

## **Tiamat™ – Dredging with Nature**

### **What are the challenges?**

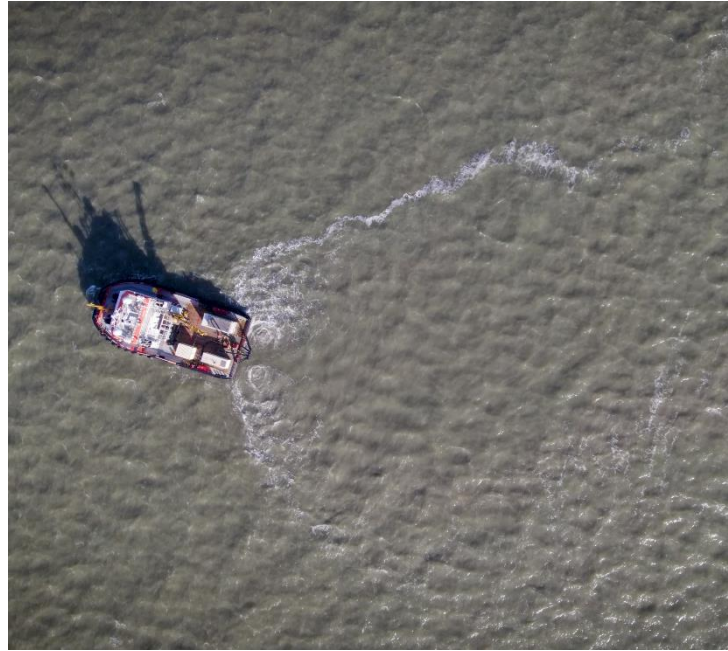
Traditional dredging methods can be costly, inflexible and do not allow the use of natural processes to improve the environment. Ports or harbours are seeking new ways to manage sediment that enables more sustainable delivery of economic, social and environmental benefits.

### **Why Tiamat?**

Engineered by the Harwich Haven Authority that has over 100 years' experience in dredging and now being commercialized by Haven Dredging, Tiamat is aligned with the values, objectives, interests and priorities of progressive dredging authorities and companies and their partners, stakeholders and society at large.

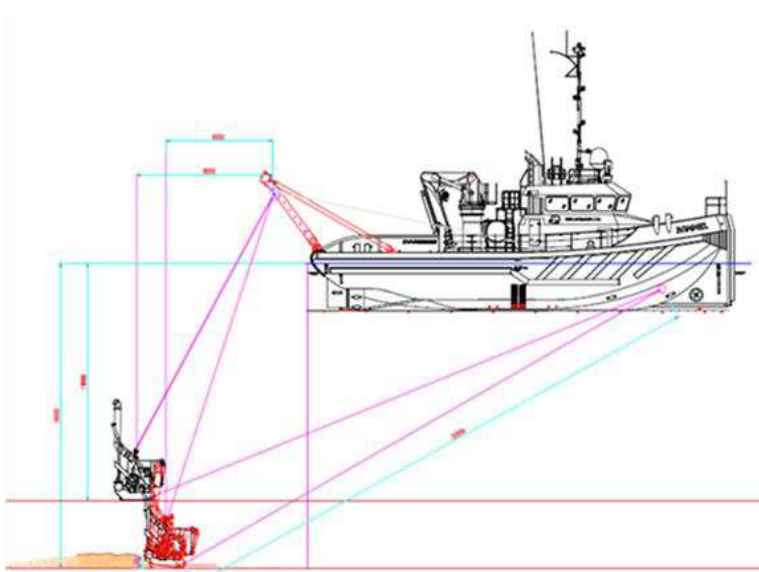
Tiamat is a new and innovative agitation dredging machine to provide port authorities and dredging companies a holistic solution to maintenance dredging – a cleaner and greener method of maintenance dredging, that is easy to deploy, adaptable and at a lower cost.

The evolution of this demonstrably robust and effective sediment recycling has been made possible through a combination of factors including knowledge building over the last century coupled with modelling and long-term monitoring undertaken by Harwich Haven Authority over the last 25 years, and communication with regulators and stakeholders. It has completely redesigned its dredging strategy to address all of the challenges of economics, ecology, climate change and coastal resilience - and moves to a more nature-based dredging approach.



### **How does Tiamat work?**

Tiamat is designed so that it could be towed behind a relatively small vessel, such as workboat or multi-cat with an A frame that is between 25-27 meters.



