Resilient and sustainable

Ports of the future with steel solutions

May 17th 2023
Michał Januszewski

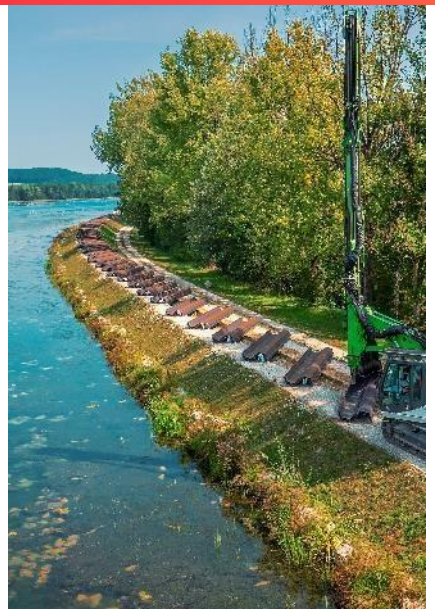
Port of Brest, France © Bouygues TPRF

4 main application domains

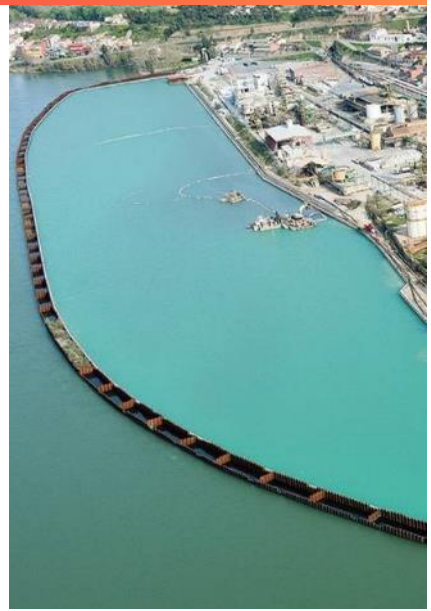
Mobility Infrastructure Solutions

Water Transport Solutions

Hazard Protection Solutions



Environmental Protection Solutions



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EcoSheetPile™ Plus

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Dyke reinforcement in Niederalteich, Germany

is part of:

XCarb®

Recycled and renewably produced

Compare CO2 footprints to everyday things

1 tonne of CO_2 is equivalent to:

1 Flight Frankfurt am Main – New York *	5,700 km with medium-sized car (10x Gdańsk - Kraków)**	1 tree needs to grow 80 years to capture that amount of CO_2 *

*Tagesschau: https://www.tagesschau.de/multimedia/bilder/grafik-co2-101.html#:~:text=Eine%20Tonne%20CO2%20entspricht%20etwa,Kilometer%20mit%20einem%20Mittelklasse%2DBenziner.
** Carbon Footprint, VW Golf 1.4 TSI, Gasoline, 125 PS, 2015, Emissions: 0,174 kg Co2/km, https://www.carbonfootprint.com/calculator.aspx

Decarbonization goals of ArcelorMittal

-35%

Scope 1 & 2 CO_2 emissions by 2030 across Europe*

Net zero

CO_2 emissions by 2050

SBTi

Committed to setting science-based targets °

*2018 baseline

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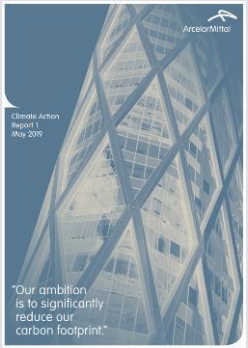
ArcelorMittal has a clear ambition to decarbonise its production

May 2019:

First **group** climate action report

ArcelorMittal's ambition to significantly reduce CO_2e globally and become carbon-neutral in Europe by 2050.



