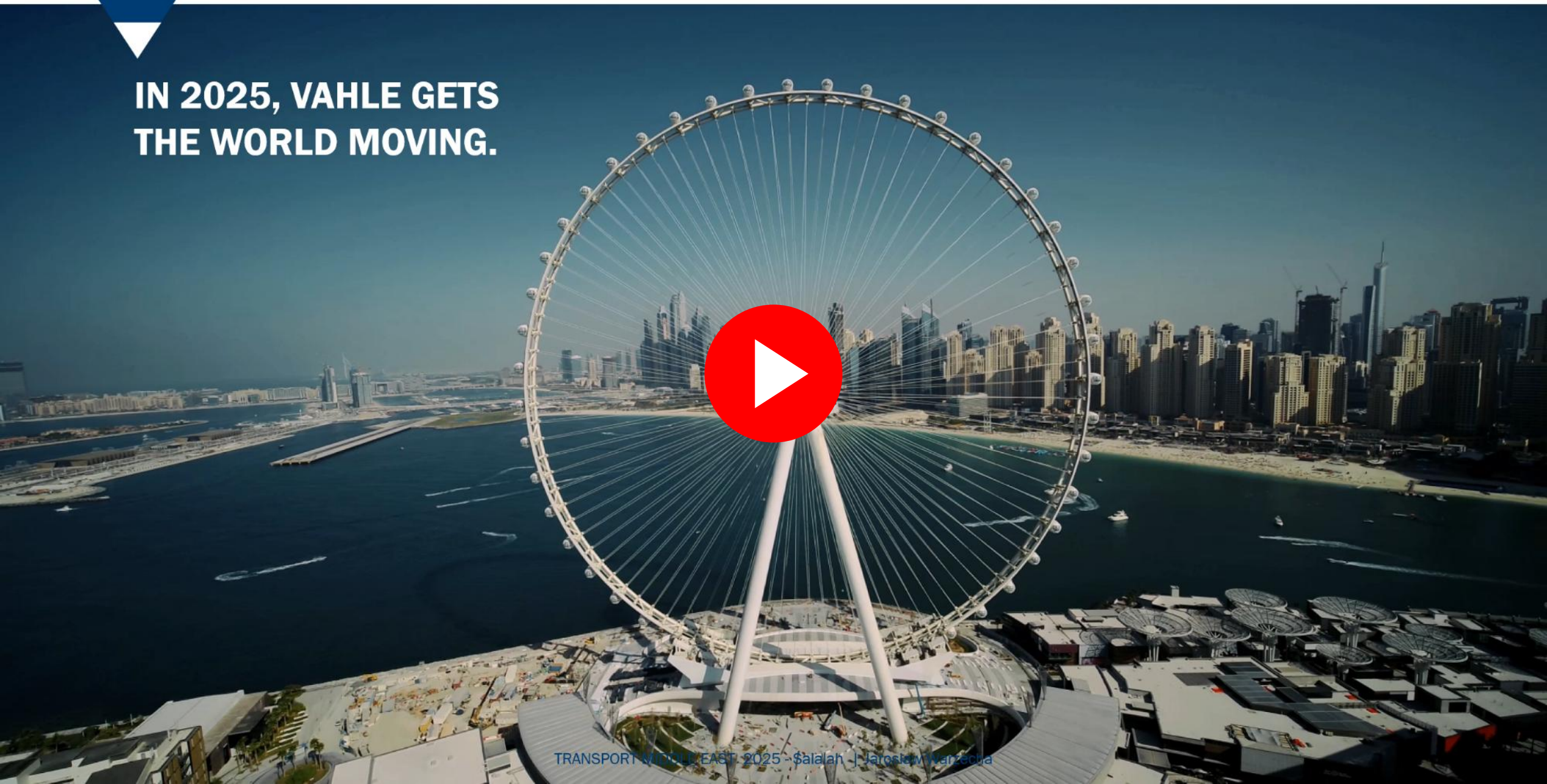
THE ZERO EMISSION TERMINAL - HOW TO CONNECT TO THE GREEN FUTURE

Salalah, 02.09.2025


IN 2025, VAHLE GETS
THE WORLD MOVING.

