THE ZERO EMISSION TERMINAL -
HOW TO CONNECT TO THE GREEN FUTURE

Manila, 11.03.2026

PHILIPPINE PORTS AND LOGISTICS 2026

VAHLE

IN 2025, VAHLE GETS THE WORLD MOVING.

VAHLE at a glance

> 200 Mio.
TURNOVER IN EURO (2025)

> 900
EMPLOYEES

13
MARKET ORGANIZATIONS

5
PRODUCT GROUPS

4
TARGET MARKETS

VAHLE at a glance

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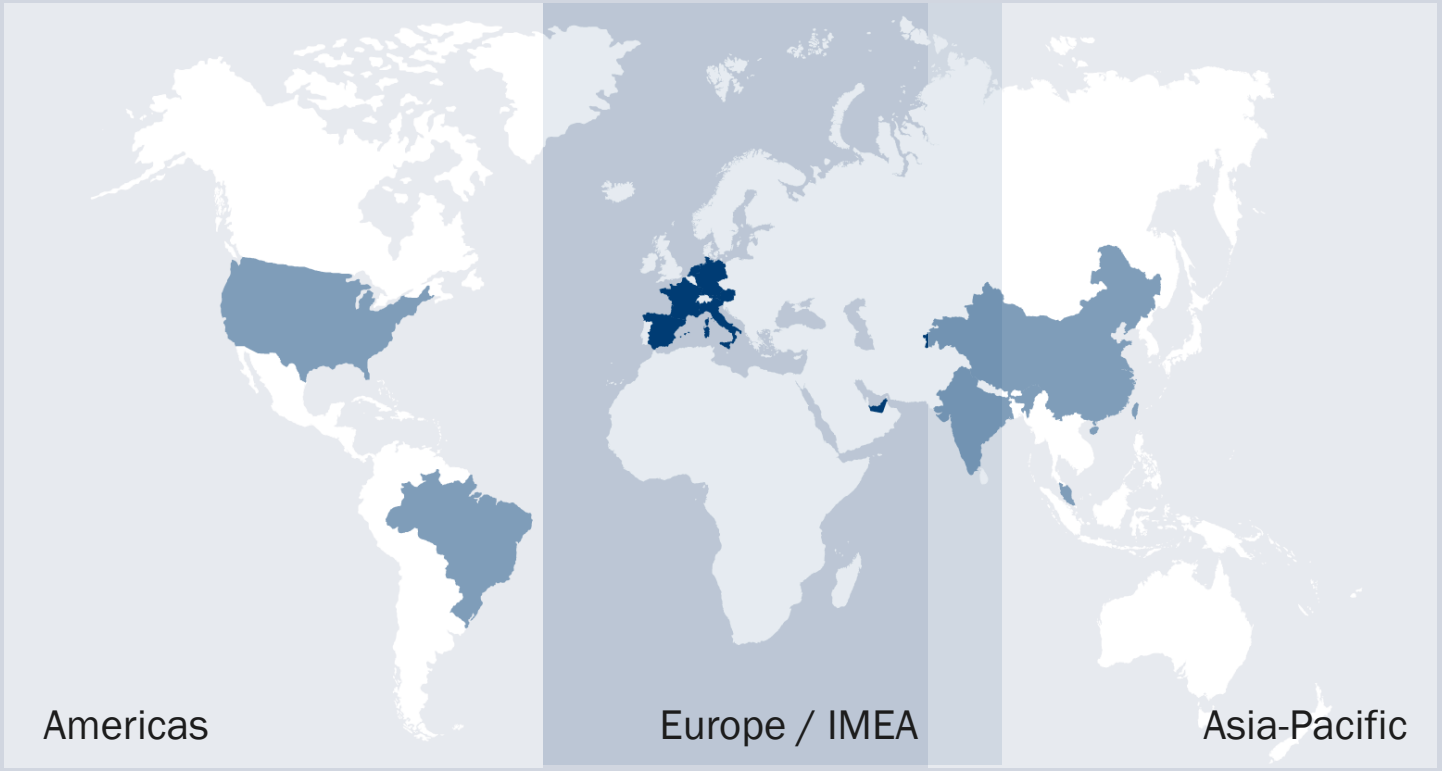