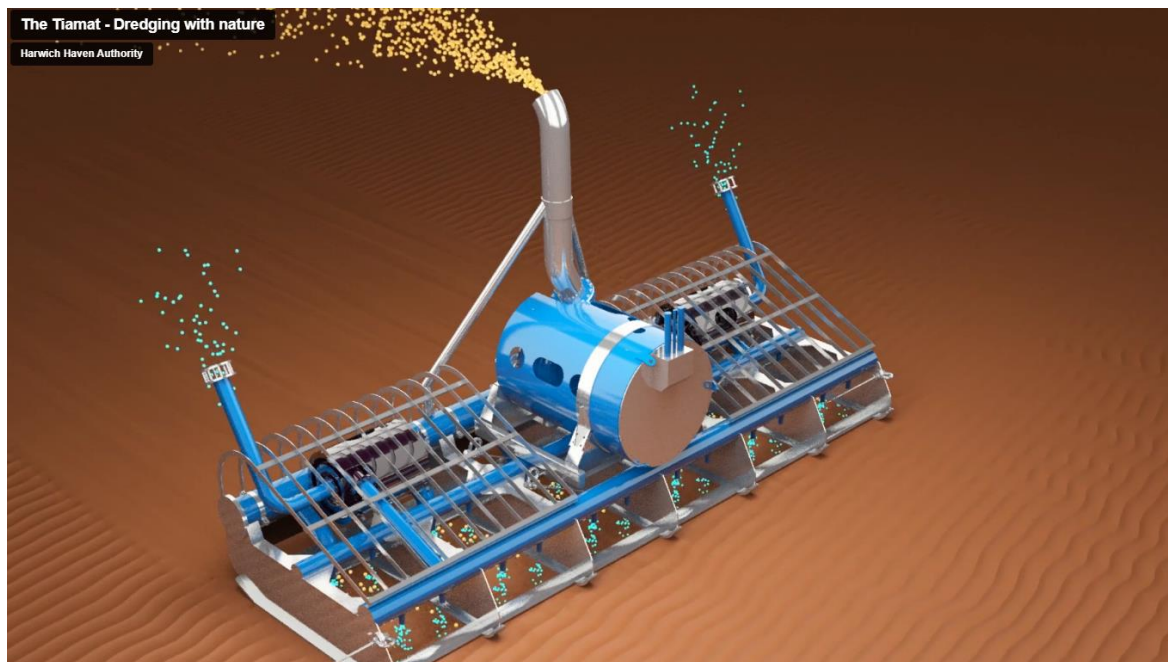
Tiamat consists of a frame carrying two pumps. One pump is used to inject water into the sediment overlying the bed of the harbour, whilst the second pump extracts the diluted silt and pumps it up a six-metre-tall pipe, from where it is released into the water column.

The silt is then washed out of the harbour through the natural tidal currents – thus, “Dredging with Nature™”. The frame is mounted on the winch of a small work boat and lowered into the water to the depth required. By being able to use standard small vessel that do not have to be adapted or modified resolves some of the capacity and resource constraints that can exist in the dredging market.

Tiamat does not rely on creating a density current, instead utilises the power of the tide and currents of the sea and rivers. Tiamat promotes self-replenishment in the estuarian system, through the natural re-suspension of sediment. Tiamat does not use side-casting but rather places the sediment back into the water column the appropriate depth. Because of this there has been no evidence of turbidity or the water quality being impacted. For further details on the operation of the Tiamat please refer to: [ewn.erdcdren.mil/?p=7392](http://ewn.erdcdren.mil/?p=7392).

### **Adaptive and scalable**

Tiamat is adaptive and flexible technology, which ensures it is available when you need it. The scalable technology ensures a bespoke design for each port – maximising the effectiveness of dredging, inclusive of all ports’ turbidity.



Ports often complain that dredging plant is not available when needed in particular WIDs. It is relatively easy to manufacturer a Tiamat device and with short lead times, whilst it could be over a year to take delivery of a new WID.

### **Tiamat enables more sustainable and environmentally friendly maintenance dredging**

Seaport leaders share a commitment to sustainability, reducing carbon footprint and striving towards achieving net zero, clean energy, and the health of coastal ecosystems.

