



DHI CASE STORY

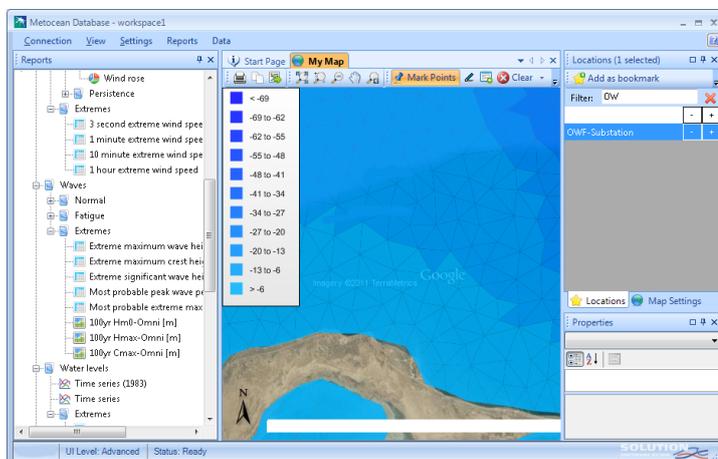
QUICK ACCESS TO ACCURATE METOCEAN DATA

For operations and design of oil & gas infrastructures in the Arabian Gulf

High quality and reliable MetOcean data are fundamental to the success of any marine and offshore project – to ensure safe and cost-optimised design, installation and operation. Our client was in need of a comprehensive new database to provide the much-needed accurate data for existing and new projects. Such accurate and reliable data normally takes months to derive through time consuming model set-up, simulations and statistical analysis. We developed a state-of-the-art database of the current MetOcean conditions in Saudi Arabian waters of the Arabian Gulf. This included an advanced Graphical User Interface (GUI) as well. The efficient accessibility to dependable and concise data now makes it possible for our client to develop new designs for offshore projects more speedily and precisely.

THE ULTIMATE DATABASE SOLUTION

To overcome the challenges of reaching accurate design data fast, our client asked us to develop the ultimate MetOcean design database. They wanted a database from which reliable MetOcean data could be extracted for any location within the Saudi Aramco concession area within seconds. We developed such a database, customised to our client's requirements. The data extraction is controlled via a user friendly GIS-based GUI, with the option of choosing from all relevant data reports and output formats – or definition of user-defined analysis or output formats.



The user interface provides easy and logical access to the required data and output formats

SUMMARY

CLIENT

Saudi Aramco, Saudi Arabia

CHALLENGE

Requirement for a new database of MetOcean conditions with easy and instant access to reliable design and operational data

SOLUTION

- Development of an all-in-one MetOcean tool based on our MIKE Customised technology platform
- Extensive hindcast modelling of wind, waves, current and water level
- Comprehensive statistical analysis of huge amounts of data
- An innovative data package and quick extraction solution
- A fast and logical GIS-based Graphical User Interface (GUI)

VALUE

- Fast, accurate and reliable data for offshore structures design and operations
- Data with high spatial and temporal resolution
- Significant time savings for design projects
- Consistent dataset for Saudi Aramco's concession areas in the Gulf
- Data for the next decade and beyond

LOCATION / COUNTRY

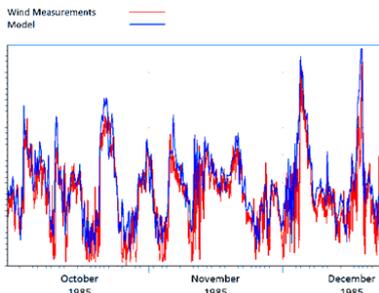
Kingdom of Saudi Arabia

BEHIND THE SCENES – COMPREHENSIVE MODELLING & STATISTICAL ANALYSIS

To develop this ultimate database, we carried out comprehensive modelling and analysis studies. The studies comprised hindcasting winds, waves, currents and water levels based on available data and numerical modelling tools and subsequent statistical analysis.

The numerical hindcast modelling was carried out with state-of-the-art numerical models from our MIKE by DHI software suite. It was based principally on wind and pressure fields from historical data and on application of proven and recognized models. The numerical hindcast studies included:

- Regional wind field analysis of the entire Arabian Gulf basin using a kinematic wind model
- PERGOS wave data applied as boundary conditions for a high-resolution local wave model
- Detailed wave modelling covering the Saudi Aramco area of the Arabian Gulf
- Detailed current and water level modelling covering the Saudi Aramco concession areas



The models were calibrated and validated against measurements of wind, waves, current and water level

From the results of the numerical modelling, time series of the relevant parameters were extracted at all computational elements (order of 300,000 elements) for statistical analysis. The statistical analyses included:

- Analysis of operational conditions and estimation of extreme conditions. The operational conditions were based on data for a 27-year continuous period from 1983 through 2009
- The extreme value analyses were based on both this 27-year continuous data series as well as on the modelling of 123 individual storm events over the period 1961-2009
- Joint probability analyses, such as wave heights vs. water level and wave heights vs. current speed

OUR MESH DATABASE AND SOLUTION SOFTWARE PLATFORM – FOUNDATIONS OF THE METOCEAN SOLUTION

Apart from our Mike by DHI software, the other two pillars of our MetOcean database solution and user interface were:

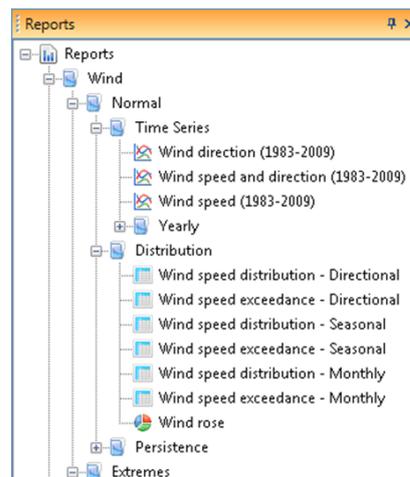
- The DHI Mesh DataManager

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- Our MIKE Customised Platform – a dedicated software solution customised to meet our clients' specific requirements with respect to user interface and output formats

The innovative DHI Mesh DataManager not only handles tera-bytes of different types of data, but also provides access to data (such as time series) within seconds. It was created under the assumption that the closer the data in spatial or temporal dimension, the higher the probability of them being accessed simultaneously. As such, 3D data matrices are fragmented into smaller blocks. This translates into efficient data storage and most importantly, quick query responses. The Mesh DataManager also provides UI functionality – most notably a map with basic GIS functionality such as zooming and panning as well as drawing capabilities to outline user-defined shapes (locations) on-the-fly.

Apart from the Mesh Database, the graphical user interface is heavily reliant on our generic MIKE Customised Software Platform component: the Operations Manager. For this project, the Operations Manager is used to establish a hierarchical tree structure of reports. The contents of the Reports explorer – the tree structure and the icons as well as the individual report settings are fully configurable for the end user.



Easy selection of output reports is ensured by a hierarchical tree structure of reports

A COMPREHENSIVE 'ALL-IN-ONE' TOOL EMERGES

Our innovative approach helped us to model, analyse, store and make huge amounts of modelling and analyses data rapidly accessible in a user-friendly database. The database includes comprehensive data for offshore structures. It also allows for custom-made analyses as all the basic data is available. Instant access to data eliminates the need for expensive, dedicated and lengthy studies to be carried out for each individual project. The GUI is easy to use and our generic Solution Software components have made the entire solution immune to changes in the future. Results are presented in convenient formats, which can be easily exported to Microsoft Word, Microsoft Excel or PDF.