



COWI uses HUGIN Software for Decision Support

Since the year 1999 the Danish consultancy group COWI A/S has used HUGIN software to provide advanced decision support in several of its projects. In particular, HUGIN has been used for risk assessment of the decommissioning options related to the removal of offshore production facilities on a number of projects.

After the Frigg Field in the North Sea ceased to produce, TOTAL E&P Norge A/S used COWI consultants to determine the most optimal removal option for the concrete platforms. Current legislation requires that concrete structures be completely removed if technically feasible. In general one of the major challenges is to identify the most feasible options for the facilities after taking all associated risks into consideration - including personnel, environmental and economic risk.

Company Background

COWI operates worldwide within engineering, environmental science and economics. Since COWI was founded in 1930, the firm has been involved in more than 50,000 projects in 175 countries.

COWI provides services ranging from professional advice about a particular problem to comprehensive planning and total engineering design of large-scale projects, including construction supervision and advice on operation and maintenance. COWI is leading some of the largest infrastructure projects in the world.

Complex, multi-disciplinary projects are planned and implemented according to an integrated approach involving traditional engineering services and environmental science, economy, sociology, training and transfer of technology.

Risk assessment methodology

An important step in the planning of the decommissioning of an offshore production facility is to quantify the associated risks in terms of risk to personnel, risk to the environment and economic risk. On this basis, the optimal decommissioning option may be identified. For complex and costly decommissioning activities, it is important that all relevant risks are identified and assessed. Only then may the risks associated with different decommissioning options be consistently compared and documented to the various interested parties.

To facilitate TOTAL's choice of removal option for concrete substructures, COWI carried out a quantitative comparative risk assessment of the possible removal options using HUGIN software.

The methodology broke down the method statement of each removal option into a number of sequential activities. For each activity the main hazards were identified and their consequences and corresponding probability of occurrence were modelled and assessed using the HUGIN software based on detailed technical background documentation and in expert workshop sessions.

A Bayesian network model for risk assessment

The HUGIN tool, which is based on Bayesian networks, was for the Frigg assessments used for evaluating both the risk of failing to reach the intended objective, and the associated economic risks for each of the options. Bayesian networks are considered to be a very reliable tool for domain modelling when considering risk assessment tasks. Using the models developed, the removal options were compared with respect to technical risk and expected costs.

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 Bayesian networks provided a strong tool for sensitivity analysis and optimal risk mitigation. Furthermore, the transparency of the modelling made it easy to communicate the risk assessments to the client, the experts and other stakeholders.



Several benefits achieved from using HUGIN

- ✓ **Clear Picture** A Bayesian network gives a clear picture of the events under consideration and makes it easy to check the sensitivity of a result to any of the probability parameters, many of which are based on engineering judgment.
- ✓ **Easy Identification** A Bayesian network allows an easy identification of the contributors to any given failure scenario included in the model. It is thus possible to focus on the most relevant issues for risk reduction, and to document the contribution made by additional safety measures.
- ✓ **Combines Hard and Soft Knowledge** A Bayesian network makes it possible to combine hard and soft knowledge in an elegant and flexible way.
- ✓ **Efficient Computations with Incomplete Knowledge** HUGIN software implements highly efficient algorithms that handle incomplete knowledge in an exact way since basic axioms of probability are used to compute the probabilities. Computing with missing observations is important in the quantitative risk assessment.
- ✓ **Flexible and Easy to Maintain** Using HUGIN software it is easy to update a model for each option and to include further details when new information becomes available as a result of inspection, tests and engineering studies.
- ✓ **Easy Integration With Other Tools** Application Programming Interfaces for HUGIN software make it easy to integrate HUGIN functionality into other tools and applications.

Why did COWI choose HUGIN Expert A/S as its software provider?



“Risk assessment is a key component of the projects we carry out at COWI. Because of this, it was essential for us to find a technology provider with a risk prediction and probability tool that enabled us to incorporate complex, uncertain scenario information into our risk models. We chose development software from HUGIN Expert A/S, and are very satisfied with our choice.”

COWI has used HUGIN software in connection with various projects. In all cases, experience has shown that HUGIN software tools are efficient and easy to use, and provide us with results we can rely on – which is essential in our line of business. Also a plus, HUGIN software is equipped with several useful functionalities such as object-oriented networks, value of information and sensitivity analysis,” says Inger Birgitte Kroon, Chief Project Manager at COWI.

“We have found HUGIN Expert A/S to be a technology partner we can count on. They react quickly to our questions, and provide us with sound advice and technical support when needed. It is our impression that the excellent service we receive from HUGIN is due to the expert level of their staff and their in-depth knowledge of the core technology behind the product they provide.”

Other risk assessment projects

HUGIN software is the preferred tool in COWI for decommissioning risk assessments, and has also been/is used for the comparative risk assessment of MCP01, North West Hutton and Brent decommissioning options.

HUGIN Expert A/S
Gasværksvej 5
DK-9000 Aalborg
Denmark
Tel: +45 96550790
Fax: +45 96550799
<http://www.hugin.com>

COWI A/S
Parallelsvej 2
DK-2800 Kongens Lyngby
Denmark
Tel: +45 45 97 22 11
Fax: +45 45 97 22 12
<http://www.cowi.com/>