DHI SOLUTION

ARCTIC ENGINEERING

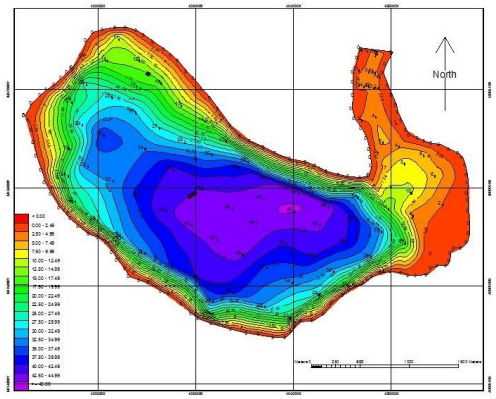
Minerals, petroleum and infrastructure projects in the Arctic

Working in the Arctic comes with some special challenges. DHI has more than 50 years of experience in arctic survey and studies, and operates independently in the most remote areas. We offer expertise on geographical and biological disciplines combined with extensive engineering know-how, as well as experience in safe operations in isolated and rough environments with an array of light survey equipment to support your project.

Based on our experience and expertise in numerous water environments, we have developed standards and tools to optimise design of structures and processes, for safe construction, operation and maintenance of marine and onshore structures and to ensure their environmental compliance. Based on our advanced in-house numerical models, our laboratories and physical testing facilities as well as our monitoring equipment, we deliver reliable and accurate solutions for your challenges associated with your activities in the Arctic region.

DHI OFFERS

- Surveys, monitoring, sampling, analyses
- Numerical modelling of physical, biological and chemical processes
- Laboratory tests (toxicology and biodegradability)
- Remote sensing and mapping (e.g. HR satellite imaging, digital terrain models)
- Environmental mapping, assessment and monitoring
- Design and operation conditions
- Water resources and management
- Water discharge and treatment
- Historical accumulation of heavy metals



Bathymetry of Mestersvig, East Greenland, measured from the ice. Mestersvig has been a mining location since the early 50s and has more recently been explored for its molybdenum deposit at

SUMMARY

CLIENT

- Oil & gas industry
- Offshore renewable industry
- Port and terminal operators
- Consultants and contractors
- Emergency response companies

CHALLENGE

- Inadequate or inaccurate design and operational data available
- Cost-ineffective solution and uncertain safety levels

SOLUTION

- Monitoring at the site
- Supplementing with remotely sensed data
- Numerical modelling to generate short and long-term statistics
- Forecasting for actual operations
- Consistent analyses combining measurements and numerical model data

VALUE

- High quality site-specific data and accurate MetOcean forecast
- Reduced risk of delayed or failed operations
- Enhanced emergency response management
- Major cost savings, reduced downtime risk and increased safety
- Cost-efficient design of marine structures enabled by customised MetOcean database solutions
- Risk levels compliant with target values

Arctic engineering is a challenge - for the structures as well as the personnel. We know how to deal with it.

METOCEAN SERVICES AND OPERATIONAL CONTROL

The provision of high quality and reliable metocean data is fundamental for the success of marine projects. Daily as well as extreme conditions have to be taken into account to establish the design conditions. Marine operations likewise rely heavily on metocean data for predicting available weather windows, reducing costly downtime and increasing operational safety.

Key features of our coastal and marine water forecasting system include multi-dimensional hydrodynamic and ecological models including advanced data assimilation routines, continuous calibration and validation of model results and comprehensive web-based presentation of relevant metocean data (including nowcast, hindcast and forecast), customised according to your specific requirements.

Tightly coupled with our metocean services, we offer standard tools to ensure safe construction, operation and maintenance of marine structures. These include:

- Metocean data (hindcast, online monitoring)
- Forecast of metocean conditions
- Iceberg surveillance and warning system
- Online monitoring
- Hydrographical and bathymetric surveys

MINING AND PETROLEUM

An increasing demand for hydrocarbons and the declining reserves in less remote areas puts the Arctic on top of the list for many oil and gas companies. However, the region offers numerous challenges of an environmental, cultural and social nature when it comes to oil and gas production. All of these need to be adressed in a sustainable manner.

Within DHI's comprehensive suite of services, the assessment of underwater sound pressure from seismic surveys and drilling as well as shipping activities is one example of our unique technology: We have combined 3D hydrographic modeling with modeling of underwater sound propagation, including reflection of sound by thermoclines. That allows for an effective management of the environmental impacts of underwater sound, e.g. on marine mammals, thereby allowing for a swifter and smoother project approval, progress and operation.

PORTS AND TERMINALS

Model testing of vessel response, wave agitation and breakwater stability (including ice-load) are standard activities in the shallow water and deep water basin in our physical testing facilities. Moreover, numerical modelling is a common tool for wave agitation studies. DHI's MIKE 21 and MIKE 3 software is complemented by a short-wave module for local wave conditions with a vessel response prediction module (WAMSIM) to allow e.g. for the optimisation of cargo handling operations, port design and terminal layout.

ENVIRONMENTAL SERVICES AND EIA

Baseline and assessment studies (Environmental Impact Assessment, EIA, and Environmental Risk Assesment) in the arctic environment are crucial to arctic exploration and development projects, e.g. in mining and offshore construction.

EIAs are conducted for all relevant aspects from marine structures to plant operation and concerning short- as well as long-term effects. We offer specific and cost-efficient methods for EIAs and environmental monitoring, integrating baseline data, monitoring and model simulations. EIA studies include assessments of:

- Release of heavy metals and other pollutants
- Impact of structures on coastline morphology
- Impacts on benthic habitats and their flora and fauna
- Impact from accidental spill

We also provide consultancy on mitigating measures to reduce impacts as much as possible. Our additional environmental services include:

- Monitoring and sampling
- Arctic flora and fauna
- Water management
- Tailing and waste disposal
- Numerical and physical models
- Risk assessments, exposure scenarios and effects

Development in the Arctic requires special environmental considerations due to the high sensitivity of the ecosystem.

SUPPORTING INTELLIGENT AND RESPONSIBLE DEVELOPMENT

Taking up the challenges of intelligent and responsible development in the region, we support your solutions with our all-round experience in the various aspects of Arctic engineering - offshore and onshore, at coasts and harbours and in fiords, tailor-made to your needs.

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