VAHLE at a glance

> 200 Mio.
TURNOVER IN EURO (2024)

> 825
EMPLOYEES

14
MARKET ORGANIZATIONS

5
PRODUCT GROUPS

4
TARGET MARKETS

VAHLE at a glance

TRANSPORT MIDDLE EAST 2025

VAHLE

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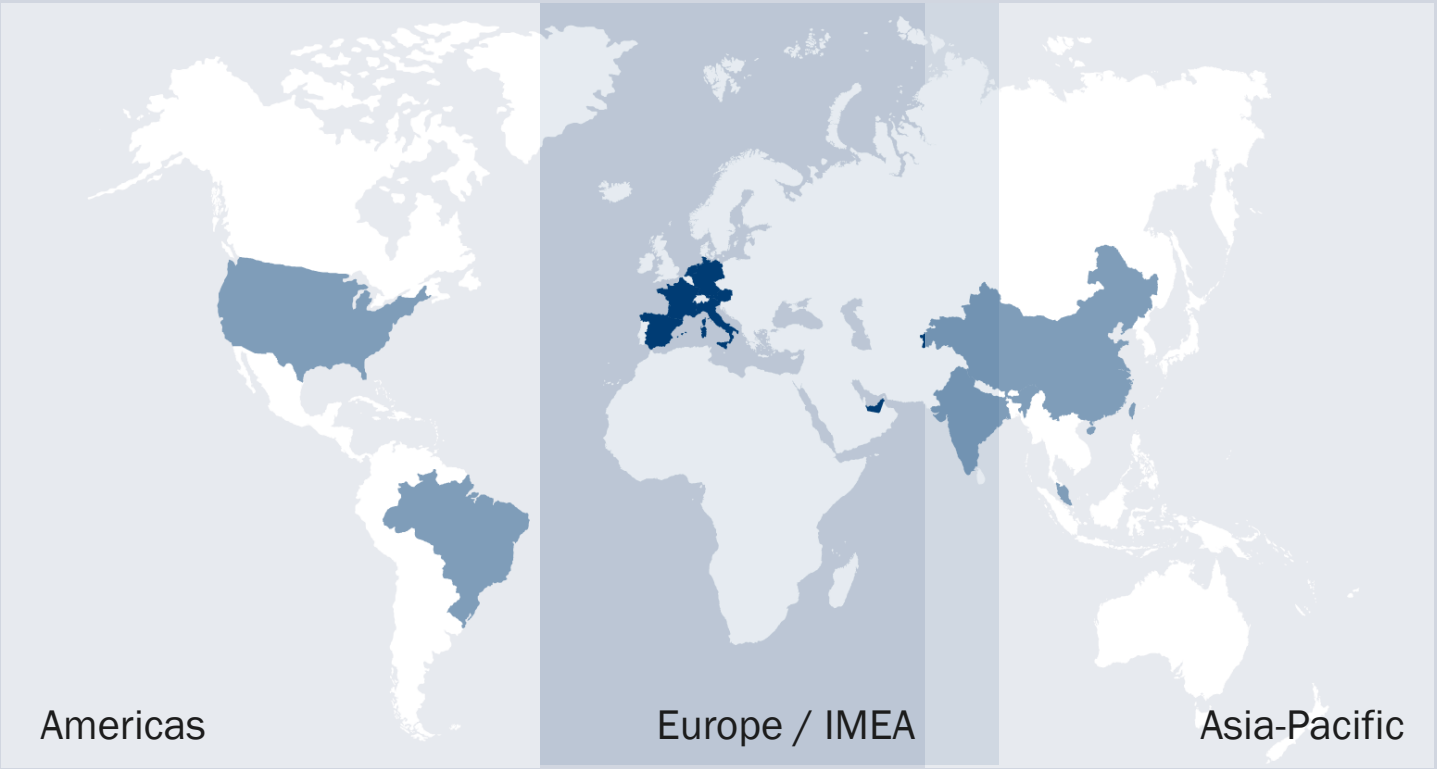


- Energy Transmission
- Data Communication
- Positioning
- Control Systems
- System Solutions
- Intralogistics
- Crane Technology
- Automotive
- Port Technology

