DUKC technology - a clear winner

On safety grounds, Maritime New Zealand strongly recommended that the NZ Port of Marsden Point install OMC International's Dynamic Under Keel Clearance (DUKC) technology following two oil tanker groundings back in 2003. Just four months ago, (August 2008) the system helped unblock Australia's biggest iron ore port after a large bulk carrier, the 'Iron King', ran aground because of a steering malfunction.

This technology is still making headlines around the world because of both the further international development of the DUKC PPU and the application of the DUKC VTS system in a crisis situation at Port Hedland. These more recent products of OMC's continued Research and Development were published in an article stressing the safety benefits that the DUKC system offers to ports and stakeholders which appeared in the December 2007 edition of *World Port Development*. During the past 12 months, the system has been increasingly recognised internationally for its proven safety benefits given its unblemished safety record of more than 40,000 safe sailings in the past 15 years. DUKC technology analyses data on waves, tides and currents and vessel dynamics in real time to produce the safest and most efficient transit of large vessels in and out of ports and along draught restricted waterways. It is in 19 ports worldwide that now includes Weipa in Australia and Bremerhaven and the Weser River waterway in Germany. DUKC is increasingly being installed by port authorities for the safety benefits it offers.

A case in point

The 'Iron King' incident in Port Hedland, Western Australia in early August 2008 provided an opportunity to put into practice the emergency response capability of this new DUKC VTS technology. The Port Hedland Port Authority (PHPA) requested technical support from OMC to help refloat and sail the 'Iron King' after it ran aground on the side of the shipping channel due to a steering malfunction. In normal circumstances, the VTS at Port Hedland would itself monitor the transit, particularly vessel speed, using the technology.

However, in the case of the 'Iron King', OMC's 24/7 support service was needed to provide unambiguous navigational assistance to the VTS and Harbour Master and then by VHF to the three marine pilots onboard the vessel. The 3-hour transit to deep water, assisted by eight tugs, was safely completed on the next high tide under DUKC advice. From some 3000km away in Melbourne, OMC helped PHPA unblock Australia's largest iron ore port in minimum time. This meant avoiding massive cost delays to iron ore exports from Port Hedland, which is a major contributor to the estimated 80 percent of Australia's coal and iron ore exports carried on ships with their maximum safe draughts and sailing times determined by a DUKC system. The refloating of this large bulk carrier is the first time in the world that the capabilities of the latest DUKC VTS technology have been used in a crisis situation to safely transit the channel outside any standard sailing window. OMC's founder and Executive Director Dr Terry O'Brien said all parties had to work together quickly because of a rapidly closing tidal window. "Our preliminary under keel clearance calculations indicated that the vessel needed to be refloated in a very short timeframe. We only had about two hours to work with. PHPA acted quickly and was able to refloat and deballast the vessel and, using our latest DUKC VTS technology, navigate it safely through to the end of the channel. Using the DUKC VTS, the Marine Pilots on the vessel had access to live up-to-the minute UKC information and feedback throughout the three-hour transit to anchorage. "This technology was designed to aid decision making during transit and to manage unforseen circumstances. The new technology clearly meets the key tasks of VTS navigational assistance – monitoring and disaster response,' he said. Within a week of this incident Dr O'Brien spoke at the 11th IALA VTS Symposium in Bergen, Norway on VTS and E-Navigation. The 'Iron King' incident provided a timely and concrete validation of his claim that OMC's new DUKC VTS technology offers emergency response capability as well as increased safety of transit. Dr O'Brien explained that through the integration of DUKC technology with VTS navigational assistance services, pilots and VTS operators were able to monitor that vessel speeds remain within safe transit speed envelopes despite rapidly changing transit conditions. Other examples were given where DUKC VTS has been used to enhance safety in situations where the passage does not proceed as planned including vessel related changes – delays, breakdowns, excess loading, or deterioration in environmental conditions. An earlier keynote speaker in this session was clearly of the belief that "dynamic depth analysis never happens" and categorised it as a challenge for the future! This strongly suggests that awareness of OMC's groundbreaking DUKC technology, which has been operational for 15 years in Australia and NZ must continue to reach the international stage.

Reaching a wider audience

DUKC technology again made headlines when it was recently on show in Portugal as part of the Euro 20Million Maritime and Navigation Information Services (MarNIS) international research project designed to boost the safety of shipping services around the world. Whilst the MarNIS Concept is specifically about enhancing safety at sea, at the same time it also has the potential to improve the efficiency of sea traffic and to prevent accidents that could pollute our maritime environment. Melbourne-based OMC International was invited to set up a European Office to enable it to join this groundbreaking project, involving more than 40 partners. OMC is the only member with its headquarters outside Europe but was sought out because of its reputation as having the only real time system available worldwide with the proven capacity to predict the vertical component of navigation in restricted waterways. In particular, its DUKC system has contributed to the development of the Port Operations and Approach Decision Support System (POADSS), which is the new generation