December 2019:

ArcelorMittal **Europe** sets target to cut carbon emissions by 30% by 2030

May 2020:

European climate action report

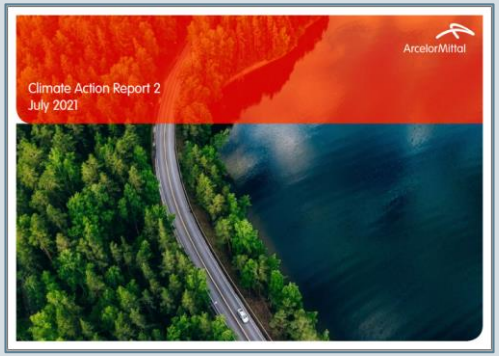
Plans to become net-zero by 2050

September 2020:

ArcelorMittal sets 2050 net-zero target

July 2021:

Second **group** climate action report



2030 global carbon emissions intensity reduction **target of 25%**

European 2030 carbon emissions intensity **reduction** target increased **to 35%** from 30% previously announced.

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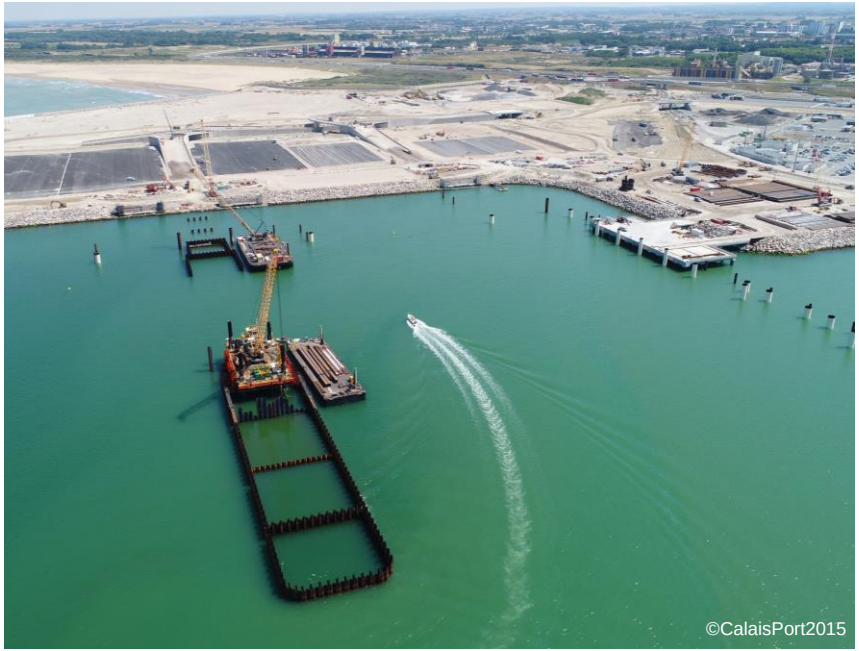
Implementation of environmental criteria in public tenders

- ArcelorMittal Sheet Piling is supporting the implementation of environmental criteria in public tenders.
- There are several methods and possibilities to include environmental criteria
  - Basis requirements: Use of recycled and recyclable materials,…
  - Monetization
    - Monetization of environmental impacts
    - Holistic view (not only CO_2 emissions)
    - Is used in the Netherlands for infrastructure projects (EMVI method)



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XCarb®

Recycled and renewably produced

Up to **100%** scrap

100% renewable electricity

XCarb® recycled and renewably produced steel has a carbon footprint as low as 0.3 tonnes of CO_2e per tonne of steel product when the metallics are 100% scrap. This is much less than for steel produced on the primary route (BF/BOF).