- Energy Transmission
- Data Communication
- Positioning
- Control Systems
- System Solutions
- Intralogistics
- Crane Technology
- Automotive
- Port Technology

Business Unit Port

PORT TECHNOLOGY
CONTAINER HANDLING

Motorized Cable Reels

Festoon & USMG Solutions

eRTG Systems

Truck Charging

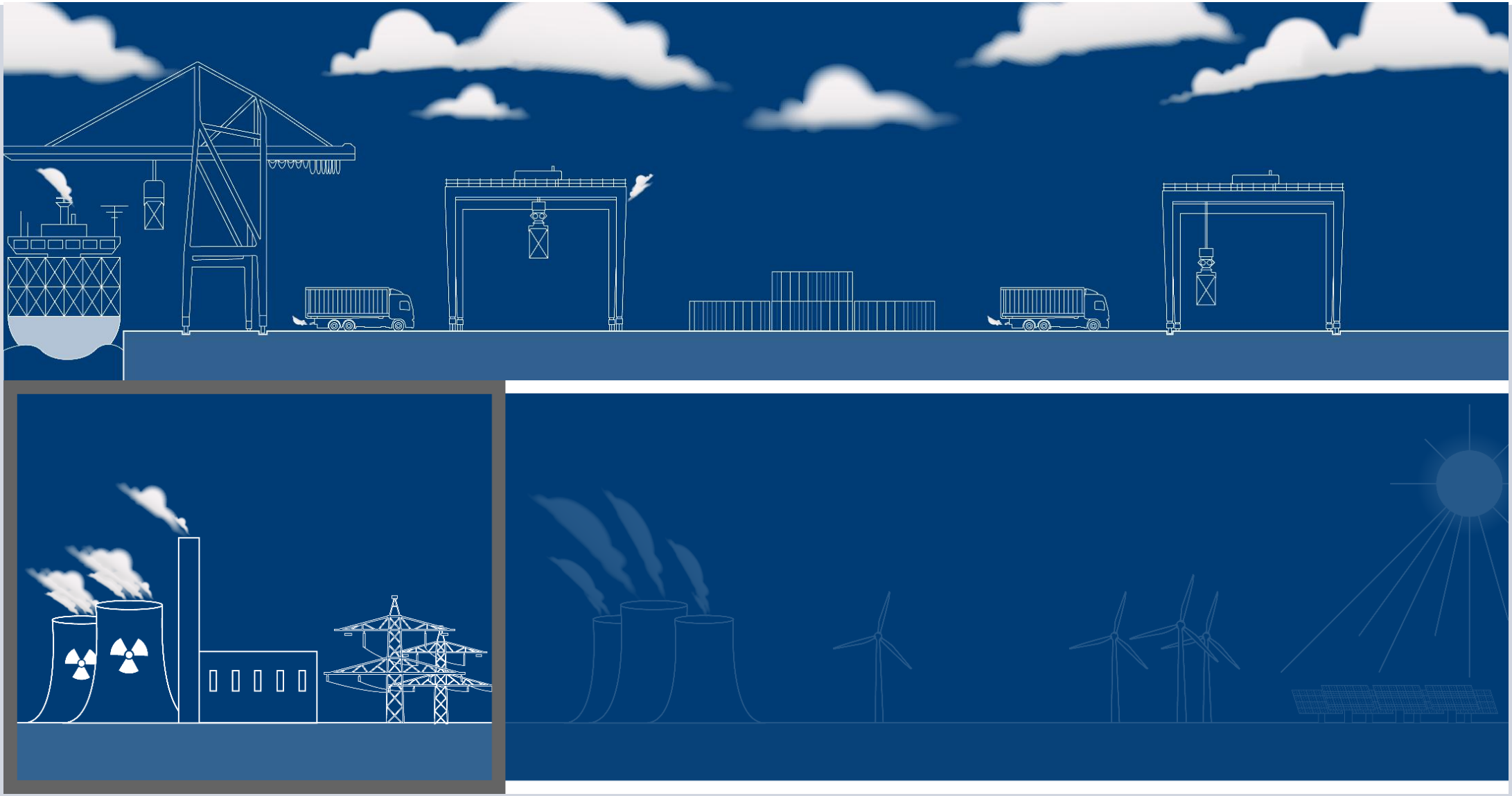
Shore Power

SPECIAL PROJECTS
Ferris Wheels, ...

