

Risk analyses

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What are risk analyses

- **Analyses of risk related to potential accidental events**
 - Identify potential unwanted events (triggering- and accidental events)
 - Describe potential causes (direct and root causes)
 - Describe potential consequences
 - Estimate the risk (consequence probability and severity)
 - Suggest and evaluate risk reducing actions based on existing risk

- **Risk analyses are proactive**
 - Risk is identified and evaluated before losses have occurred

- **Different analyses have different focus**

What are risk reducing actions

- **Reduction of the probability of accidental events**
 - Remove the causes for the triggering events
 - Pre-accident barriers to avoid accidental events

- **Reduction of the severity of accidental event**
 - Accident barriers to reduce the consequences of the accidental event (step 1)
 - Post-accident barriers to reduce the consequences of accidental events (step 2)

Both categories should always be taken into consideration

Why risk analysis

To prevent loss of values including:

■ HSE losses

- Personal injuries
- Long time health effects
- Environmental effects

■ Production/operational losses

- Availability
- Performance
- Quality

■ Material damages

■ Loss of market reputation

A large white curly bracket on the left side of the slide groups the four categories of losses: HSE losses, Production/operational losses, Material damages, and Loss of market reputation. A line from the bottom of this bracket points to a grey rectangular box on the right that contains the text "Economy losses".

Economy losses

Type of analyses

- **There is a "jungel" of different methods:**
 - Action Error Analysis (AEA)
 - Action Error Mode Analysis (AEMA)
 - Failure Mode Effect and Criticality Analysis (FMECA)
 - Fault Tree Analysis (FTA)
 - Hazard Identification (HAZID)
 - Hazard and Operability (HAZOP)
 - Operational Problem Analysis (OPERA)
 - Potential Human Error and Cause Analysis (PHECA)
 - Quantitative risk analysis (QRA)
 - Reliability analysis
 - Robustness analysis
 - Safe Job Analysis (SJA)
 - Safety analysis
 - Vulnerability analysis...

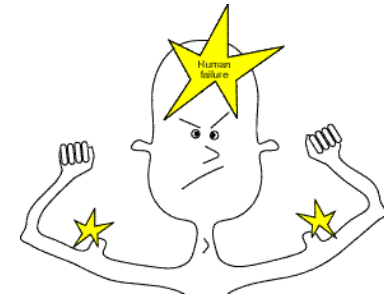
About methods

- **Several methods are almost identical**
- **Often unceartenties about what analysis to use**
- **Often unceartenties about when anayses shall be applied**
- **Bad method knowledge puts emphasis on method and not content**
- **Internal methods should be changed based on best practice**

Basis analyses

■ Qualitative analyses

- Operational problem analysis (OPERA)
Conceptual analysis with focus on "all kind of problems"
- Failure mode effect and criticality analysis (FMECA)
Detailed analysis with focus on component reliability
- Action error analysis (AEA)
Detailed analysis with focus on human reliability



■ Quantitative analyses

- Fault tree analysis (FTA)
Probability "numbers" on reliability
- Event tree analysis (ETA)
Probability "numbers" on consequences

Risk analysis are performed in all product lifecycles:

- Development
- Manufacturing
- Operation
- Maintenance

Risk analyses require knowledge

■ Basis knowledge (extract)

- Analysis method
- Technical failure mechanisms
- Human errors
- Material technology
- Surface treatments
- Physics and chemistry
- Machine elements and electronics
- Calculations
- Product development
- Manufacturing
- Maintenance

■ Operational knowledge*

- Drilling equipment
- Drilling process
- Drilling problems
- Procedures
- Standards and regulations

*Drilling as an example

Multi discipline task

■ Operational people

- Working at the site where the unwanted events occur
- Know the operational use of the equipment
- Have often simple and creative solutions

■ Vendors

- Have made the drawings, calculations, test programs, etc.

■ Independent third part

- Know the methods and the risk analysis process
- Able to structure large amount of information
- Have the basic knowledge
- Able to make complex calculations of event probabilities
- Able to see relations between subjects

Actions are suggested – Then what

- **Make a risk management report for critical problems**
 - Problem description
 - Risk reducing actions
 - Risk reducing effect
 - Disadvantage
 - Cost evaluation and funding
 - Selected actions
 - Responsible for action plan and implementation
 - Status

- **Aim for risk reducing actions that will solve several problems**