(1) HSBC, Steel for the Future, 2019

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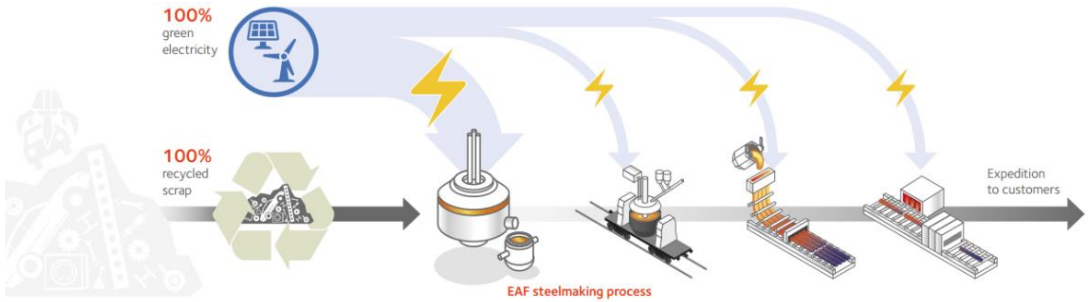
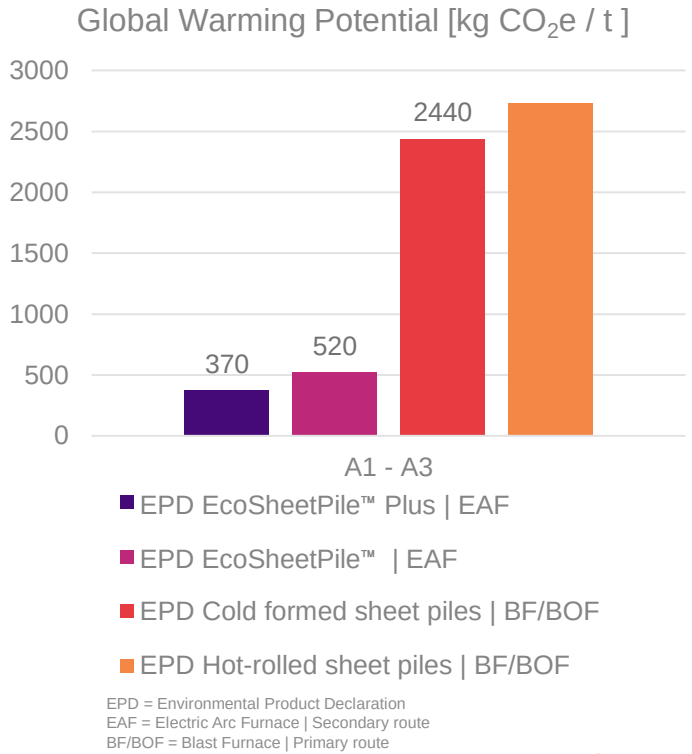
EcoSheetPile™ Plus

XCarb®
100% recycled and renewably produced

EcoSheetPile™ Plus is part of ArcelorMittal's XCarb™ initiative

- Produced from **100 % recycled steel & 100 % renewable electricity**, reaching GWP of only **370 kg CO_2-eq/t** (A1 - A3).
- Compared to conventionally produced sheet piles, the production of EcoSheetPile™ Plus emits **81 % less CO_2-eq***.
- The environmental impact of a project can be assessed with Life Cycle Analysis (LCA), and Environmental Product Declarations (EPD)
- Our customers can reduce the environmental impact of their projects with EcoSheetPile™ Plus





EPD = Environmental Product Declaration
EAF = Electric Arc Furnace | Secondary route
BF/BOF = Blast Furnace | Primary route

*EPD of sheet piles available in Europe

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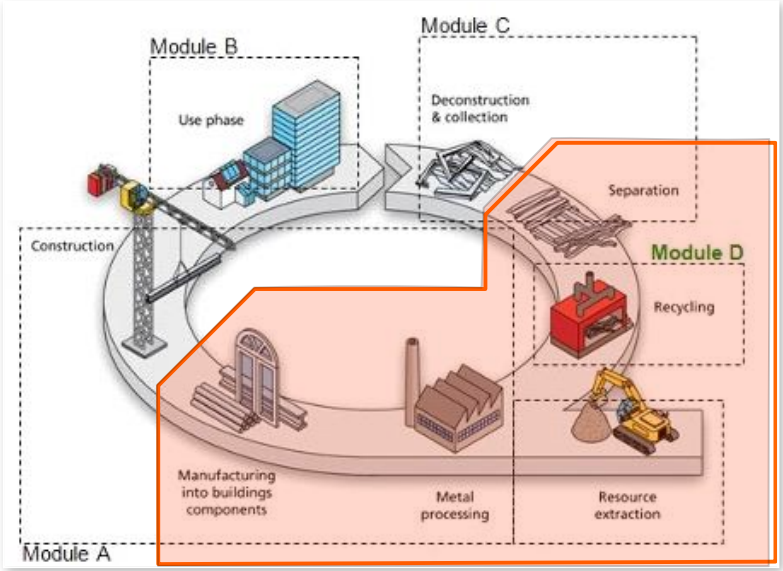
Environmental Product Declaration (EPD)

