Ensure that you are knowledgeable: study legislation, procedures, golden rules, etc.
- ❑ Daily check in the field
- ❑ Daily safety tour
- ❑ Daily discussion with N-1 about the efficiency of your safety management system

- Major accidents

→ Continuous unease and awareness

Integrity Leadership - Asset Integrity Management Principles

- ❑ Ensure technical competence
- ❑ Ensure proper risk assessment
- ❑ Ensure to be informed about the major risks and associated barriers
- ❑ Ensure effectiveness of the barriers
- ❑ Ensure to be informed about degraded situations and compensating measures

A MANAGER VERSUS A LEADER

- A manager basically directs resources to complete predetermined goals or projects.
  - For example, a manager may engage in hiring, training, and scheduling employees in order to accomplish work in the most efficient and cost effective manner possible.

- A manager is considered a failure if he/she is not able to complete the project or goals with efficiency or when the cost becomes too high

- A leader is someone who has clearly defined convictions and more important who has the courage to do what is necessary to turn his or her convictions into reality

To maximize your effectiveness you have to be able to function both as a leader and as a manager

CONCLUSION

"*Managers do things right, while leaders do the right thing*"

<u>Leader-managers do the right things in the right way</u>

Thank you for your attention