Business Unit Port

TRANSPORT MIDDLE EAST 2025

VAHLE

PORT TECHNOLOGY
CONTAINER HANDLING

Motorized Cable Reels

Festoon & USMG Solutions

eRTG Systems

Truck Charging

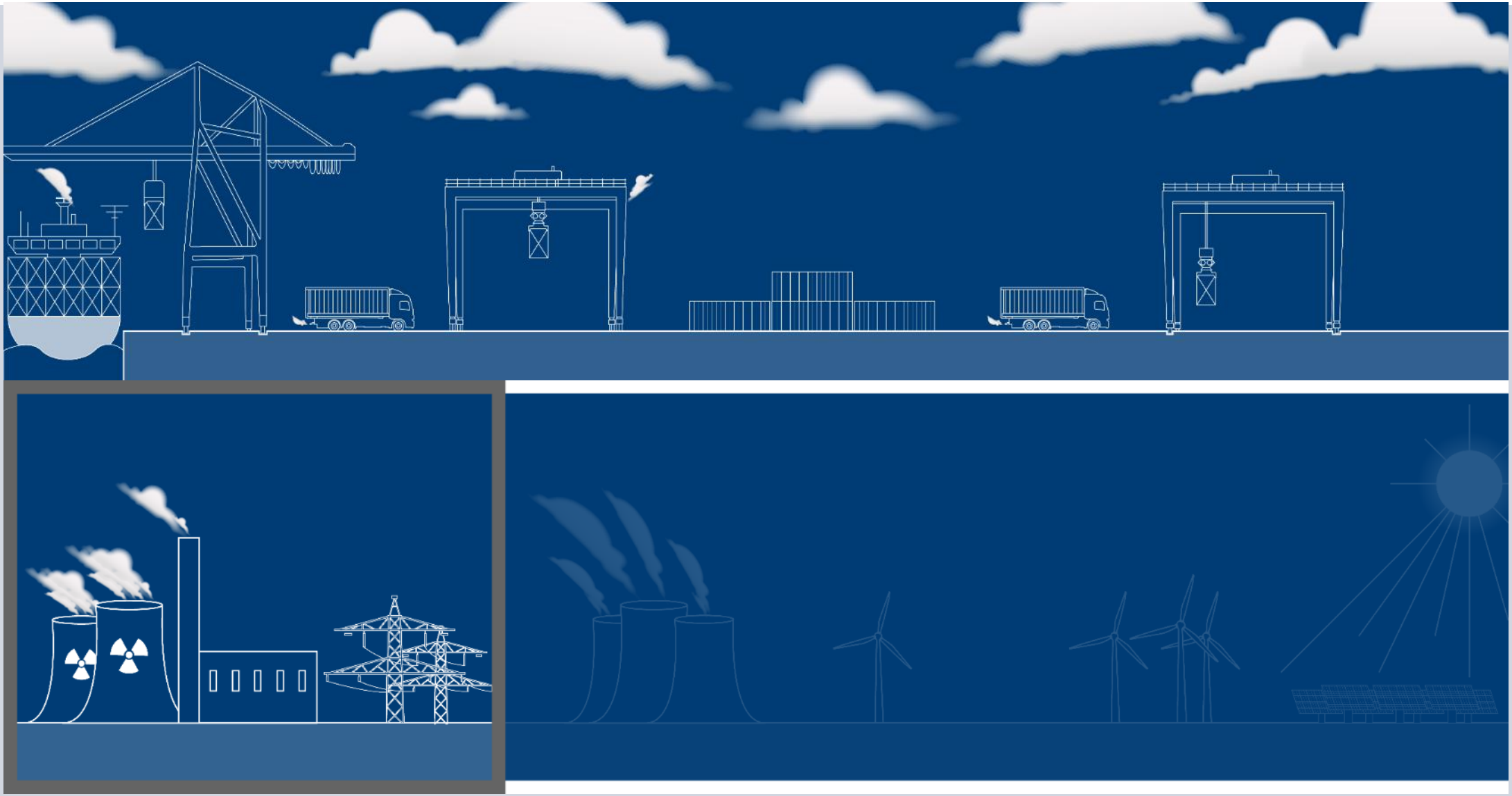
Shore Power

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

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VAHLE

Container Terminal Automation

Step by step approach

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VAHLE

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