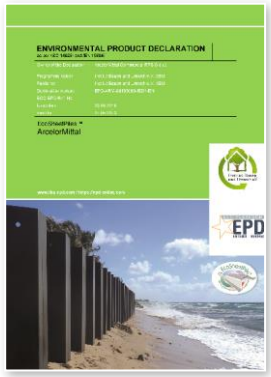
- Independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products (EN 15804 and ISO 14025)
- Does not imply that the declared product is environmentally superior to alternatives

→ Environmental impact of products

- Declared unit: 1 t (metric tonne)
- Cradle-to-gate - with options:
  - A1-A3, C3, (C4) & D
- Transport (within Europe), installation &

  use phase ≈ negligible





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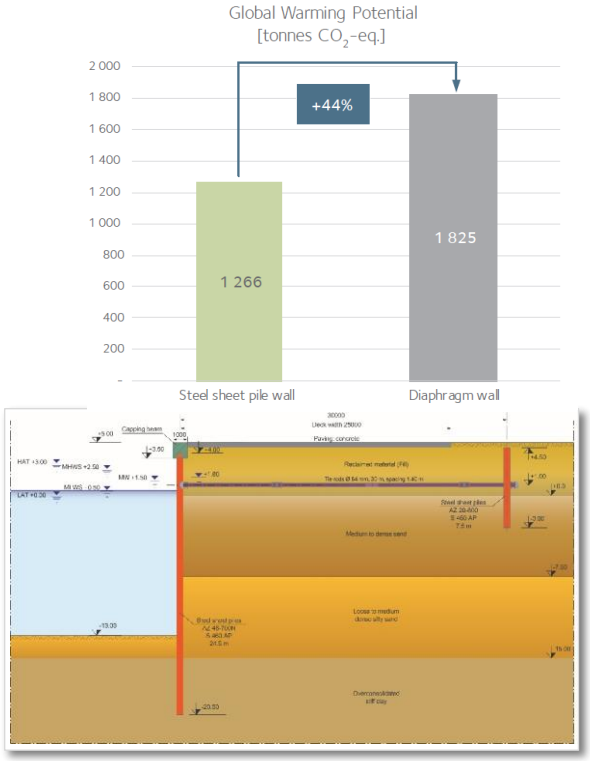
LCA comparison – Port structures (based on *Tractebel*'s study - 2018)

- 200 m cruise ship terminal built in a Belgian port (-13.0 m)
- Assessed through a **Life Cycle Analysis** (LCA) – peer-reviewed
- Project specific LCA considers
  - Production (***cradle to gate***)
  - **Installation** and **deconstruction** after service life
  - **Recycling** of steel and partially concrete (option)
  - Transport of the key construction materials
- Difference in Global Warming Potential (GWP, **CO_2-eq. emissions**) is **44%,** compared to a diaphragm wall.
- Notes
  - Steel sheet piles can be recovered easily and either reused (quite rare after 50 years) or 100% recycled,
  - LCA uses the EcoSheetPile™ EPD of ArcelorMittal



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Efforts for a sustainable production

- Both sites producing ArcelorMittal sheet piles (Belval & Differdange, Dabrowa) are certified by **ResponsibleSteel™**

- ArcelorMittal Belval & Differdange was one of the first globally to be independently audited and found to meet the ResponsibleSteel™ standards which include:
  - Climate change and greenhouse gas emissions
  - Water stewardship and biodiversity
  - Human rights and labour rights
  - Community relations and business integrity

- ArcelorMittal Beval & Differdange has successfully achieved **Cradle to Cradle Certified® Gold** for their XCarb® products, which include EcoSheetPile™ Plus sheet piles