PEOPLE MOVER
TRAMS, TRAINS, ...

Simplified Container Terminal Overview

In a changing world – 20 years ago



Simplified Container Terminal Overview

Nowadays and in the future

Simplified Container Terminal Overview

Container Terminal Automation

Step by step approach

1.0 ELECTRIFICATION

Insulated conductor rails 1000V, 1000A with aluminium/ stainless steel

2.0 POSITIONING

Precise position feedback with a contactless reading head

3.0 DATA COMMUNICATION

Interference-free and safe data & video

2020 - 300 Mbps

2024 - 600 Mbps

2026 – 1 Gbps

4.0 - AUTOMATION

Combination of electrification, positioning and data communication for remote control

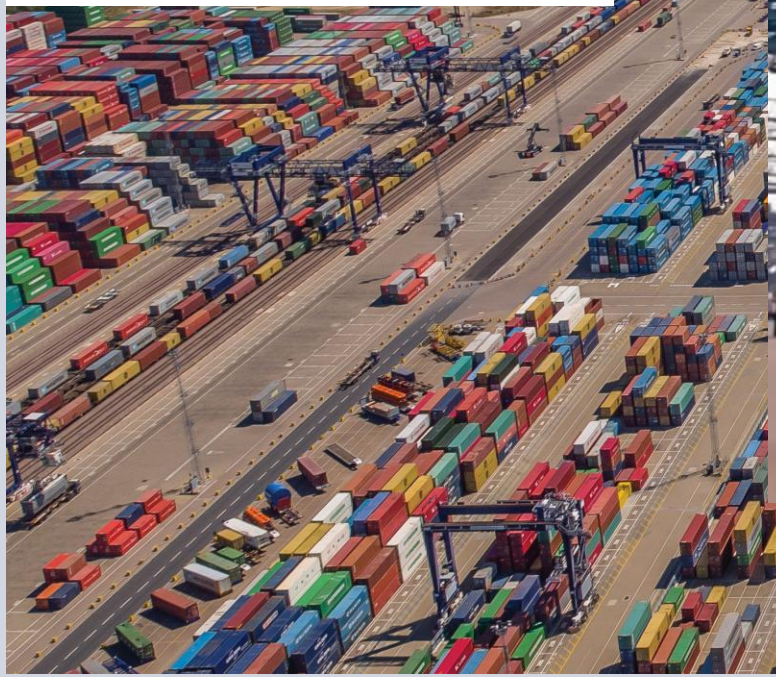
Case study – Great Britain, HPH UK – Port of Felixstowe

Innovations and Milestones

2014 – today

Brownfield
66 ZPMC RTGs

RTG Retrofit
59 blocks (15,3 km)



