Snorre A: Granskning, analyse og forbedring

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Dramatisk gasslekkasje på Snorre A

I morgentimen mandag lekker det fremdeles gass på Snorre A. 180 personer arbeider på platforma. De resterende 38 om bord jobber nå på spreng for å få kontroll over lekkasjen. Det fryktes at arbeidet kan ta måneder.
Close to catastrophe

The 28.11.04 gas blow-out on Snorre A is one of the most serious incidents ever in the Norwegian oil & gas industry.

- The PSA’s investigation identified 28 non-conformances, in four principal categories:
  - failure to observe governing regulations
  - failure to understand and implement risk assessments
  - insufficient management involvement
  - breaches in the requirements for well barriers
- PSA’s order to Statoil: identify the (underlying) causes of the non-conformances,
  - i.e.: perform a thorough organizational analysis of Snorre A
  - Statoil wanted this analysis to be performed by someone independent and professional
Research questions, methods and data

- Question 1: Why were the rules broken?
- Question 2: Was the blow-out only a result of coincidence and “bad luck”, or was it a “system accident”, due to inherent weaknesses in the Snorre organization?
- Three different data sources
  - Document review
  - Questionnaire-based survey
  - Personal in-depth interviews
    - 152 respondents – covering all parts of the Snorre organization and its surroundings – onshore and offshore (61)

Simple, linear accident model: ”the domino model”

- Sequential cause analysis - “search backwards to the initial cause”
  - Which (most) often proves to be “human error”
- Measures: eliminate or improve risk factors
  - E.g. training, control mechanisms, improved equipment…
complex linear incident model – "the swiss cheese model"
(Reason 1990, 1997)

Causal analysis: multiple barrier failures
- Human errors/lack of competence
- Failing organizational barriers
- Technical failures

Measures: identify and strengthen existing barriers, add new barriers
- Education
- Control mechanisms
- Technical surveillance

Non-linear, systemic models

"It (the accident) was caused by a series of organisational failures: the failure to respond to clear warning signs, communication problems, lack of attention to major hazards, superficial auditing and, as much as anything, a failure to learn from previous experience." (Hopkins 2000)

Causal analysis: concurrence, - "functional resonance", "system gets out of balance"

Risk understanding: large accidents often follow a period where the organization has drifted towards higher risk levels
Operational risk – practical drift

- The 28.11.04 blow-out does not appear to be the result of chance or "bad luck."
- The Snorre A organization had been run with a relatively high level of operational risk for a long time.

If this had been about a lorry...
Understanding safety-critical behaviour

- We must understand individual behaviour in relation to organizational and technological conditions
  - man, technology and organization (MTO)
  - interpretative sociological approach/constructivist perspective
- The “Pentagon Model”
Technology

- Wear and tear, lack of long-term maintenance, limited redundancy, "minimum investment"
  - incident-driven mode of working, "fire-fighting!"
  - insufficient opportunities to work in a systematic, planned and long-term way
  - well-developed ability to be versatile and improvise
- Production focus
  - "as much, as fast as possible"
  - "full speed ahead"

Learnings:
- The state of the technology, and the maintenance policy, influence working habits
- Operational policies influence culture development

Formal structure

- Change of operator: Saga-Hydro-Statoil
  - Snorre A was to a large extent maintained as a "Saga organization", in terms of both staffing and culture
- Changing structure in the underground departments (RESU)
  - not all routines were in place + management change
  - wider control span combined with high workloads
  - much responsibility placed with a few experienced personnel
  - increased vulnerability for quality checking of decisions
- Change of drilling operator: Prosafe – Odfjell
  - management capacity
  - shift of attention

Learnings:
- Organizational changes is not only about formal structures
- Changes take time and efforts, and may divert attentions
- New organizational solutions may have unintended consequences
Regulations/governing documents

- Varying degree of knowledge and understanding
- Accessibility
- Scope and complexity, changes and updates
- Training and time to become familiar with the documentation
  - working conditions/efficiency pressures

Learnings:
- The totality may be more than the sum of the parts
- Training is important
- Different users have different qualifications
- "working by the rules" is sometimes difficult (or impossible?)

