Risk Assessment for Frigg field Decommissioning

Decommissioning services

- **Decision support for selection of optimal removal option**
- **Identification of key risks**
- **Sensitivity to**
  - model changes
  - removal method
- **Documentation to support the public consultation process**

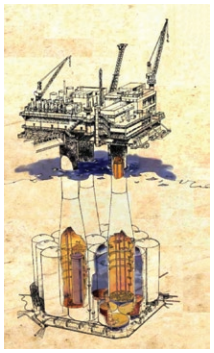
The Frigg field consists of 3 concrete platforms (GBS) and 3 steel jackets located on the border of the Norwegian and the UK sector of the North Sea. The field has recently ceased to produce, and decisions regarding decommissioning of the platforms shall be taken.

Current legislation requires that concrete structures are completely removed if it is technically feasible. Since none of the concrete substructures were designed for removal, the owner faces a challenge in finding feasible removal options. A justification of the removal option selected, which is influenced by uncertain technical, environmental and safety aspects, shall be made to the authorities.

To facilitate TotalFinaElf's choice of removal option for the 3 concrete substructures, COWI A/S carried out a quantitative comparative risk assessment of various removal options. The methodology comprised of breaking down the method statement of each removal option into 6-14 sequential activities. For each activity the main hazards were identified and their consequences and corresponding probability of occurrence were assessed from detailed technical background documentation and in expert workshop sessions. On this basis a risk model was established using Bayesian Networks, which is a class of probabilistic models well suited for handling interdependent variables. Using this model, the removal options were compared with respect to technical risk and expected costs.

The technical feasibility of the removal activities included quantification of catastrophic failure probabilities and severe cost/schedule overrun. These problems could be caused by structural failure, leaks during re-floating or accidents during e.g. cutting or lifting operations.

The main output of the project was a well documented quantitative basis for selection of the optimal removal option. The study included sensitivity analyses and identification of main risk contributors. The key to success of the risk assessment was the combination of expert knowledge of tools, structures and processes with the right modelling techniques. The study has played a major role in the public consultation process by representing a state-of-the-art approach to synthesizing detailed technical background information into clear decision parameters.



TCP2

- **Condeep type**
- **Structure weight 232,000 tons**

TP1

- **Sea-Tank type**
- **Structure weight 164,000 tons**

CDP1

- **Doris type cylindrical concrete tank**
- **Structure weight 423,000 tons**

Facts about the Frigg field

- **Installed 1974-77 in the North Sea**
- **Production ceased 2004**
- **Water depth approx. 100 m**

Project period: 2000-2001

Client:
TOTAL E&P Norge A/S

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