Case study – Great Britain, HPH UK – Port of Felixstowe

Innovations and Milestones

2020 – today

Greenfield

8 Remote ZPMC AeRTGCs

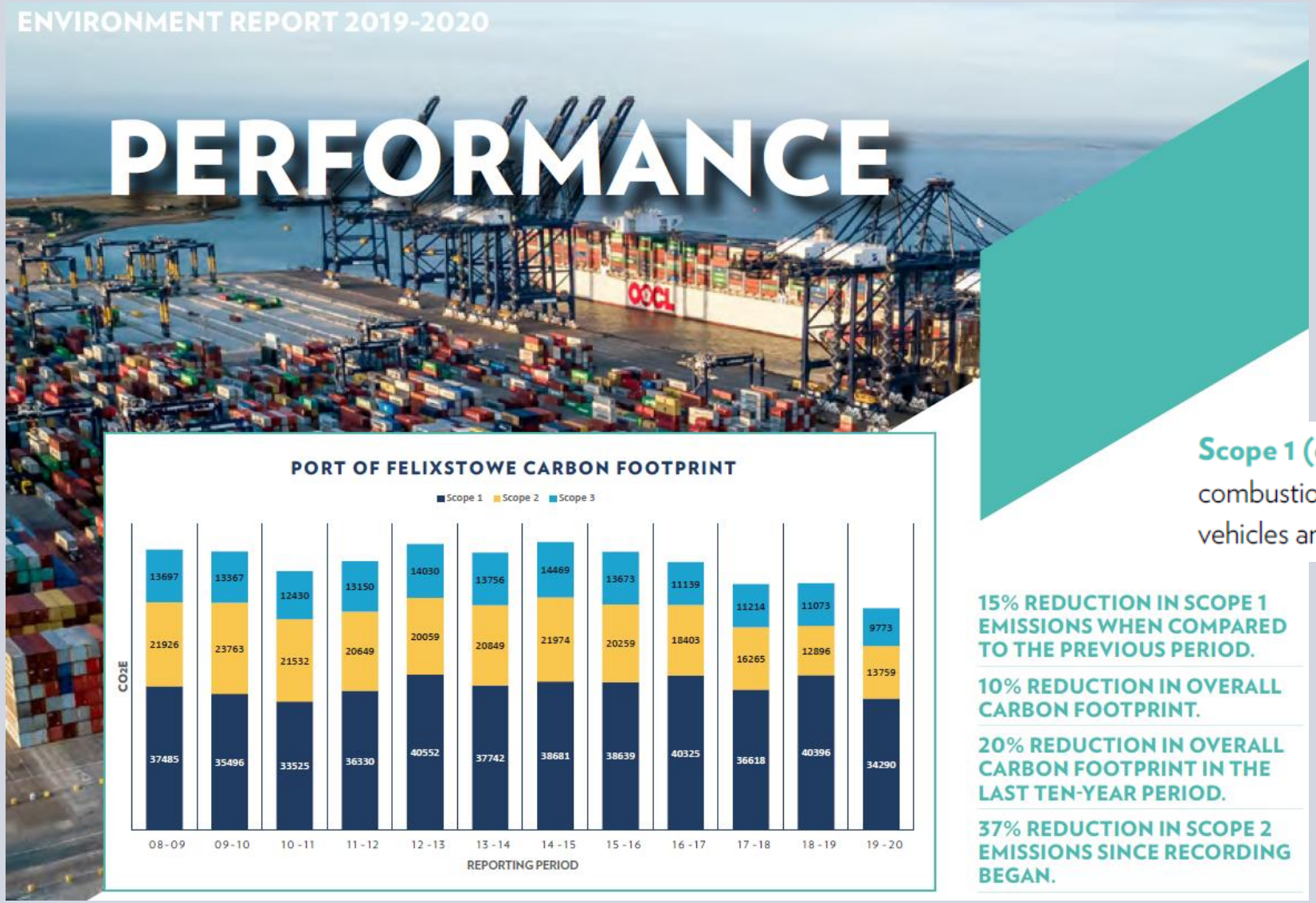
17 Remote KC AeRTGCs

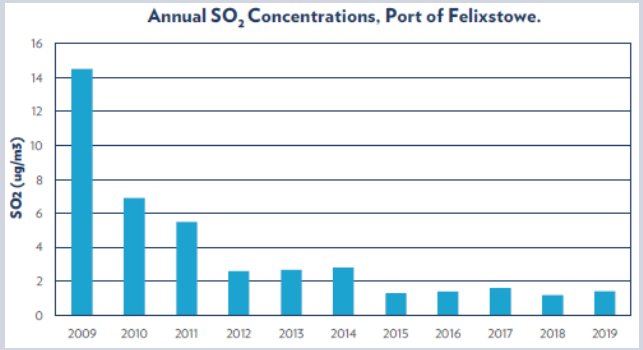
Container Blocks

18 blocks (5,2 km)

Great Britain, HPH UK – Port of Felixstowe

Customer case study





Scope 1 (direct) emissions produced on-site by fossil fuel combustion; mainly by RTG cranes, internal movement vehicles and port vehicles.

15% REDUCTION IN SCOPE 1 EMISSIONS WHEN COMPARED TO THE PREVIOUS PERIOD.

10% REDUCTION IN OVERALL CARBON FOOTPRINT.

20% REDUCTION IN OVERALL CARBON FOOTPRINT IN THE LAST TEN-YEAR PERIOD.

37% REDUCTION IN SCOPE 2 EMISSIONS SINCE RECORDING BEGAN.