2023 - 600 Mbps

2025 – 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

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VAHLE

2020 – today

Greenfield

8 Remote ZPMC AeRTGCs

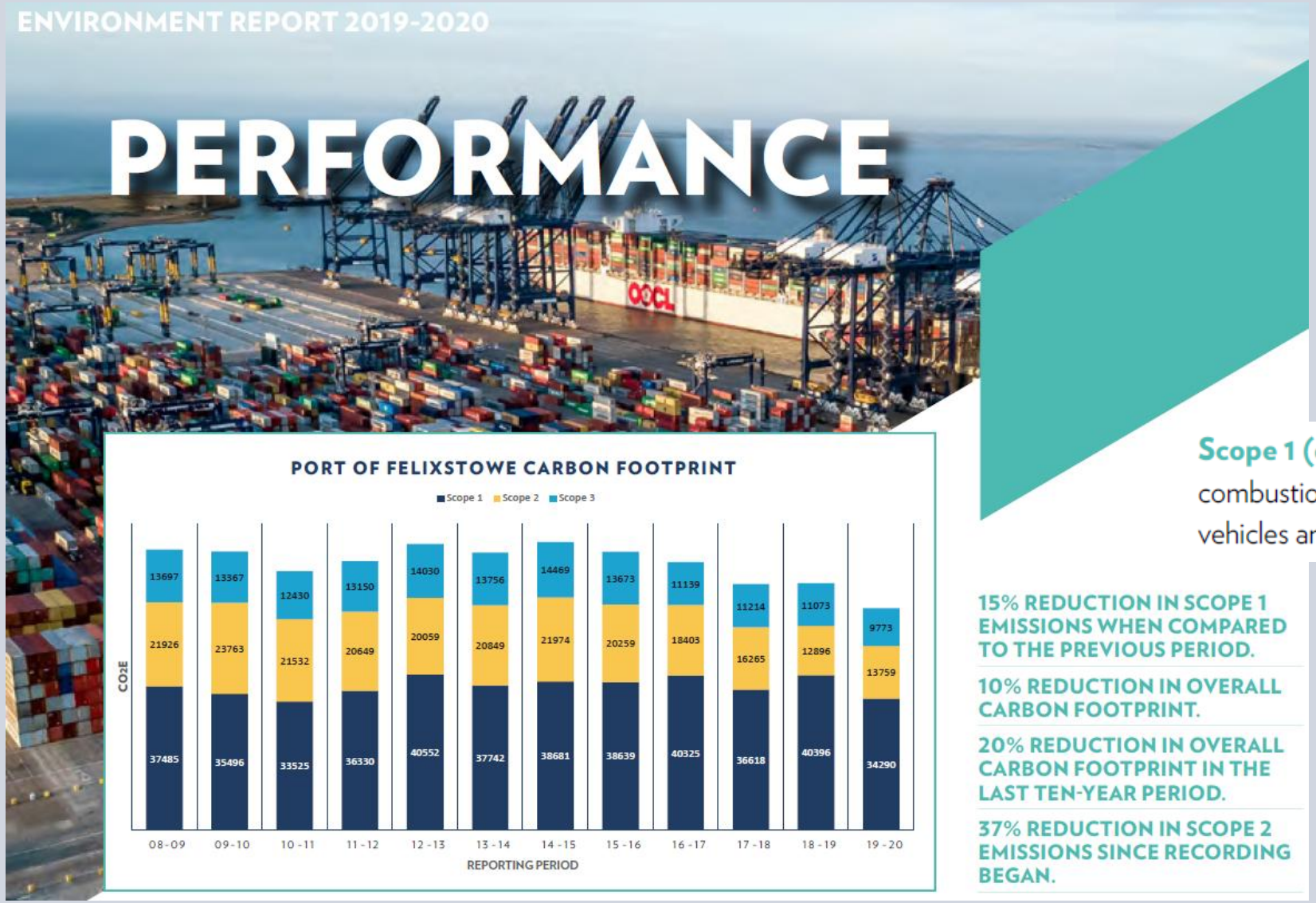
17 Remote KC AeRTGCs

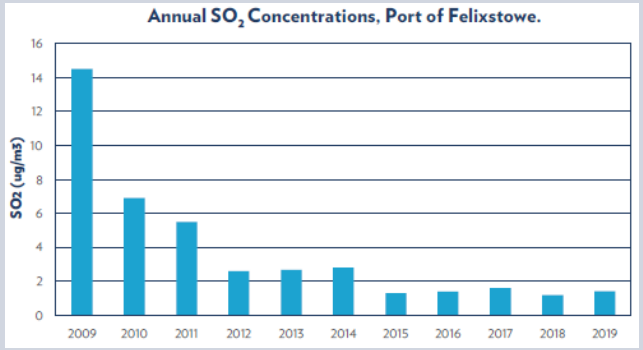
Container Blocks

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

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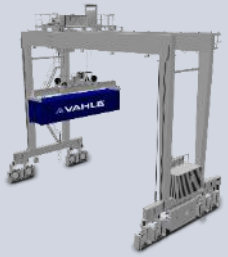
Thailand, HPT Laem Chabang – Terminal D

