SCOUR PREVENTION MATS

AN INNOVATIVE, ENVIRONMENTALLY SOUND SOLUTION TO SEABED SCOUR
Scour is erosion that occurs when water turbulence is caused by an object or structure interrupting flow. Oceanic flows caused by tidal current and waves will wash away the underlying seabed as a result.

### Applications:
- Offshore Wind foundations
- Subsea Cables
- Platforms and rigs
- Subsea Pipelines
- Decommissioning
- Coastal structures, bridges, piers and harbours

### Sectors:
- Offshore Wind foundations, substations and cables
- Offshore Oil and Gas platforms and pipelines
- Civil Engineering
- Wave and tidal devices and cables
FREQUENTLY ASKED QUESTIONS:

- How does it work?
- What are the environmental impacts?
- Will we get consent?
- How many tyres are needed and can you secure supply?
- What does it cost compared to the alternatives?
- Where has it been used commercially before?
Two characteristics make SPMs effective:

- **Shape** – tyres fill with sand and stabilise the seabed.
- **Low Specific Gravity** - neither float away, nor sink.

Tyre mats stabilise the seabed at the level at which they are placed - self anchoring function.

The tyres add friction to the seabed which causes currents to decrease in speed, causing sediments migrating across the site to become trapped within the tyres.

**The Scour Prevention Mat (SPM) consists of tyres laid flat on the seabed forming a single layered mat**
SEDIMENT ENTRAPMENT PROCESS

Oke 1988
IT IS ENVIRONMENTALLY SOUND

- Components already widely used in marine environments
- Tyres are extremely durable and designed for highly demanding applications
- Leaching & Toxicity – Zinc and organic compounds (e.g. polyaromatic hydrocarbons and organic acids) are the principal potential leachates, however rates of release when submerged in salt water do not alter ambient conditions
- Physical Abrasion – Minimal abrasion as SPM’s are submerged within surrounding seabed material
- Tyre Degradation – Ultra-Violet light is the principle cause of degradation, Once subsurface, this risk diminishes to near zero.
- All tyres used are selected using strict quality procedures
IT IS ENVIRONMENTALLY SOUND

- Made from recycled materials and supports ‘Circular Economy’ principles
- Fully removable on decommissioning
- Loose Tyres – Stringent design of fixings and fastenings removes the risk of tyres breaking away from SPM’s
- Marine Life – Surveys of our trial SPM’s have shown marine life already colonising the SPM area within 6 months of installation, mainly Crustaceans
- Mitigates the need to use vast quantities of virgin natural materials e.g. eclogite rock
- Reuse of tyres has a significantly lower CO₂ profile, including embodied carbon
- Deals with an enormous international waste challenge with a new use for end-of-life tyres
**CONSENTING**

- Licenses have been consented for use of Scour Prevention Mats in the North Sea (UKCS).
- Marine Management Organisation (MMO) granted license for a UK offshore windfarm
  - Consultation with Natural England, Centre for Environment, Fisheries and Aquacultural Science (CEFAS) and public
- Department of Energy and Climate Change (DECC), now Department for Business, Energy and Industrial Strategy (BEIS), in UK granted license for North Sea Project
- Feedback from the consultation processes has been fed into the manufacturing, design, cleaning and installation procedures to ensure that the SPMs have minimal environmental impact.
SUPPLY OF TYRES

- Tyre supply confirmed for small to large jobs across continents
  - Standard Scour Prevention Tyre Mat:
    - 10.1m x 5.1m x 0.2m
    - Weight: 950kg
    - 128 tyres
  - Bespoke Scour Prevention Tyre Mat for 7m Ø monopile:
    - Octagonal shape spanning 28m in width x 0.2m thick
    - Weight: 9,286kg
    - 1,312 tyres
BESPOKE SPM FOR LARGE DIAMETER MONOPOLES
IS IT COST EFFECTIVE?

- Cost of mattresses comparable to concrete alternatives
- One-time installation, maintenance free, no secondary scour
- Lightweight and therefore cost-effective, low-risk installation
- Modular design for fully flexible installation from vessel of opportunity
- Installation time comparable to alternatives e.g. concrete mattress
- Delivered to order or manufactured under licence for optimum cost efficiency

Installation via vessel crane & lifting frame to lower mattresses in place. Removal via lifting beam for asset inspection, maintenance & decommissioning.
CASE STUDIES:

- Foundation remediation and scour protection
- Cable & pipeline scour protection
- Bespoke scour protection at cable crossing points
CASE STUDY 1: AROUND FOUNDATION

- Wind farm located on a dynamic southern North Sea sandbank off the east coast.
- Monopile foundations of 4.2m diameter driven 31m into the seabed
- 900m³ of rocks dumped into scour pits as scour prevention post-foundation installation
- Significant secondary scour occurred around the initial rock protection
- SPM’s placed over in-fill material in primary scour area. Within **1x lunar cycle**, the seabed had built back up.

Site data
- Dense medium sand.
- Grain size $d_{50} = 0.250$mm
- Located on a dynamic sandbank with sand waves and ripples migrating across the site.
- Water depth – 5-10m
- Current velocity 0.8m/s – 1.1m/s
- Mean wave height – 0.7m
- Max wave height – 4.1m
- Peak wave height – 5.2m
Installation of six tyre mats within the centre of a wind farm to provide cable protection

Demonstrated that mats can be installed and removed for asset maintenance, repair or decom

Dive surveys noted the rapid infilling of sediment five hours after placement

Mats stabilised the seabed and weathered winter storms with wave heights over 5m

Mats remain in place, infilled and providing effective scour control more than 6 years later
CASE STUDY 3: CABLE PIPELINE CROSSINGS

- North Sea Project installed in April 2015
- Telecommunication cable crossing over pipe
- Bespoke mats offering:
  - Scour prevention to a cable
  - Protection to pipeline

- Remote installation using steel frame/ROV:
  - At 80m depth: 1 mat per 2 hours.
  - At 20m depth: 1 mat per hour.
SCOUR PREVENTIONS KEY BENEFITS

- Cost-effective
- Field Proven
- Maintenance Free
- No secondary scour
- Flexible sizing and installation
- Uses recycled materials
- Decommission friendly
QUESTIONS?

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