Total savings since 2015-2020:

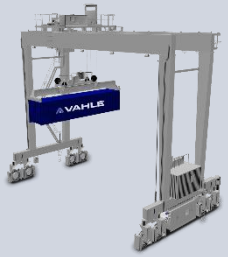
89.620 tons CO^2

Source: PoF Environment Report 2020

Thailand, HPT Laem Chabang – Terminal D

Greenfield Project Success Stories

2017 - today



Remote operation with 20 new AERTGCs

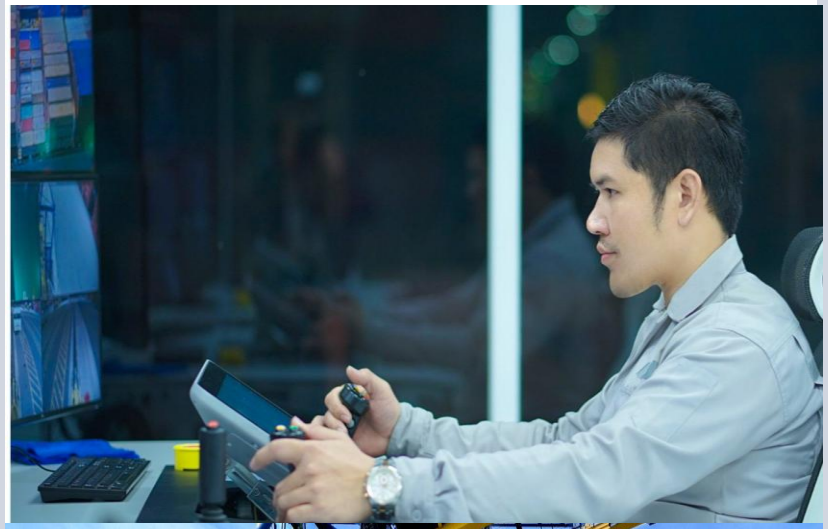
Automation of 20 container blocks
in phase 1 – 5,040 m

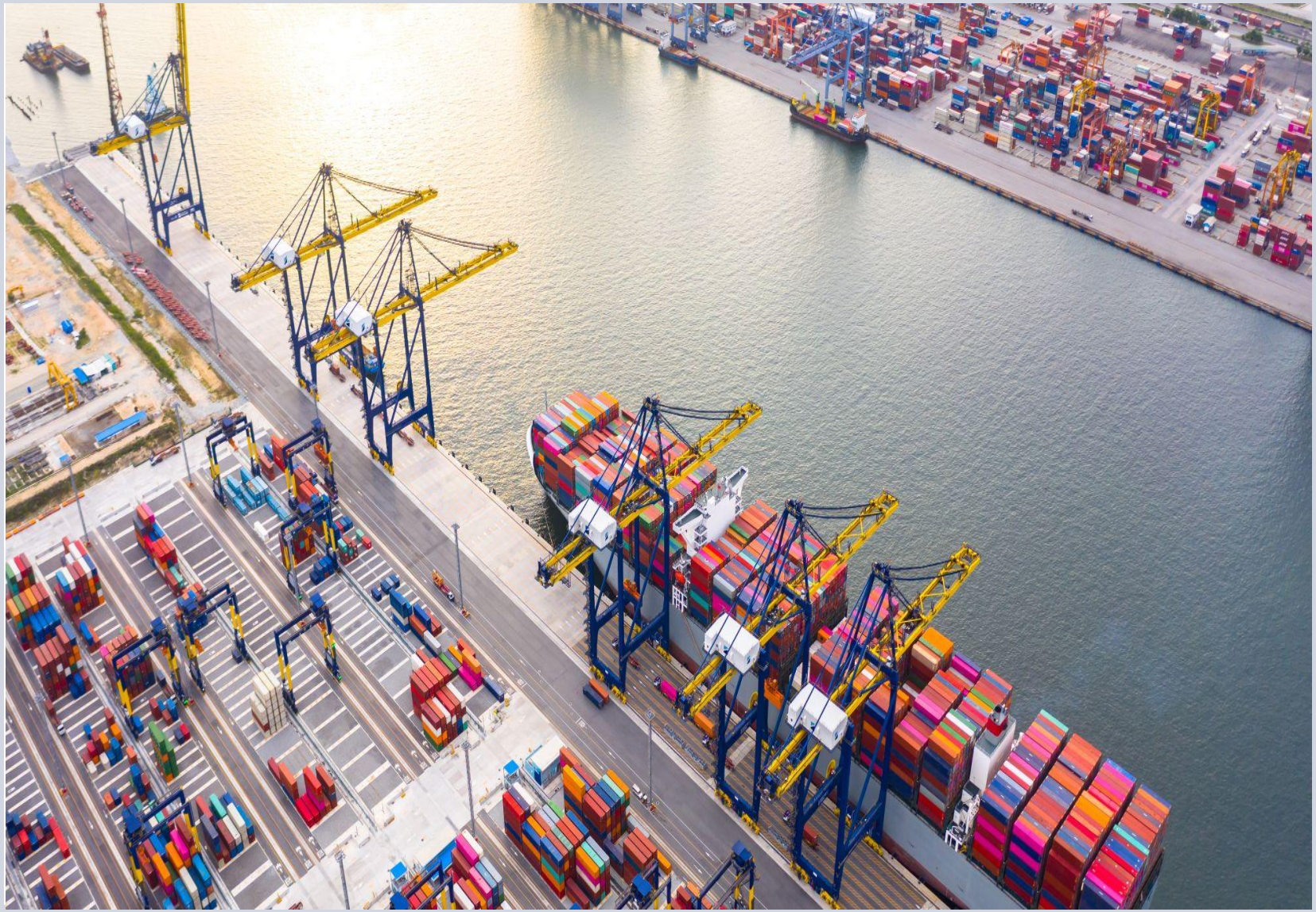
Including **SMGX data communication system**