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

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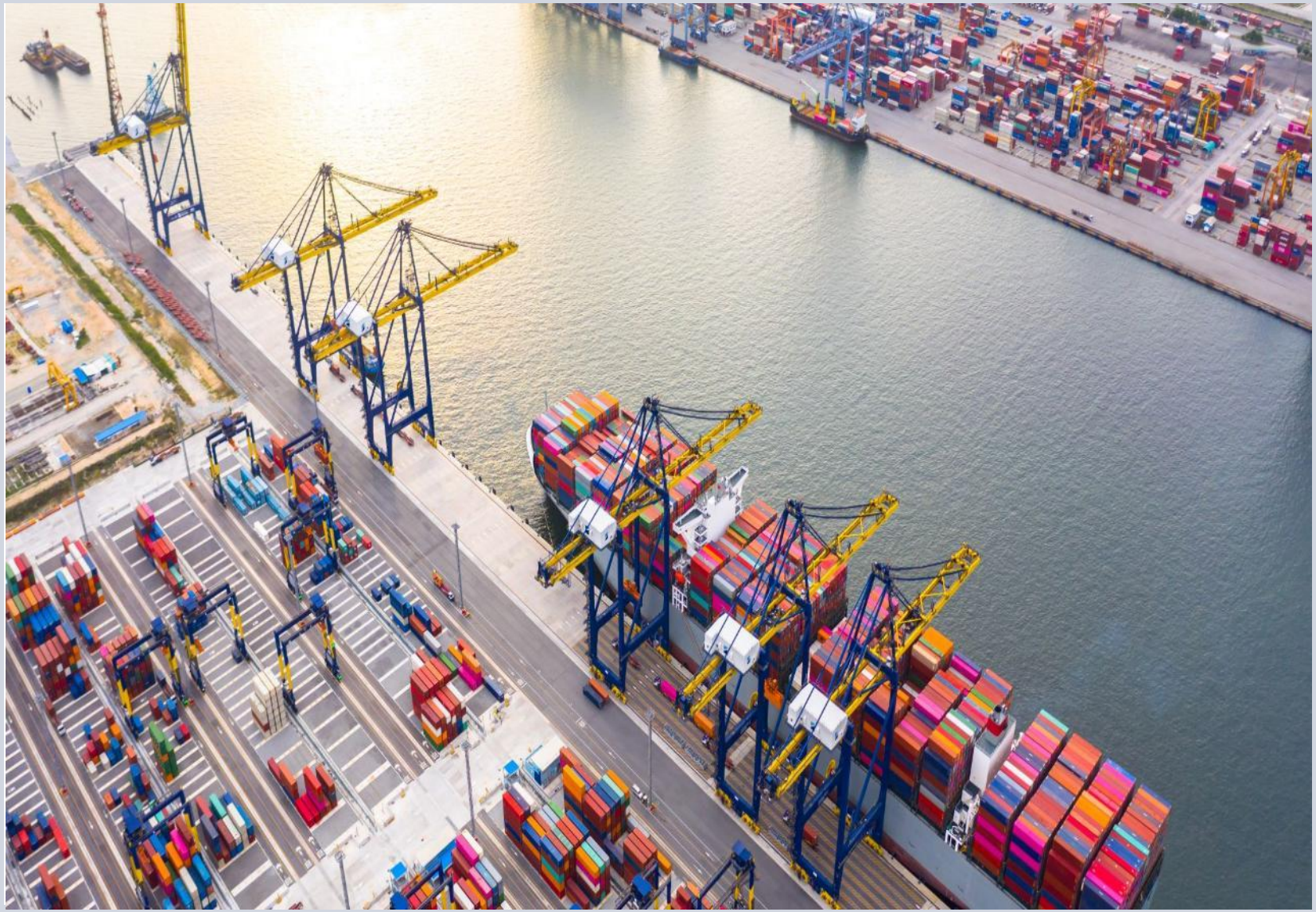
Case study – Thailand, Laem Chabang – HPT Terminal D