The use of Tiamat reduces the environmental impacts of dredging, through lower emissions and disposal of silt. Tiamat’s greenhouse gas emissions are about a 70% lower of a comparable THSD and would be much

lower if HvO<sup>1</sup> was used as the marine fuel. Tiamat can also, depending on the location, help the maintenance and replenishment of mudflats and thereby reduce the requirement to undertake beneficial placement work<sup>2</sup>.

By using Tiamat, sediment is sustainably dredged from the seabed or riverbed using a non-invasive method and encouraging the natural movement of the sediment back into water column. This natural suspension of sediment helps to maintain a healthy and natural estuarine system by working alongside nature and for the benefit of nature.



Tiamat also supports the ecology of mud flats, as it replaces the need for invasive “beneficial placement” of sediment, potentially disrupting wildlife settled here. Wildlife in or around the dredging zone will also be less impacted because Tiamat shortens the dredging process, encouraging the sediment to disperse naturally and more sustainably, rather than locating it somewhere else.

By using Tiamat, vessels as small as 25 meters can be used to dredge in the chosen area, which means that there will be lower fuel consumption compared to traditional methods, resulting in reduced carbon emissions. Similarly, because there is no need to dispose of sediment at a disposal site, often several times a day, Tiamat significantly reduces harmful emissions being released into the environment by up to 90%. Depending on the location of the disposal site, this means a considerable saving of carbon to the planet. Other wildlife and nature will also be less impacted by the dredging. This may include noise and emissions pollution, as well as additional traffic on waterways.

#### **Does Tiamat impact water quality?**

Monitoring during Tiamat operation has shown that a high suspended sediment concentration (SSC) plume occurs immediately behind the Tiamat, but that this quickly disperses and does not impact the wider area. The pump rate can be reduced, or a smaller Tiamat can be built to limit the SSC for areas where a localised plume could pose a risk to sensitive receptors.

#### **Tiamat reduces the overall cost of dredging**

The cost of dredging with Tiamat is lower than other forms of dredging, as a bespoke vessel is not required to complete the work, nor is the need for disposal of the sediment – as it will naturally move back into the estuarine system.

By needing only the work boat and using the energy of the tide and currents and the use of agitation Tiamat can readily operate at a cost rate much lower than TSHD, depending on size. This results in not needing to travel to a disposal site multiple times a day, which in turn, greatly reduces fuel costs as well as saving valuable time.

#### **Productivity equal to a TSHD**

Tiamat is expected to have the productivity of a TSHD of about 4,500-6,000 cubic meters, at about 24,000 cubic meters per 12-hour day<sup>3</sup>.

#### **What conditions is Tiamat best suited to?**

It depends on the dredging problem that needs to be solved. To disperse sediment, the ideal location to be dredged would be predominantly silt and clay and for there to be relatively strong tidal currents (> 0.5 m/s) to ensure that the suspended sediment is transported away from the dredged areas.

<sup>1</sup> HvO – Hydrated Vegetable Oil.

<sup>2</sup> The Environment impact assessment and the monitoring indicates that local beaches will not be impacted by mud. And that the mud flats are not either overwhelmed with extra silt or depleted from the use of AGD in the Haven.

<sup>3</sup> Based on calculations performed by HR Wallingford

However, where the issue is the navigability of the sediment, then tidal range is less important as Tiamat is excellent in reducing the sheer strength of silt and mud.

Due to the ability to adapt the size and power of Tiamat it can also be used in locations where conventional dredging methods are either too expensive or in accessible, such as reservoirs, canals, and small waterway. Here the Tiamat can help to keep the sediment in suspension for longer periods and deposited in the estuarine system if required.

Each location would have to be assessed to determine the best way that Tiamat can value to the dredging strategy and protocol.

#### **Trials of Tiamat**

Harwich Haven Authority conducted four trials of the machine including an independent environmental impact assessment conducted by Royal Haskoning and HR Wallingford and reviewed by the Environmental Agency and Natural England of the UK. After each trial and subsequent discussion of the monitoring results and the impressions of the vessel crew, improvements have been made to the machine and to working practice. Tiamat is now being used as part of Harwich Haven's dredging processes.

#### **More information**

[Spearman, J. and Benson, T. \(2022\) Evolution of nature-based dredging solutions at Harwich, UK. In: WODCON XXIII, 16-20 May 2022, Copenhagen, Denmark.](#)