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Circular economy

REDUCE

1970 - 2020

Build same structure with

50% less steel

REUSE

- Rental
- Sales of second hand
- Reuse up to 10 times

RECYCLE

Steel is 100% recyclable

&

SSP out of 100% recycled steel

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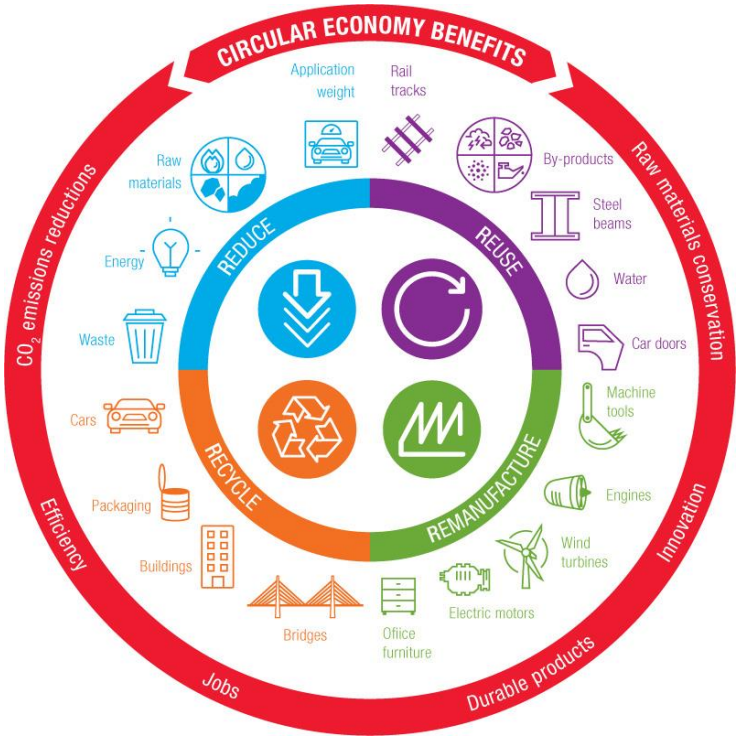
Steel sheet piles: A product in the sense of circular economy

Steel sheet piles score particularly well on the following principles of the circular economy:

- **Reduce:** Through optimization of sheet piling solutions, the used profiles have become lighter and lighter over the past decades (- 50 %), while still meeting the same requirements.
- **Reuse:** Steel sheet piles can be used and reused up to 10 times for temporary applications, thus reducing the environmental impact each time the sheets are re-used. ArcelorMittal also offers rental and sale of second-hand sheet piles.
- **Recycle:** Steel is a permanent material. It can be 100% recycled without any loss of quality. Steel sheet piles from Luxembourg are out of 100 % recycled steel.



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EcoSheetPile™ Plus

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Dyke reinforcement in Niederalteich, Germany

is part of:

XCarb®

Recycled and renewably produced

EcoSheetPile™ Plus

Renovation of the port facilities of a wood pulp mill in Mönsterås, Sweden

280 t AZ 24-700

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EcoSheetPile™ Plus

Fishing terminal in the port of Egersund, Norway

2,150 t AS 500

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Offshore energy park facilities, Port of Le Havre, France

900 t from AZ 27-800 to AZ 40-700N

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EcoSheetPile™ Plus

Quay wall in the port of Helsingborg, Sweden

424 t AZ 42-700N

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Seine-Nord-Europe canal project 200m quay wall at Ribecourt, France

910 t HZ 880M A-12 / AZ 13-770

XCarb®
Recycled and renewably produced

EcoSheetPile™ Plus

Construction of the first solar-powered train station in Drammen, Norway

400 t AZ 12-770 and AZ 13-700

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EcoSheetPile™ Plus

New train station in Varberg, Sweden

1,200 t PU 22 and AZ 44-700N

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EcoSheetPile™ Plus

Soil retention at the HS2 high-speed railway, United Kingdom

636 t AZ 36-700N and AZ 46-700N

XCarb®
Recycled and renewably produced

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SmartSheetPile

Future-proof your steel foundation solutions

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What is a SmartSheetPile ?

The term "Smart" is used here in the context of recent advances in microchips and sensor technology that enabled physical objects to be filled with intelligence, connectivity and context-awareness, through the use of sensors.

