Greener Ports
With Next-Gen Physics-Based Digital Tools

Mr. Matthew Prumm
Global Lead - Business Development
We’re an independent, private and not-for-profit organisation

Our knowledge represents almost 60 years of dedicated research
Solving challenging problems for more than 120 ports worldwide

Our people are highly qualified
80% of our 1,100 employees hold an MSc or a PhD degree

We have been in Latin America for over 40 years
Who We Work For

Ports

Operators

Agencies

Resources

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“If we don’t take action, the collapse of our civilizations and the extinction of much of the natural world is on the horizon.“

Sir David Attenborough, UN COP 24 December 2018
We Are Doing Something About It

Paris Agreement: Temperature Rise below 2°C this Century

Reduce GHG Emissions by 50% 2008 – 2050

Incentivise shipowners to exceed regulated targets

IMO is the only organization to have adopted energy-efficiency measures that are legally binding across an entire global industry, applying to all countries.
How will this be achieved?

- Digitization
- Alliances
- Economies of Scale
- Mechanical Measures
- Renewable Energy
- Alternate Fuels

How Can Ports Contribute?
How will this be achieved?
The Port Perspective – Critical Position in Supply Chain

- Can not directly control efficiency of stakeholders
- Can Encourage Stakeholder Performance

Incremental and accessible pathway to efficient environmental protection

- Infrastructure (e.g. Shore Power)
- Optimize existing assets
Optimization = Reduction of Waste

Sources of Waste in a Typical Port

• Delays
• Over dredging
The Path to Optimization and Efficiency

• Need to balance the **social, commercial and environmental interests** of stakeholders, which vary over time.

• **Iteration** is required to determine the solution which is ‘just right’, and **Flexibility** is required maintain it.

• Digital Twin technology is widely used to achieve this in other industries.
Physical Port Environment: The Digital Twin
A digital model of your port to support your strategic and operational needs

- Attract and Call Larger Vessels
- Reduce Capital and Maintenance Dredging
- Improve Scheduling
- Ensure Safe Mooring and Manoeuvring
Case Study: Port of Brisbane
Case Study: Port of Brisbane

Major shipping line wants port to accommodate larger vessels

- Major CAPEX Dredging
  - Time for approvals and works
- Manoeuvrability, Tugs & Moorings

- OPEX Dredging
  - Difficulty scheduling
- Manoeuvrability, Tugs & Moorings
Case Study: Port of Brisbane
Case Study: Port of Brisbane

**Capacity**

Dredge only as deep as needed.

**Operational**

Larger vessels, larger windows, less OPEX dredging, more safety.
Results

Reduced Dredging
Over 9,000,000 m³

No. Vessels Draft >14m
+300%

Maximum Vessel Draft
+ 0.5m

Cost Savings
>100M USD

* Based on first 8 months of operation
Physical Port Environment: The Digital Twin
Empowering optimal strategic and operational needs

- ENVIRONMENTAL MODELLING
  - HYDRODYNAMICS
  - WAVES (LONG WAVES)
  - WIND
  - SEDIMENT TRANSPORT

- VESSEL RESPONSE
  - UNDERKEEL CLEARANCE
  - MANEUVERABILITY
  - MOORING ANALYSIS
  - SWINGING

- EXTERNAL DATA
  - AIS/VTS
  - WAVE BUOYS
  - TIDE GAUGES
  - REGIONAL FORECASTS
  - VESSEL DATABASE
Environmental Modelling

- **7-day forecasting** of wind, waves, currents, water levels at port scale
- **Siltation forecasting** to optimise maintenance dredging
- Machine Learning & Live Updates based on measured data
- Informs vessel response and manoeuvrability
Digitize the Vessel Traffic

- Implement a **3D Vessel response engine** comparable to high-end Full-Bridge Simulators.
- Highly accurate assessment of UKC, manoeuvrability and moored vessel interaction
- Physics based, quantitative assessment of risks at port level
- Easy incorporation of the Human Factor in Full Bridge Simulators
A Digital Twin of Your Port
Towards a Greener, More Efficient, More Competitive Port

Unlocking hidden capacity and providing decision support to your waterside operations
Physics Based Decision Support
For a Greener, More Efficient Port

- Larger Vessels, More Often
- Reduce Delays
- Integrate Your Stakeholders
- Reduce Dredging
- Identify Bottlenecks
Modular Framework | Customized Solutions | Full Integration

- **Empower your ports and stakeholders**

- **Full integration** with existing systems

- **Modular** structure to support **customized** solutions
The Physics Based Approach to Greener Ports

Unlock the true capacity of your Port
Reduce unnecessary dredging and delays at berth
Support your port and terminal stakeholders