



DHI CASE STORY

HELPING THE OFFSHORE OIL INDUSTRY ASSESS ENVIRONMENTAL IMPACT

Monitoring the seabed around oil and gas production platforms

Maersk Oil operates several oil and gas platforms in the North Sea. To assess the environmental impact of their drilling and production activities, they asked us to conduct chemical and biological monitoring surveys of the seabed around several platforms. Through a long-term survey program, we have performed several such assessments around many of Maersk Oil's platforms.

ASSESSING THE IMPACT OF OIL AND GAS EXPLORATION ON THE SEABED

When conducting oil and gas operations, there is a risk of impacting the marine environment. In Denmark, environmental authorities have set up guidelines to monitor the environmental conditions around oil and gas production platforms.

Off the coast of Denmark in the North Sea, Maersk Oil implements these guidelines for the oil and gas production platforms it operates. Due to our long history of performing chemical and biological seabed monitoring, they chose us to monitor the marine environment around their platforms.

In 2012, we monitored the environmental state of the seabed around three platforms – Gorm, Harald and Halfdan. Using results from the long-term survey programme, we assessed:

- the environmental state around the platforms compared with a reference station
- spatial and temporal changes in the environmental state of the seabed around the platform



Benthic fauna sample.

SUMMARY

CLIENT

Maersk Oil

CHALLENGE

- Potential harm to the environment around seabed due to drilling activities
- Need to comply with the demands of environmental authorities

SOLUTION

Accurate and detailed environmental monitoring of the seabed using sampling, analyses and assessments of the sediment chemistry and benthic fauna

VALUE

- High quality assessment of the development and environmental status of the seabed around oil platforms
- Ensuring environmental protection
- Enabling operators to document their clean environmental records and thereby maintain their operating licenses
- Supporting compliance with international Health, Safety and Environmental standards (HSE) standards

LOCATION / COUNTRY

North Sea

MONITORING THE ENVIRONMENTAL STATE OF THE SEABED

As part of the monitoring surveys, we collected 180 samples of sediment at approximately 24 stations for:

- physical and chemical analyses
- the identification and quantification of benthic fauna

We then conducted physical and chemical analyses on the samples, including:

- grain size analysis and determination of the median grain size and the silt/clay fraction of the sediment
- dry matter, loss on ignition and total organic carbon
- metals – Barium (Ba), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Zinc (Zn), Mercury (Hg) and Aluminium (Al)
- total hydrocarbons and polycyclic aromatic hydrocarbons/ alkylated aromatic hydrocarbons (PAH/NPD)



Sediment samples being collected around platforms using a HAPS core sampler.

Our analyses of the collected benthic fauna included:

- species identification
- biodiversity and abundance analyses
- biomass of all major taxonomic groups (as total wet weight and total dry weight)
- precisely determining the biomass of the brittle star *Amphiura filiformis*, which is known to be sensitive to drilling activities

We used our expert knowledge, statistical analyses and available literature to evaluate the environmental state around the platforms. Our work enabled Maersk Oil to document their clean environmental record and proceed with their North Sea operations.

In addition to Gorm, Harald and Halfdan, we have previously completed surveys and monitoring reports of the seabed around other Maersk Oil-operated platforms, including Dan, Tyra, Kraka and Valdemar.

WIDE-RANGING EXPERIENCE

We have experience working with other large oil and gas companies to monitor the seabed around their production platforms, including:

- Dong Energy and Production A/S – Siri and Hejre platforms
- Hess Denmark A/S – South Arne and Northern Wellhead platforms

Furthermore, we have also conducted baseline surveys for new production fields. These baseline surveys described the existing structure and conditions of the seabed sediment chemistry and benthic fauna. This provided a good basis for further assessment of the potential impacts of exploration drilling, as well as oil and gas production.

In addition to monitoring and Environmental Monitoring and Management Plans (EMMPs), we also provide related services – including modelling of oil spills and produced water discharge. Environmental Impact Assessments (EIAs) of structures at sea are another of our key competencies.

COMPLYING WITH INTERNATIONAL STANDARDS

To ensure the continued high quality of our results, all procedures complied with relevant international Health, Safety and Environmental (HSE) standards. We conducted our activities in accordance with DS/EN ISO 9001 – an internationally recognised certification of quality management systems. This qualification verifies that our quality management system has been certified against the best practice standard and found compliant.

We also followed the requirements of local environmental authorities. This included performing our survey in accordance with Danish requirements with respect to the:

- number of samples taken
- analyses of samples for certain physical, chemical and biological variables

In addition, our environmental laboratories are accredited under ISO/IEC 17025. They also have Organisation for Economic Co-operation and Development's Principles of Good Laboratory Practice (OECD GLP) approval. The approval process included inspections of our quality management system for compliance with ISO 9001. Our environmental management is certified under DS/EN ISO 14001. Our field work is carried out within the framework of ISO 18001 (health and safety management systems).

We also made sure that our monitoring and reporting fulfilled the international standards in EMMPs.