Safer Shipping | Smarter Ports

OMC INTERNATIONAL

Channel Design & Dredge Optimisation

omcinternational.com
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Balancing Safety, Economics & Environmental Concerns

OMC has carried out a large number of dredge optimisation studies in Australia and abroad and with the conjunctive use of the DUKC® operational system has reduced capital dredging requirements in the order of 50% in some cases.

MINIMISE DREDGING VOLUMES

OMC's cutting edge DUKC® technology can be used to minimise dredging volumes and thereby minimise both the capital and maintenance costs of dredging operations and the environmental impacts associated with these operations.

Millions of dollars in extra costs and possible environmental damage have been saved by the conjunctive use of DUKC® optimised dredging and a DUKC® operational system.

OPTIMISING WITH WORLD-LEADING TECHNOLOGY

Where DUKC® technology is installed, the UKC requirements of each section of a channel transit can be quantified. This information can then be used to create the channel depth profile which optimally matches the specified channel access criteria. Increased allowable sailing drafts and tidal windows are delivered at a greatly reduced dredging cost and with minimum possible environmental effects.

Traditional channel design based upon assumptions of static UKC requirements results in unnecessary dredging and a channel profile that does not match operational requirements.

OMC waterway design engineers are world leaders in the development and implementation of channel design and depth optimisation technology. Our unique understanding of port operations, statistical modelling techniques and UKC analysis enables us to present an accurate picture of cost-benefit to the client. Our optimisation methods enable dredging to be targeted, ensuring maximum return on investment and minimum environmental impact.

Adoption of DUKC® will provide the port with a significant reduction in capital dredging costs and ongoing operational benefits through wider vessel sailing windows and a reduced risk of vessels grounding under severe conditions.

Martin Watts, Project Director
Lyttelton Port Company

PORT OF PORT HEDLAND - CROP ANALYSIS

The Port of Port Hedland is the world's largest bulk export port. Pilbara Ports Authority (PPA) facilitates approximately $130 million of trade through this Port every day. This is achieved through a uni-directional and tidally constrained 42km channel, with a tidal range up to 7.4m and tidal currents up to 3.5 knots. Up to 8 capesize vessels can depart on a single tide.

The practical implication is that any incident within the channel has the potential to block access to the port. Therefore, the risks must be carefully managed having consideration for all the operational factors, including the channel profile, environmental conditions, geographic constraints, and vessel characteristics.

In April 2017, PPA released the tender for the Channel Risk and Optimisation Project (CROP). CROP is a $120m dredging project with a primary aim of mitigating the risk of disruption to the Port in the event of an adverse incident obstructing the channel, and optimising the channel by removing high spots and make already existing deeper depths available for navigation.

In determining the CROP's optimum design, PPA used DUKC® technology in evaluating the proposed channel design depth profiles, and to quantify the benefits of the project.

The optimum channel depth profile identified by PPA's Operations Team through the DUKC® channel optimisation resulted in a reduced dredged area of more than 90,000m2 without compromising any of the forecasted efficiency or safety benefits.

An analysis against the static UKC was performed by applying DUKC® methodology and its operations to the channel design, which highlighted that utilising DUKC® for the channel optimisation resulted in a considerable benefit over a traditional static UKC approach. To achieve the same level of accessibility without DUKC® would have required a channel profile on average 0.63m deeper, and up to 1.4m deeper.

By utilising the DUKC® technology in the CROP's design optimisation process, the overall dredging areas, and their associated costs and environmental impact, could be minimised without compromising the benefits. This project was the first time where dredge optimisation utilising DUKC® methodology was coupled with Dynamic Port Capacity Modelling to fully comprehend the potential value and expected outcome of a dredging campaign.

LYTTELTON PORT DREDGE OPTIMISATION

Lyttelton Port of Christchurch serves a wide range of importers and exporters with full shipping services 24/7 and is a critical link in both New Zealand and global trade networks. In addition to a container terminal and the country's largest coal terminal, Lyttelton Port Company (LPC) has facilities for loading and unloading bulk products such as petroleum, fertiliser, gypsum, cement, logs, conventional break-bulk, and imported vehicles.

In 2017 LPC were finalising their design to upgrade the port's shipping channel to accommodate larger container ships and ensure the future competitiveness of the port and the efficiency of the Christchurch region's transport links with the world. Deepening the shipping channel to accommodate the larger ships will require one of New Zealand's largest dredging projects which will represent a significant investment for the port.

OMC was asked to review the channel design and submitted two alternative designs for the channel depths, one based on the port continuing to manage under-keel clearance (UKC) risk based on a simple "static" UKC rule, the other based on implementing state-of-the-art DUKC® technology which uses precise measurements and modelling of waves, tides and ship motions to provide optimal sailing advice for each vessel transiting the new channel.

