



## Under-keel clearance system saves millions of dollars and reduces danger to Great Barrier Reef

by Dr TERRY O'BRIEN, managing director, OMC International

An Australian invention, the Dynamic Under Keel Clearance system is saving exporters and shippers many millions of dollars annually through reduced shipping costs.

Developed by Melbourne-based OMC International, the technology was first used for coal carriers at the Port of Hay Point in March 2003 and the Ports Corporation of Queensland has signed a new five year licence agreement for its continued use.

Queensland transport minister John Mickel said the non-monetary benefits of the system were also of great value, by providing port pilots and ships greater certainty as to the conditions under which ships are sailing...the improved safety had obvious benefits in reducing the likelihood of a significant environmental event within the Great Barrier Reef.

The DUKC® is a unique navigational system designed to calculate waves, tides, currents and vessel dynamics in real time to produce the safest and most efficient transit of large ships in and out of ports and through shallow, restricted waterways.

The iron ore carriers at Port Hedland and Dampier in northwest Western Australia adopted the system in 1996. It is currently installed at most bulk ports around Australia and New Zealand, at container ports such as Fremantle and Brisbane, and is also delivering gains for regional ports and shipping channels.

It is recognised as the world's leading UKC management system and there is no other real-time UKC System in use that transits vessels deeper than a static rule.

The system maintains an unblemished safety record and has over a 15 year period assisted more than 33,000 vessel movements. On average, a vessel in a draft controlled situation somewhere in the world, transits every two hours under the system's advice.

OMC has also developed, validated and is currently trialling DUKC® for safer and more efficient navigation through Torres Strait. The system is ready for operation, subject to the outcome of ASMA's decision making process on the proposed governance model for UKC Management through the Strait. The system is the only fully validated real time UKC system available worldwide which has actually taken ships deeper.

### Reliability

The accuracy of the system's numerical models for prediction of all ship motions affecting under keel clearance has been validated by undertaking more than 200 ship transits to obtain full-scale measurements of vessel speed, track and vertical displacements. These validation tests have been undertaken for a wide variety of channel widths, configurations and lengths, vessel types, sizes and stability conditions, vessel speeds, wave conditions, tidal regimes and current speeds.

The system has been rigorously and independently tested by specialist risk management consultants to ensure that they satisfy internationally-accepted levels of risk for safely managing the UKC of vessel transits.

The system is supported 24/7 by an experienced staff of engineers, naval architects and software engineering/IT personnel, employed full-time on the development, implementation and support, including ongoing system maintenance, training of operators and regular audits.

### Benefits

- Economic benefits in excess of A\$5 billion worldwide have accrued to stakeholders since the first installation in 1993. These benefits are obtained at a fraction of the dredging costs that

would be required to yield equivalent increases in productivity. They are delivered through increased tidal windows allowing greater throughput of vessels and reduced downtime of port facilities reducing vessel demurrage costs and increased drafts allowing additional cargo to be loaded into each vessel.

- Informed understanding of grounding risk as under keel clearance safety is quantified at ALL times under ALL conditions
- Greater operating flexibility & improved management decision making as the system provides near real time dynamic information from 36 hours prior to channel transit. It links together transit speed, under keel clearance, prevailing environmental conditions and loading data providing more precise data for decisions made by port and ship operators.
- Protection of the maritime environment by reducing the risk of bottoming impact or ship grounding and by minimising dredging volumes.

### Amazing value to bulk ports

Estimated benefits directly attributed to DUKC® Systems as determined and advertised by the ports of Port Hedland (commissioned 1995), Port Dampier (commissioned 1995) and Hay Point (commissioned 1993) have collectively been over half a billion dollars.

### Value to container ports

Safety is paramount to these ports as they are often adjacent to capital cities. While a DUKC® can frequently enable more boxes to be loaded, there are also benefits in maintaining tight schedules. A good example is the Port of Fremantle where this system was installed in 1994

for import BP tankers. Following the success with these vessels, the System was extended in 1997 to incorporate the next generation container ships entering the Inner Harbour which included an extensive and successful validation process. The introduction of DUKC® to these berths allowed drafts to be safely increased by 35cm with a very low probability of berthing with delay, relating to an average approximate increase in freight of 120 TEUs. In addition, the use of the system's technology has significantly increased berthing efficiency, with container vessels able to clear the port many hours earlier than would have been the case without the use of it.

DUKC® was installed in the port of Lisbon in 2007 and the port of Melbourne has recently approved the introductory process for the Port of Melbourne following an intensive risk management exercise.

### Targeted dredging

The technology has the potential to limit the amount of dredging required for the same operational UKC criteria. This may translate into saved dollars and minimized environmental impacts.

### The future

OMC is continuing the development of DUKC® systems and faces a bright but challenging future. The latest is the DUKC® VTS, a unique tool which provides operators of Vessel Traffic Systems (VTS) with real-time UKC management advice in the vertical direction. This completes a suite of integrated products for the management of vessel under keel clearance as illustrated by the following diagram:

OMC is now recognised as the world authority in the development and operation of real-time UKC Systems. As evidence of OMC's international standing, its founder, Dr. Terry O'Brien, is an active and innovative contributor to a number of international working groups. He is Chair of PIANC Working Group 54 which is tasked to develop guidelines for the use of hydro/meteo data to optimise safe waterway access and determine the operational limits of navigational channels and is a member of PIANC Working Group 49 on Channel Design.

More recently, the experience of

developing and operating DUKC® systems is currently being provided as input to IALA for the development of guidelines for the incorporation of real-time underkeel clearance management into VTS systems.

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**DUKC® Product Suite**

The diagram illustrates a three-stage workflow for DUKC® products:

- Well in advance of sailing, draft is set using DUKC® Long Term Planner**: A screenshot of a software interface showing a line graph of draft over time.
- Within 36 hours of channel transit, DUKC® is run to refine draft and windows up to the time of sailing**: A screenshot of a software interface showing a bar chart of draft windows.
- Once aboard, the pilot uses the DUKC® PPU to refine speeds and assist in handling unexpected circumstances**: A screenshot of a software interface showing a map of a waterway.

Additional product descriptions:

- The DUKC Scheduler** integrates DUKC outputs with Port Management Information System
- DUKC WASP** forecasts swells out to 36 hours
- Shore based DUKC VTS system** assists the VTS in real time monitoring of the passage.

OMC International logo at the bottom left.



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