

Clearing the way

for a safe passage

The Dynamic Under Keel Clearance (DUKC) System is a unique maritime engineering software system developed for safer and more efficient navigation of large ships in shallow restricted waterways. World Port Development looks at the benefits it can bring.

The Dynamic Under Keel Clearance (DUKC) System system calculates waves, tides, currents and vessel dynamics in real time to produce the safest and most efficient transit of ships in and out of ports and along coastal waterways. The DUKC system (an Australian invention) is currently installed at 13 ports around Australia, New Zealand and Europe and maintains an unblemished safety record at each of these ports. In fact the system has over 14 years

track record as the leading real-time UKC system in the world, assisting more than 33,000 vessel movements and directly generating in excess of \$5 billion dollars to port users and stakeholders. Every day an average 10 vessels transit under DUKC advice, with daily bulk tonnage amounts exported on vessels using the advice exceeding half a million tonnes (of iron ore) out of the Pilbara in Western Australia and approaching half a million tonnes (of coal) from the East Coast of Australia. OMC International Pty Ltd (OMC), a maritime engineering company specialising in the development and application of computer solutions to improve the efficiency and safety of port and waterway operations, has developed the DUKC System. The OMC team consists of 20 staff including engineers, software developers and administrative personnel able to develop, deploy and

support our products and services throughout the world. This team has a reputation for tackling problems considered too difficult by others, and delivering innovative, workable solutions. As recognition of OMC's international standing as the world's leading developer and operator of real-time UKC systems, its founder, Dr Terry O'Brien, has recently been appointed Chair of PIANC Working Group 54 which is tasked to develop guidelines for the use of hydro/meteo data to optimise safe port access and determine the operational limits of navigational channels.

Independently tested

The accuracy of DUKC numerical models for prediction of all ship motions affecting under keel clearance has been validated by undertaking approximately 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 Dynamic Under Keel Clearance Systems have been rigorously and independently tested at various ports 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 25 engineers, naval architects and software engineering/IT personnel, employed full-time on the development, implementation and support of DUKC systems, including ongoing system maintenance, training of operators and regular audits. The system provides a natural integration with a port's quality procedures. OMC is certified to ISO9001:2000 for the development, implementation and support of the DUKC system. Lloyd's Register Quality Assurance (LQRA) has recently carried out a successful audit on OMC's Quality Management System (QMS).

Typical benefits

The economic benefits provided by the dynamic under keel clearance system are delivered through:

- Increased tidal windows allowing greater throughput of vessels and reduced downtime of port facilities. Vessel demurrage costs can also be reduced.
- Increased drafts allowing additional cargo to be loaded onto each vessel. As expected available draughts are increased, arrival and departure draughts for long term planning can also be increased.

Summary - estimated benefits

A summary of the estimated benefits directly attributed to the dynamic under keel clearance system at three of the Australian bulk ports, as determined and advertised by the ports, are:

- **Port Hedland, Western Australia - Commissioned 1995 (BHP Billiton)**


 - Exports over 110 million tonnes iron ore annually
 - Additional 5 million tonnes per annum loaded directly due to DUKC
 - Average increase in maximum draught directly due to DUKC of 65cm. For typical Cape size vessels, this draught increase amounts to approximately 8,000 tonnes per vessel
 - At least 50 additional vessels sail each year due to wider tidal windows
 - Increased value of annual export earnings amounts to approximately US\$200 million
- **Port of Dampier, Western Australia - Commissioned 1995 (Rio Tinto {Pilbara Iron})**

 - Exports over 110 million tonnes iron ore annually
 - Average increase in maximum draught due to the application of the DUKC of 40cm
 - Significant widening of tidal windows, particularly during neap tides
 - The increased value of annual export earnings amounted to approx. US\$130 million
- **Port of Hay Point, Queensland - Commissioned 1993 (Ports Corp Qld)**

 - Exports 85 million tonnes coal annually
 - Typical increases in draught due to the application of the DUKC system range from 50cm to 1.1 m, depending on the tidal residuals and wave conditions
 - Additional 3,000,000 tonnes of coal annually (an average increase of over 8,000 tonnes per vessel); the freight savings from these increased shipments amount to approximately US\$60 million annually; the increased value of annual export earnings amount to approx. US\$ 180 million.