LPC performed a cost-benefit analysis and decided to proceed with the DUKC®-optimised channel design based on a significant saving in capital expenditure and an ongoing reduction in operating risk. The DUKC® system is currently in the process of being configured and validated and will be ready for operation by the time the dredging is complete.

Benefits -

LPC estimate that the use of DUKC® technology will reduce the required Stage 1 dredging volumes by approximately 800,000 cubic metres. This will reduce the capital cost of Stage 1 dredging by 15%. The reduced dredging volume will also reduce project duration and environmental impacts.

LPC will also be able to use DUKC® to monitor the impact of sedimentation patterns in the deepened channel and schedule optimal maintenance dredging to ensure minimal impact on vessel accessibility to the port.

"The decision to adopt the DUKC® system has allowed LPC to reduce the dredging volume required for Stage 1 of the deepening project by more than 40% compared with initial estimates, which were based on standard industry guidelines.

Martin Watts, Project Director
Lyttelton Port Company

DELIVERING TOTAL PORT SOLUTIONS

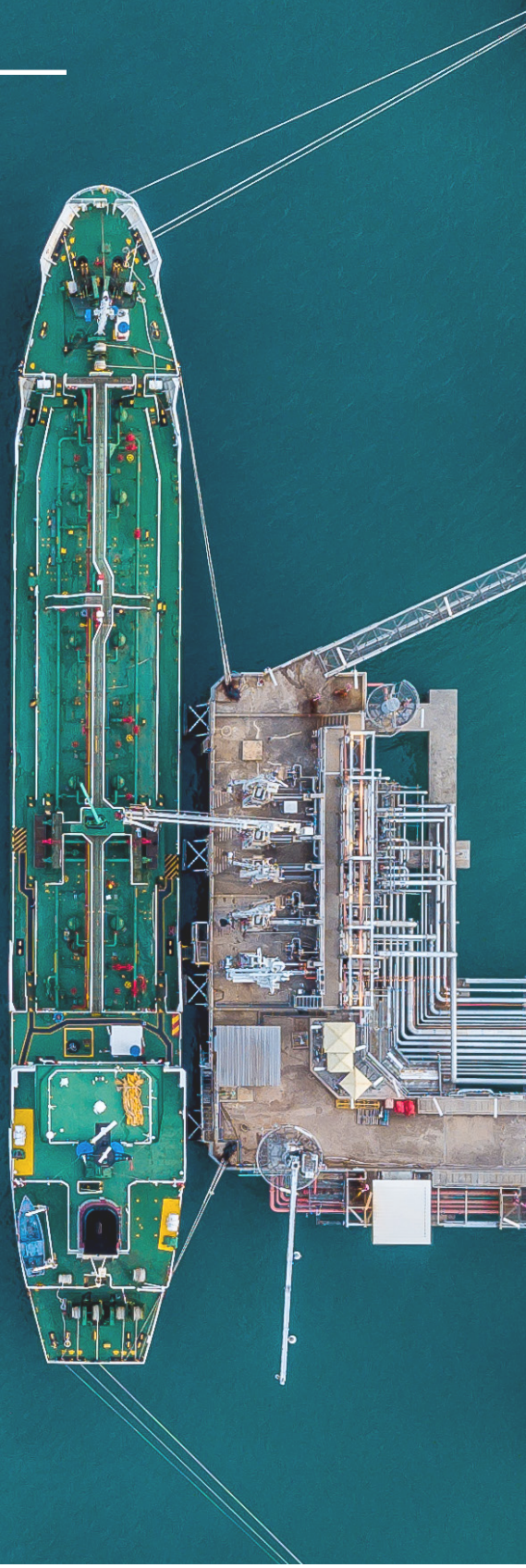
DUKC®

DUKC® has assisted more than **120 port facilities, terminals,and waterways to safely and efficiently conduct 165,000+ deep draft transits**. Utilising state-of-the-art modelling techniques, DUKC® is the world's most comprehensive, and extensively validated, operational UKC management system.

Drawing on a team of engineers, environmental scientists, naval architects, and master mariners, OMC's waterways design expertise is built on a 25 year history of leading the development and implementation of operational UKC technology (Vertical Dimension).

Our unique technology has been extended to include the Horizontal Dimension, port operations and statistical modelling techniques. This enables us to provide an even more precise cost benefit analysis for our clients.

Our optimisation methods enable dredging to be targeted, ensuring maximum return on investment and minimum environmental impact.



OMC's additional capabilities:

- Horizontal and Vertical Channel Design
- Met-ocean Data Measurement and Forecasting
- Capital and Maintenance Dredging Optimisation
- Channel Siltation and Maintenance
- Dynamic Port Capacity Modelling
- Ship Motion Analysis
- Mooring Design and Berth Warning Systems
- Ship Simulation

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