World's first fully automated terminal

Case study – Thailand, Laem Chabang – HPT Terminal D

Container Terminal Automation





Available technology for different crane functions

Functions for retrofit and new OEM cranes

- **Block change batteries** to charge during the exit of the conductor bar powered block. We use NCA cells for this type of battery solution,
- **Hybrid batteries** in combination with smaller Diesel genset and/or conductor bar for a full eRTGC. We use NCA cells for this type of battery solution.
- **Peak shaving batteries** to cap load peaks above a defined limit. The power grid reference is kept within a defined value.

VAHLE Battery Storages for RTGCs

Retrofit projects in a VAHLE energy battery storage container

New OEM cranes in OEM e-room or battery power pack

New battery-storage development by Vahle

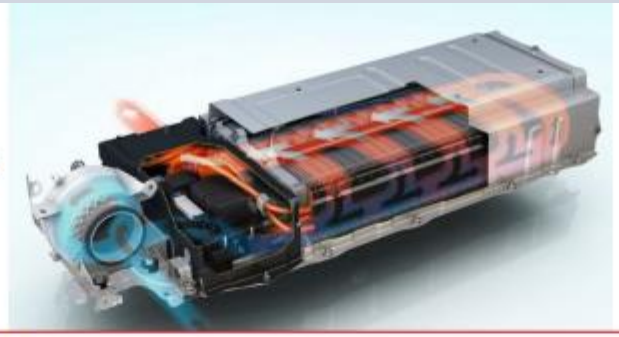
AIR COOLED

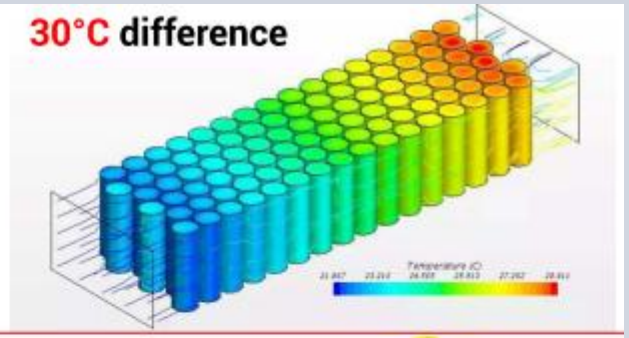
- Big space need
- Air contamination
- Low efficiency

