CARGO OPTIMISATION: WATERSIDE

Maximising the efficiency and productivity of the water column and ensuring channel integrity and vessel safety
Setting the scene
Ports having to adapt to ever larger ships

- Coastal Tanker (205 m)
- Aframax (245 m)
- Suez-Max (285 m)
- VLCC (330 m)
- ULCC (415 m)
Risk controls

STATIC
Traditional rules based on static data, referred to as SUKC.

VARIABLE RISK

UKC = X% of Static Draft

X% Allows For:
- Tidel Residual Change
- Squat
- Wave Response
- Safety Allowances
Improved risk controls

**DYNAMIC**

DUKC® measurement based on **real time** data for each element.

**FIXED (CONSTANT) RISK**
Economic and Safety Drivers
OMC’s evidence from existing studies show:

- 95% existing static rule conservative
- Potential for draught increases and/or productivity gains through increased tidal windows
- 4% existing static rule marginal
- Potential for a touch bottom incident. High risk but actual risk never quantified
- 1% existing static rule unsafe
- Very high potential for a touch bottom incident
Under most conditions a static rule will be conservative. However, groundings can occur when a ship is sensitive to the prevailing conditions (this is actual data!) A static rule won’t tell you when this is the case!
Case Study - Port Taranaki

Increased DUKC® Tidal Windows

Original Static Tidal Window

Static Rules not Sufficient in High Swell Conditions
South American Port – Similar Results

1% Unsafe under Static Rules
Why push for an extra cm?

- Every cm of draft is ~120 tonnes of cargo
- Iron Ore say ~$50 per tonne
- $120 \times $50 = $6,000 per cm/vessel
- ~1300 cape vessels p.a.
- $6,000 \times 1300 = $7,800,000 extra income p.a. per cm
- Any additional draft increases income streams
“The DUKC program continues to be a major asset for BHP and the Port. As the port grows so does the value of the DUKC program, the value is in the order of 7% of throughput (circa 15 million tonnes).

The benefits are many:

1) Direct tonnage gain from the additional 50cm in available draft over a static system, which adds an extra 7,000 tonnes to a vessel loading.

2) The increased sailing window (of about an hour) available enables us to sail multiple vessels on a tide.

3) Increased safety because all calculations are measurable and are accurate.”

BHP (Port Hedland)
Port Hedland Port Authority

- 2014/2015:
- Export tonnage 444,786,569 tonnes (approx 2400 vessels)
- Direct value of DUKC: approx an additional 40M tonnes per annum
- Or US$2 billion in addition revenue (US$50.15 (6/6/16))
- Tonnage record on a single tide: 1,511,977 tonnes (8 capesize vessels)

Arium

- In the 11 months since implementation:
- Directly reduced freight costs by over US$660,000
- Additional throughput of approximately 47,000t
- Increased revenue of more than US$2,000,000
Offshore Representative ROI’s

- Australia Iron Ore Exports - 600 Million tonnes per annum (60 crore per annum)
  - 95% of Australia’s iron ore exports sails on ships with maximum drafts and sailing times determined by DUKC® systems

- Australian Coal Exports - 230 Million tonnes per annum (23 crore per annum)
  - 70% of Australia’s coal exports sail on ships with maximum drafts and sailing times determined by DUKC® systems

<table>
<thead>
<tr>
<th>Western Australian Ports</th>
<th>Average Benefit (m)</th>
<th>Number of Ships p.a.</th>
<th>TPCI</th>
<th>Additional Tonnage p.a. (lakh)</th>
<th>Profit / tonne</th>
<th>Total Benefit p.a. (INR crore)</th>
<th>Total Cost p.a. (INR crore)</th>
<th>ROI</th>
<th>Avg Tonnage (lakh)</th>
<th>Ships saved</th>
<th>Voyage Cost (INR crore)</th>
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<td>30.0</td>
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## Representative Client Benefits

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<tr>
<th></th>
<th>Average #ships/annum</th>
<th>Av GRT</th>
<th>TPC</th>
<th>Av benefit, cm</th>
<th>Profit/tonnes</th>
<th>Total Benefit (US$)</th>
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**Torres Straits**

8725

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With Torres still restricted with static 12.2, but analyses indicates average benefit possible of approx 30-40cm
Dynamic Underkeel Clearance

- Static Draft
- Dynamic Motions
- Under Keel Clearance
- Survey Tolerance and Siltation
- Channel Depth
- TIDE Height
- WATER Density Change
- SQUAT Allowance
- WAVE RESPONSE Allowance
- HEEL Allowance
Recap: Dynamic UKC (DUKC®)

- Provides a **consistent scientific approach** to UKC management. It is **deterministic** not probabilistic.
- Utilises near **real time and forecast environmental data** (tides, waves, currents) and uses **sophisticated ship modelling** to calculate ship motions and UKC.
- **Rigorous application** of PIANC guidelines and limits.
- **Effective mitigation** of grounding hazards.
- Extensive **full-scale DGPS validation** (>450 vessels).
DUKC® Primary Outcomes

- **Ensures Safety** and
- **Maximises Productivity and Efficiency** and
- **Increased Economic Benefits**
  (By exploiting the inefficiencies of the static rule)

- Enhanced decision making with transit plan accuracy
- Detailed reports Improved Master/Pilot Information Exchange
- Enhanced vessel scheduling/reduced channel conflicts
- Enhanced contingency planning
- Removes commercial pressures
- Implements a shared picture between ship and shore
PPA Corporate Video - Maintaining channel integrity in the Port Hedland harbour

https://youtu.be/Fquk0KLb_cU

Courtesy and Copyright: Port Hedland Port Authority
OMC International

• Inventor and sole supplier of DUKC®
  ➢ Dr Terry O’Brien involved in 2 PIANC committees
  ➢ Technical advisors to UKHO TSMAD committees
  ➢ Industrial member of IALA, and VTS committees

• Safety Record: 140,000+ bulk, container and tanker movements since 1993 without incident (about 1 movement per hour)

• Productivity and economic gains for DUKC users

• Installed at 25 Worldwide ports

• Over 450 vessels surveyed
Dear Co-workers
Modern life is too complex...
I’m leaving to find a place untouched by technology...

Turn left. Five metres ahead.

I’m back!
Thank You