These benefits are obtained at a fraction of the dredging costs that would be required to yield equivalent increases in productivity. The system has been, and will continue to be,

progressively developed and improved through innovative research and development. Recent developments have been to take the system onboard ships with the DUKC Portable Pilot

Unit (PPU) and to integrate it into the VTS Systems with DUKC VTS, which both allow monitoring of under keel clearance in real-time during a transit. The DUKC PPU provides a seamless transition from the shore based prediction system, which operates from 36 hours up until a vessels transit, to a system operated onboard a vessel during transit through port approach channels and shallow waterways. The ship based DUKC PPU is operated by the pilots during an actual transit. The DUKC PPU enables a pilot to monitor dynamic under keel clearance predictions throughout the transit. It has speed control functionality to ensure that the pilot's speed and vessel-passing intention is always consistent with safe under keel clearance. The DUKC VTS is the most recent dynamic under keel clearance development and provides in-transit monitoring of a vessel's predicted UKC to a VTS Operator. Data from AIS and a DUKC PPU (where used) feed directly into the DUKC VTS to provide VTS Operators with warnings of the imminent possibility of vessel groundings during their transit through depth restricted waterways. This has recently been commissioned at Port Hedland to maximise the efficiency and safety of the sailing of the iron ore vessels in the face of increasing pressure for iron ore exports. 

New agribulks terminal officially open for business



From left to right, Peter Jones (ABP Chief Executive), Carsten Hojland (Gleadell's Chairman), Nick Palmer (ABP Port Director, Grimsby & Immingham) and David Sheppard (Gleadell's MD)

The latest stage in the development of the Port of Grimsby & Immingham - the UK's largest port by tonnage - was revealed last month with the official opening of Gleadell Bulk Terminal at Immingham. Constructed by Associated British Ports (ABP) - owners of the Port of Immingham - the brand-new agribulks storage facility has been built in collaboration with ABP's long-standing customer, Gleadell Agriculture Ltd (Gleadell). In a ceremony and reception hosted by Peter Jones, Chief Executive of ABP, Nick Palmer, ABP Port Director, Grimsby & Immingham, and David Sheppard, Managing Director of Gleadell, the terminal was declared open by Gleadell's Chairman, Carsten Hojland. The inauguration of the facility marked the culmination of nine months' construction work and an investment by ABP of UK£3.26 million. The terminal is located in an ideal position in the Inner Dock of the Port of Immingham, on the UK's busiest foreign-trading estuary - the Humber. When full, Gleadell Bulk Terminal has the capacity to store some 25,000 tonnes of grain. Commenting on the new terminal, ABP Chief Executive Peter Jones said: "Gleadell, a valued, long-

standing ABP customer, has been loading grain at the Port of Immingham for almost 25 years now. This new facility enables ABP to continue to offer the highest level of support and service to Gleadell, and to play an important part in the ongoing growth of their business. The ability to handle a wide array of cargoes and trades is just one of a number of reasons why Grimsby & Immingham remains the country's pre-eminent port by tonnage, and it is developments of this kind that will continue to ensure the port keeps its leading status in the UK for many, many years to come." David Sheppard, Gleadell's MD, added: "Immingham's strategic location at the heart of the UK's grain-producing farmland makes it ideal for our farmer-customers and suppliers. This dockside facility, designed for both import and export cargoes, offers access to increasingly important European markets. The opening of this new terminal also leaves us very well-placed for the possible expansion of the biofuel industry in the vicinity of the port." Gleadell Bulk Terminal features a state-of-the-art, fully mobile shiploader capable of handling 1,200 tonnes of grain per hour. The terminal is expected to handle a range of export cargoes - including wheat, barley, oilseed rape and pulses - destined for customers in the Mediterranean, Northern Europe, Scandinavia and Ireland, as well as specialist organic import grain.