Petroleum Safety Authority Norway
Trends in Risk Level
‘Risk Level’ Measuring Scheme

Methodology
Petroleum Safety Authority

• First as part of the Norwegian Petroleum Directorate.

• Safety regulator since 1973.

• Regulatory responsibility for safety and the working environment in Norway’s petroleum sector.

• Reports to the Ministry of Labour and Social Affairs.

• About 170 employees.
Trends in risk level  

Background  

- Large structural changes in the petroleum industry during the late 90’s led to ‘friction’ between the employers organisations and the unions in regards to the potential effect of changes on safety  
- The unions claimed that the safety was suffering  
- The employer organizations claimed that safety had never been better based on indicators like loss of work time  
- The authorities lacked the necessary information to establish an independent view of development in ‘safety level’  
- In 1999 it was decided to establish a methodology with the purpose of measuring important parameters that influence safety and working environment  
- First yearly report published in 2001. Continuous development of the methodology
Objectives

- Measure the development in risk level
- Measure effects of the HSE related work in the industry
- Contribute to identifying areas that are critical to HSE on industry level
- Create focus on specific HSE issues
- Increase insight into potential causes of accidents and undesirable conditions
Trends in risk level
Participants and contributors

Reference group:
Employers associations, unions and authorities Tripartite

Advisory group

Data / information/knowledge

Responsible for the product

Professional experts

Safety forum

The industry

HSE Professional group

Professional experts

Advise on further development. Tripartite
Trends in risk level
Methodology

TRENDS IN RISK LEVEL - RNNP

MAJOR ACCIDENT PRECURSORS

OTHER ACCIDENT INDICATORS

BARRIERS AND MAINTENANCE

QUESTIONNAIRE

QUALITATIVE STUDIES

OCCUPATIONAL ILLNESS AND INJURY

ACUTE SPILLS TO ENVIRONMENT
Collecting data
Quantitative information

Data collected from the industry on request → Quality assurance of information – PSA

Data collected from databases within PSA → Quality assurance of information – Industry

Analysis
Indicators used

• Lagging indicators
  - Based on undesirable events
    - Accidents, incidents and near misses

• Leading indicators
  - Based on availability of safety critical barriers
  - Based on maintenance data
  - Based on questionnaire survey (every second year)
    - Workers on facilities view on HSE related work that influence their safety and health

• Qualitative in-depth studies
Accident precursors / indicators

- Non-ignited hydrocarbon releases
- Ignited hydrocarbon releases
- Well kicks/ loss of well control
- Fire/ explosion – non process fluids
- Vessel on collision course
- Drifting objects
- Collision with filed related vessel, shuttle tanker
- Structural damage, stability, anchoring, dynamic pos failure

- Releases from subsea production systems, pipelines, risers
- Damage to subsea production systems
- Helicopter
- Man over board
- Serious injury – personnel
- Occupational illness
- Total power failure
- Diving accident
- H2S emission
- Falling object

Black: Major accident potential
Accident precursor frequency
‘Major accidents’
Number of well control incidents, normalised

![Bar chart showing the number of well control incidents from 2000 to 2016. The chart compares production drilling (red bars) and exploration drilling (blue bars). The x-axis represents the years, and the y-axis represents the number of events per 100 drilled wells. The data shows fluctuations in the number of incidents over the years, with some years having significantly higher numbers than others.]
Well control incidents, contribution to potential loss of life
Major accident risk – risk management

• Risk must be managed
• Hypothesis – major accident risk
  - If the number of incidents with major accident potential are reduced, and the potential in regards to major accidents are reduced in the incidents that remains – risk management is becoming more efficient
  - Potential is evaluated based on real life risk assessments for the same type of plants where the incidents occur. Potential Loss of Life (PLL) forms the basis for a set of weight factors for each type of incident and each type of plant

\[ R = \sum_{I} \sum_{J} DFU_{ij} \cdot v_{ij} \]
Major accidents – indicator
Weighted indicator, potential loss of life

Three year rolling average
Normalized – working hours
2000 = 100

\[ R = \sum_{i} \sum_{j} D FU_{ij} \cdot v_{ij} \]
Barrier indicators

**Barrier**: technical, operational and/or organisational elements intended individually or collectively to prevent the occurrence of a specific sequence of events, or to influence it in an intended direction by limiting harm and/or loss.

Barrier indicators in ‘Trends in Risk Level’ are failure rates and maintenance information.
Barrieres
Average failure rate, 3-year rolling average

Number of failures
Number of tests
Trends in risk level
Contributions

• Important for the tri-partite cooperation
  - Establish a common platform in regards to the development of important safety parameters
  - Act as a foundation for areas of improvement

• Generates knowledge
  - Large and unique database (also in international context)
  - Is used by several interest groups, e.g. for safety research

• An important input to PSAs knowledge base in regards to risk based planning
  - Supervisory activities
  - Development of regulatory requirements
  - Input to our Ministry
Reports

• Yearly reports

• See: [www.ptil.no/rnnp](http://www.ptil.no/rnnp)
  - English summary report available