A SmartSheetPile is :

- Digitally “self-aware”
- Aware of its surroundings
- Connected
- Continuously transmitting data
- Feeding a dedicated online platform for long-term follow-up

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SmartSheetPile - Smart steel solutions for innovative infrastructures

SmartSheetPile in the 4 application domains using wide range of sensors

Water Transport Solutions

- Uncover hidden quay wall capacities to improve productivity
- Monitor corrosion in real time with precise remaining thickness measurement

Hazard Protection Solutions

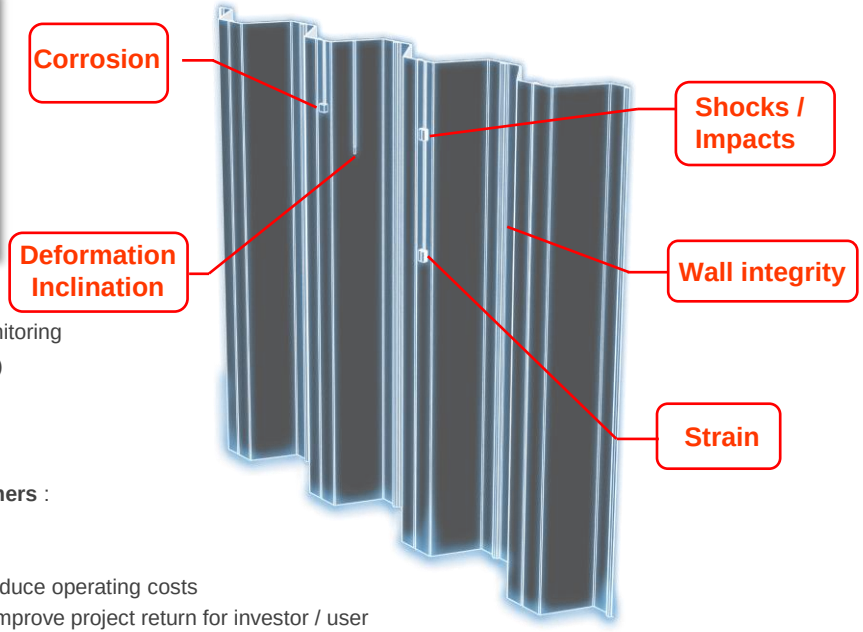
- Raise the alarm on water levels and water pressure
- Detect early signs of potential catastrophic failure

Mobility Infrastructure Solutions

- Monitor the health, loads and deformation of bridge abutments in real time
- Reduce downtime and traffic disruption with more efficient preventive maintenance

Environmental Protection Solutions

- Guarantee the integrity of the sheet pile wall against declutching
- Ensure the imperviousness of the sheet pile wall



- real-time structural behavior monitoring
- remote data transfer (data cloud)
- create a “digital” project copy
- use of AI for big data processing

- **Create added value for customers** :
  - Secure the assets
  - limit project downtimes
  - preventive maintenance – reduce operating costs
  - reveal hidden capacities – improve project return for investor / user

- Take on the digital transformation, enhance reliabilities and such the efficiencies of sheet pile solutions

SmartSheetPile to become a game changer in the foundation industry

SmartSheetPile Solution

Objectives :

- Real-time remote structural monitoring
- Support clients and stakeholders in creating a digital twin
- Support creation and use of Artificial Intelligence for big data processing and providing assistance for decision-taking
- Create added value for customers :
  - Secure the structure
  - Minimize hindrance and limit project downtimes
  - Achieve preventive maintenance – reduce operating costs
  - Reveal hidden capacities and detect weak spots – improve project returns
  - Take on the digital transformation, enhance the reliability and the efficiency of sheet pile solutions

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SmartSheetPile – The menu list (options / phenomena)

The SmartSheetPile is a modular product, so the end user can select from a menu list of phenomena being tracked:

“Core” sheet pile behavior

- Corrosion / material loss
- Inclination / tilt
- Structural deformation (strain)
- Anchor tension
- Soil pressure
- Shock / vibrations

Surrounding / environmental information:

- Tidal levels
- Soil inclination
- Settlement
- Ground water levels
- Temperature

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SmartSheetPile – Applications in the different domains

Water Transport

- Uncover hidden quay wall capacities
- Monitor corrosion in real time
- Extend the lifetime

Hazard Protection

- Raise the alarm on increasing water levels
- Detect early signs of potential catastrophic collapse

Mobility Infrastructure

- Monitor the structural health of bridge abutments
- Reduce traffic disruption with more effective preventive maintenance

Environmental Protection

- Guarantee the integrity against declutching
- Ensure the imperviousness of the sheet pile wall

Thank you

Green

Smart

Steel

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