Leading KPIs based on PSAs
Trends in Risk Level
RNNP

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Trends in risk level
Participants and contributors

Reference group:
Employers associations, unions and authorities
Tripartite

Safety forum
The industry
PSA
Advisory group
HSE Professional group

Data / information/knowledge
Responsible for the product
Professional experts

Advise on further development.
Tripartite
Basis for selecting indicators

• Indicators must be:
  - Valid
  - Reliable
  - Sensitive
  - Representative
  - ‘Bias proof’
  - Cost effective

• For RNNP:
  - Primarily based on existing data
  - Communication
  - Industry level

A. Hale, 2009
Leading vs lagging

• Definition dependent on context

• Input – Throughput – Output – Outcome (HSE, 2001)

• In RNNP we use a combination of leading and lagging indicators, or indicators relevant to the ‘HSE chain’

• Critical question: Does the indicator contribute to improvement (directly or indirectly)?
Trends in risk level
Methodology

TRENDS IN RISK LEVEL

MAJOR ACCIDENT PRECURSORS

OTHER ACCIDENT PRECURSORS

BARRIERS AND MAINTENANCE

QUESTIONNAIRE

QUALITATIVE STUDIES

OCCUPATIONAL ILLNES AND INJURY
Accident precursors
**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 field 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
Hydrocarbon releases
rate > 0.1 kg/sec

Release frequency
Weighted in relation to potential for loss of life - risk
Major accident risk - production facilities
Weighted risk indicator, potential loss of life

Three year rolling average
Normalized – working hours
2005 = 100

\[ R = \sum_{i} \sum_{j} v_{ij} X_{ij} \]
Barriers and maintenance
Barriers

• The main focus is on barriers relating to leaks in production and process facilities, where the following barrier functions are included:
  - maintain the integrity of hydrocarbon production and process facilities (covered to a large extent by the DFUs)
  - prevent ignition
  - reduce cloud/spill
  - prevent escalation
  - prevent fatalities

• Measure = # faulty tests/ # tests, i.e. Fraction of failures
Mean fraction of failures for selected barrier elements, 2010

Average fraction of faults
Total fraction of failures presented per barrier element for all operators
Fraction of failures for closing tests of wing and master valves, pr facility
Well integrity

- Fraction of wells in red category: 0.3%
- Fraction of wells in orange category: 7.5%
- Fraction of wells in yellow category: 17.8%
- Fraction of wells in green category: 74.3%

Diagram:
- NCS operational wells
  - No: Barrier principals still fulfilled by measures
  - Yes: Degradation problem of barrier or leak through a barrier?
    - Yes: Impact?
      - High: One barrier failure and the other is degraded / not verified, or external leak
      - Medium: One barrier failure and the other is intact. Or a single failure may lead to leak to surroundings
    - No: One barrier leaks within AC or barrier degraded, The other is intact
  - No: Healthy well, no or minor integrity issue
Maintenance,
Classification of tag items
Production installations
Preventive maintenance
Production facilities
Qualitative studies

• Social science methodology
  - Interviews
  - Anthropological methods
    - E.g. why do certain groups score significantly worse than others?
  - Literature studies
    - Typical based on investigation reports and journal papers
  - Work shops
    - Related to specific topics – e.g. framework conditions impact on safety

• Main purpose of these studies are to enable a more thorough understanding of the development in risk trends
Qualitative study in 2010
Hydrocarbon releases – cause vs measures

This study's main object is to identify some challenges that the industry can make use of in its own preparation of measures to reduce risk of hydrocarbon leakages on the Norwegian Continental Shelf.

Problems addressed in this study:

• What human, technical and organizational causes can be put forward to explain the occurrence of hydrocarbon leaks on the Norwegian Continental Shelf?

• What risk reducing measures has been proposed after post-event investigations?

• Is there a good correspondence between identified causes and these measures?
Questionnaire survey

Among all employees in the offshore and onshore activities of the petroleum industry
Questionnaire survey

• The goal is to measure the employees’ perception of the HES conditions and HES work and how the perception develop during the years

• The contents
  - HES conditions and HES work (HES climate) - 56
  - Perceived risk potentials in connection with different accident scenarios (DFUs) - 13
  - Experience of physical and psychosocial working environment - 33
  - Experience of leisure time- and recreation conditions – 10
  - Restitution after work -11
  - Health complaints, absence due to sickness and reporting of occupational injuries - 21

• The questions are mainly the same offshore and onshore

• Reply from 6928 offshore and 3183 onshore employees (2009/2010)