E4V

LITHIUMWERKS

PowerTech systems





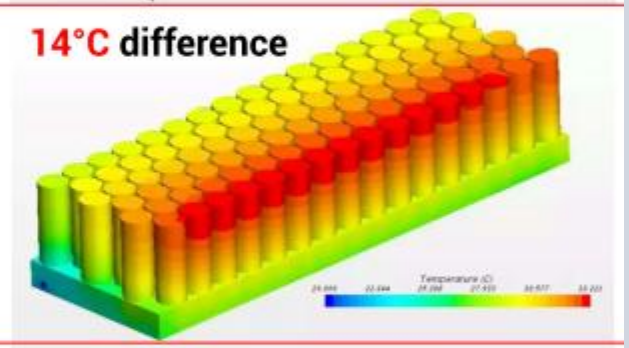
WATER COOLED

- Cold plate (volume/weight)
- Isolate water from live parts
- Water leakage risk

INVENOX

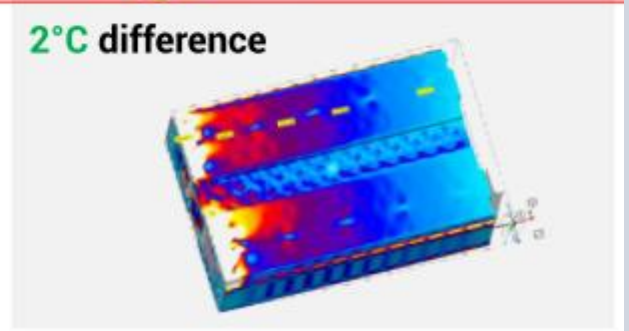
Xerotech

KREISEL



Immersion Cooling

- Best cooling efficiency
- No additional parts
- Homogeneous temperature
- Improved safety



Intelligent Battery Management System (BMS)

Safety BMS / BSM
Battery Management System
Battery Safety Management

European hardware and software electronics BMS
Prevent overcharge/discharge, overcurrent
Prevent over/undertemperature

- Best-in-class functional safety reaching ASIL C
- World first immersion cooled battery conforming to ISO 26262

ISO 26262 = automotive standard for safety of electronic/electronic components

ASIL = Automotive Safety Integrated Level, ranging from A to D

Project study - Khalifa Port | Abu Dhabi

Impressions – Trimotion compact – Installation and comissioning

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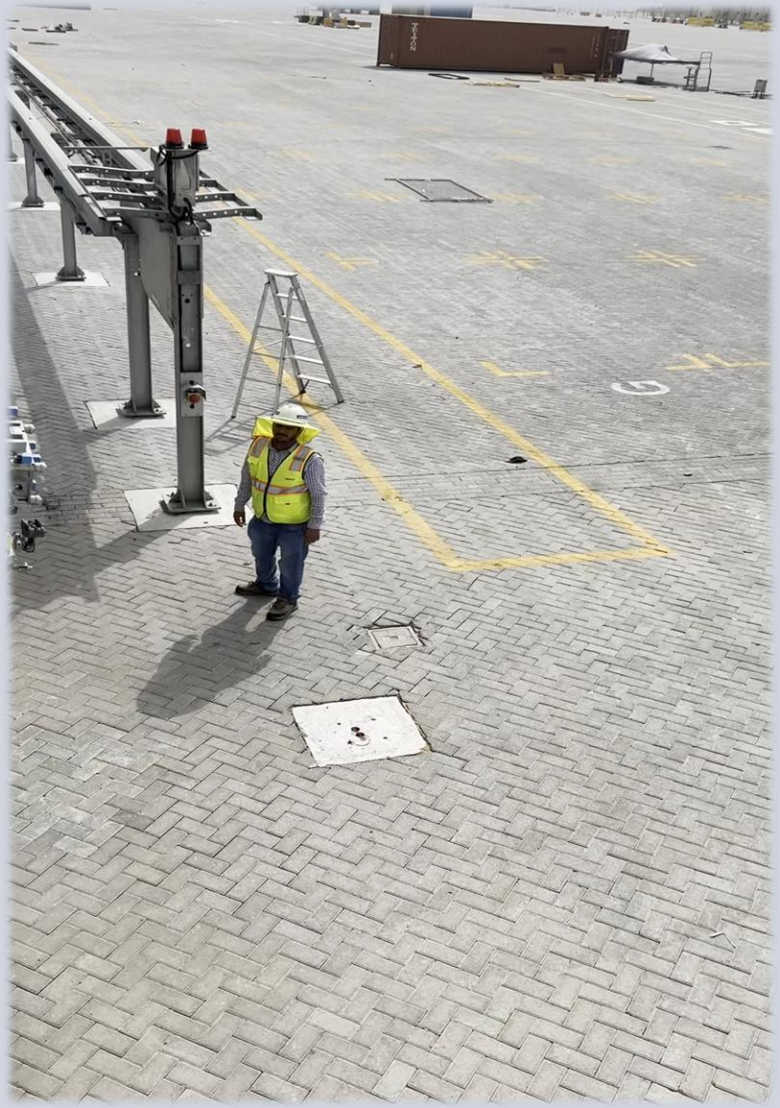