Portable Pilot Unit (PPU). The POADSS integrates three-dimensional position information with DUKC to predict and measure in real time this critical vertical dimension including vessel dynamics and UKC during the actual transit from berth to deep water. This key component of the four-year MarNIS project ended on October 16 with a real time demonstration at the Port of Lisbon where the DUKC has been operational since mid- 2007. More than 120 shipping industry representatives, including government and regulatory authorities, harbour masters and pilots gathered on board a vessel to watch the first live demonstration of the POADSS. A senior pilot from the Port of Lisbon operated the POADSS for the transit, demonstrating the unit's capability to display the predicted UKC alongside the actual measured UKC data for the full transit from berth to deep water. Dr O'Brien, in a presentation to the delegates onboard the vessel before the real time demonstration, explained that DUKC is all about the vertical dimension where you deal with centimeters, not meters, in accuracy of clearance. "That is why we have to have very refined ship motion models and quality controlled environmental data inputs," he said. "With the horizontal dimension, pilots navigating down a channel can look out the window to get their visual cues, and to help them decide their course around bends, and the like. In the vertical dimension, looking out the window doesn't tell you very much about how much clearance you have underneath you. You can feel a vibration usually when you are getting close to the bottom but that doesn't tell you 200 meters further on that you are in danger of the ship striking the bottom. That is why accurate prediction is very, very important and has to be done with the use of sophisticated hydrodynamic models. When a pilot takes a ship out into the Atlantic, with swells of five meters height and 12-14 second periods interacting with 2 to 3 knots of currents and the ship is pitching, it is very difficult for the pilot to estimate whether the downward movement down is going to be 3m or 4m or even 8m. This was the first time actual real time measured UKC data has been compared in centimeter accuracy with predictions from DUKC technology and the POADSS has demonstrated excellent agreement between predictions and measurements. A key value of this result lies in its contribution to building up the confidence of pilots who have to take on trust that these models are validated and will produce the right answers." Interestingly, Dr O'Brien also referred to the two Marsden Point groundings when he spoke about DUKC safety benefits during the POADSS demonstration. He said there were two groundings within three months of each other in the Marsden Point channel, on a shoal, yet there had been no grounding in the preceding 30 years of operation. The tankers were bringing crude oil in from the Middle East. "People often think that existing practices are safe because no incidents have historically occurred without understanding what their level of operational risk is, and what has changed over time to change their operational risk (larger vessels, increased throughput etc). In the case of the second grounding, it split the outer skin of the tanker but fortunately it was a double hulled tanker which averted an environmental disaster." Subsequent analysis by OMC demonstrated that if a DUKC system had been in operation, the system would have advised that these sailings not take place due to inadequate UKC and the two incidents would not have occurred. Marsden Point was the first port to have DUKC installed purely on safety grounds. However, all ports using DUKC state safety as one of the major benefits from operating with DUKC. The following opinion suggests others may follow Marsden Point's example. Western Australia-based Captain Eric Atkinson, who retired as Fremantle Port's Harbour Master in October after two decades, helped introduce the DUKC technology into that port 14 years ago. He says he promoted the DUKC system as a safety management tool for Fremantle. "There is nowhere else in the world that I am aware of where a port has a system that can show what the safety margin will be for the duration of the transit into or out of the port. The transit results can then be used as an audit process using the ship's echo sounder to get the actual clearance against the projected clearance," he says. "I think Harbour Masters are attracted to the safety component and I also think the use of PPU will be an added factor in the future. I will stick my neck out and predict that vertical ship motion technology will be an integral part of every port and narrow shipping lane operation Australia-wide within 5-10 years and I predict that once IALA accepts the concept of vertical ship motion, you will see a recognition of same through the IMO, and DUKC or similar will be a worldwide standard in all major ports around the world." One Captain who definitely isn't retiring is Captain Jonathon Pearce, who oversaw the introduction of DUKC into the NZ port of Taranaki. Still such a staunch advocate of this technology, he has now "jumped ship" to help educate the shipping industry about the safety benefits of DUKC in his new role as OMC's Business Development Manager, basing himself at OMC's new UK office in the grounds of HR Wallingford which opened in October, 2008. Captain Pearce has 30 years' marine experience including 11 years as a harbour pilot and advisor to Maritime NZ on pilot training. As marine officer at the port of Taranaki from 1994 to 2006, he recalls many safety benefits from the DUKC system, including being able to increase the tidal window from about five hours per day to nearly all day on most tides. Most importantly on the very occasional transit, in adverse conditions, he had to reduce DUKC sailing windows from the static rule for safety reasons alone. Captain Pearce went on to say "more and more ports authorities and pilotage services are being held accountable for their actions. It could be argued that static rules, whilst having served the industry well, may be coming to the end of their usefulness, as they have dramatically failed at some ports. The technology is now available to accurately assess the under keel clearance of a vessel thereby substantially reducing the risk of a grounding. I can see it becoming more difficult for a port to defend itself in the event of a grounding under static rules as DUKC technology becomes more prevalent." DUKC is the only fully validated real time under keel clearance system available around the world, which has actually taken ships deeper than Static UKC rules. As well as safety benefits this system gives shippers greater certainty of how much extra cargo they can safely carry and has provided nearly A$10 billion in economic benefits to ports and port users. OMC will continue its involvement with international maritime bodies such as PIANC, IALA and MarNIS, all of whom share a focus on improving the safety and efficiency of sea traffic while protecting the maritime environment by accident prevention. OMC will continue to offer its DUKC technology as a practical and proven decision support tool for predicting the critical depth dimension as a unique contribution to these objectives.

Determined to see DUKC® technology get greater international recognition are, from left, OMC International Business Development Manager Captain Jonathon Pearce, OMC Founder and Executive Director Dr Terry O'Brien and OMC Managing Director Mr Peter O'Brien.