Social relations and networks

- Stable workforce – high level of internal social integration
  - good working environment
  - sense of belonging, job satisfaction
  - mutual trust
- Limited social integration in Statoil
  - Snorre A was "left in peace"
  - weak entrenchment in Statoil's informal networks
  - lack of access to experience and expertise outside own entity, i.e.: little external social capital

Learnings:
- The importance of informal social networks, and the accessibility of external social capital, is often not understood, and therefore also underestimated
Culture: values, norms, attitudes, competence

- At 28.11.04, Snorre A was not culturally integrated in Statoil
- The "Snorre A production and operation culture":
  - dominant value: keep the operation going and the production volume up
  - short-term attitude, ad hoc
  - go-getting attitude, versatility, local knowledge, improvisations
  - historically not the best climate for professional objections and critical questions
  - relatively high tolerance of risk, gradually developed over time

Learnings:
- Understanding culture is a precondition for understanding attitudes and behaviour
- Local cultures are, almost always, a historical product
- Cultures change slowly
- Influencing culture is difficult (but not impossible)

Work processes

- Working conditions characterised by interruptions, changes and lack of systematic planning
- Little involvement by the platform organization in planning well operations
  - faith in "experts"
  - pressure on time and short deadlines
- Working conditions for management
  - "the administrative pressure"
  - little time to monitor personnel and follow up day-to-day operations

Learnings:
- Working conditions, tasks and work processes must be understood as a "working system"
- The working conditions for operational leaders are important safety factors
### Formal and informal safety barriers in the organization

<table>
<thead>
<tr>
<th>Formal mechanisms</th>
<th>Informal mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doing things right</td>
<td>Ask colleagues seeking advice</td>
</tr>
<tr>
<td>Governing documentation</td>
<td>Climate for warning – halting operations</td>
</tr>
<tr>
<td>Quality control</td>
<td>Formal meetings approval</td>
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</tbody>
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- The reduced organizational robustness of the Snorre organization was due to weakening and deficits in all categories of safety barriers

### The Snorre lesson

- Heightened risk level, developed over time, may be difficult to spot in advance
- Safety in offshore operations must be understood in a holistic perspective, i.e. can not be reduced to a sum of components
- The safety level is a result of combined influences of, and interplay between, different factors: technological, operational, organizational, cultural, relational and interactional –
Oppfølging
• 14 tiltak
• Effektmåling

Hovedresultater fra effektmålingen

Sikkerhetsutviklingen i UPN og i Snorre A
En gjennomgående oppfatning er at en i den siste tiden har fått en mer eksplisitt fokus på sikkerhet, og at dette gjelder i alle delene av organisasjonen. På spørsmål om en samlet vurdering svarer så å si alle at risikostyringen gjennomføres på en bedre måte, og at sikkerheten nå er bedre ivaretatt enn tidligere.

Tiltakspakken etter Snorre A virker sammen med andre forbedringer og tiltak, slik som Kollegiprogrammet og kampanjen mot fallende gjenstander. Selv om det er noe varierende vurderinger med hensyn til i hvilken grad tiltakene er kjent og har hatt konkrete konsekvenser, mener de aller fleste at den samlede effekten av tiltakspakken er en vesentlig forbedring av sikkerhetsnivået.

Det er ingen tvil om at Snorre A i dag opereres på en langt sikrere måte enn før 28.11.04. Årsaken er en generell styrking av de organisatoriske sikkerhetsbarrierene, både de formelle og de uformelle.
Styrking av organisatoriske sikkerhetsbarrierer – Snorre A

Formelle mekanismer
- Opplæring
- Styrende dok.
- Forbedring
- Oppfølging

Uformelle mekanismer
- Nettverksutvikling
- Personellrotasjon
- Integrasjon i Statoil

Formelle mekanismer
- Ledelsesinvolvering
- Planleggingskontroll

Uformelle mekanismer
- Kollegaprogrammet
- "Høy seg"
- Legitimitet for å "ta to"

Sikkerhetseffekter
-Arsaksanalyse etter Snorre A
28.11.04

"Arsaksanalysen etter Snorre A er det viktigste dokumentet jeg har lest etter at jeg kom til Statoil"
Takk for oppmerksomheten!