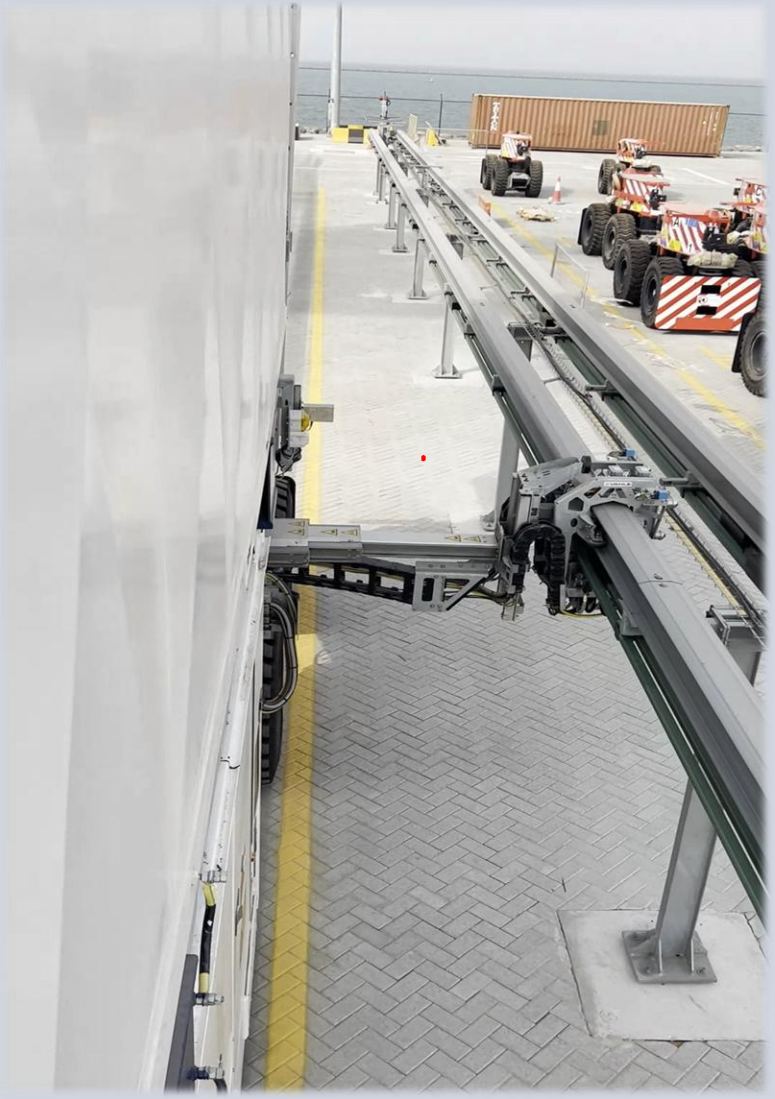

Benefits of VAHLE Electrification & Automation Solutions

ECONOMIC

- Optimized OPEX by reduced fuel cost and idle time
- Reduced dependency on fossil fuel supplies
- Reduced GenSet maintenance cost
- Smart / remote maintenance
- Personnel costs are saved
- Productivity is increased
- Optimized Total Cost of Ownership

ECOLOGIC

- Reduction of CO_2 emissions and noise pollution
- Sustainable and green – at best with renewables

EFFICIENT

- Flexible yard operation
- Automatic connection system
- Autosteering
- Seamless synchronization
- Human Safety

PHILIPPINE PORTS AND LOGISTICS 2026

AVAHLE

YOUR VISION COUNTS:
WE ARE READY

MEET US AT:
BOOTH #11&22

PROUD MEMBER OF:

PEMA