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

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VAHLE

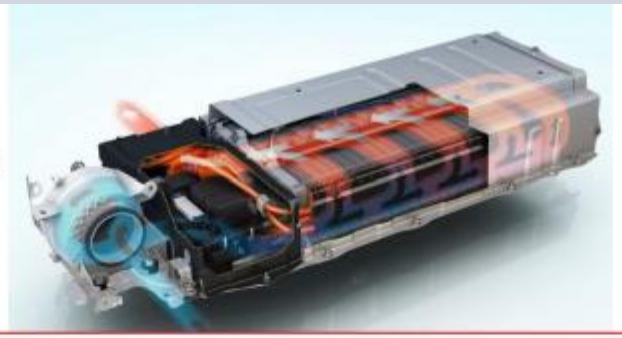
AIR COOLED

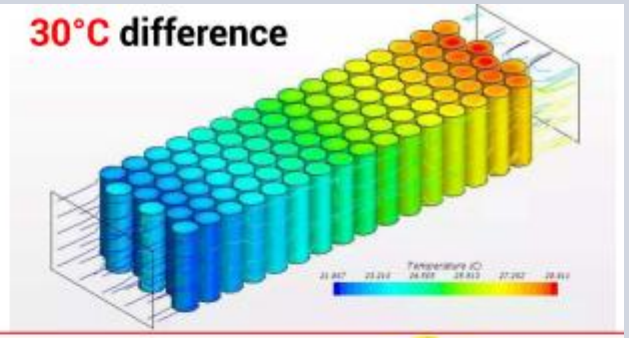
- Big space need
- Air contamination
- Low efficiency

E4V

LITHIUMWERKS

PowerTech systems





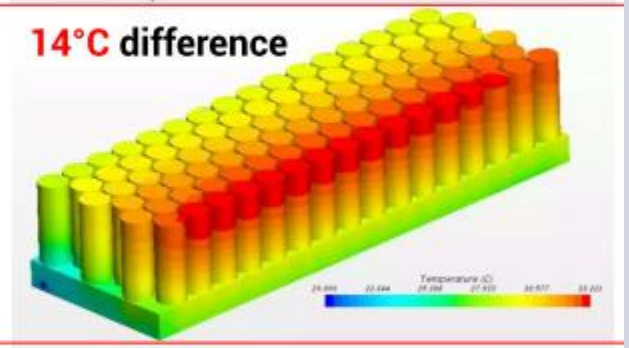
WATER COOLED

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

INVENOX

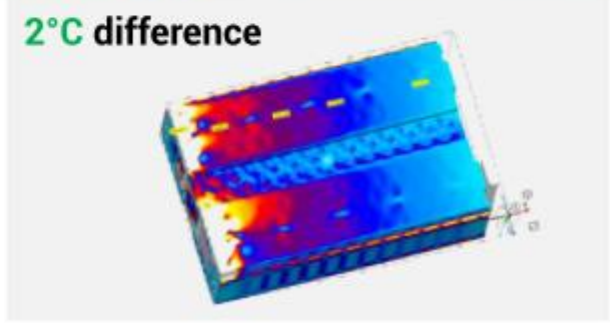
Xerotech

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

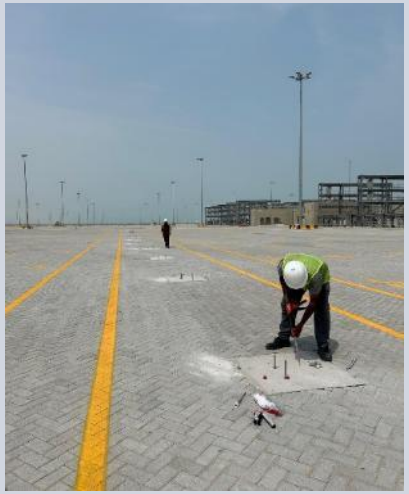
- Best-in-class functional safety reaching ASIL C
- World first immersion cooled battery conforming to ISO 26262

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



Project study - Khalifa Port | Abu Dhabi

Impressions – Trimotion compact – Installation and comissioning

Benefits of VAHLE Electrification & Automation Solutions

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VAHLE

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

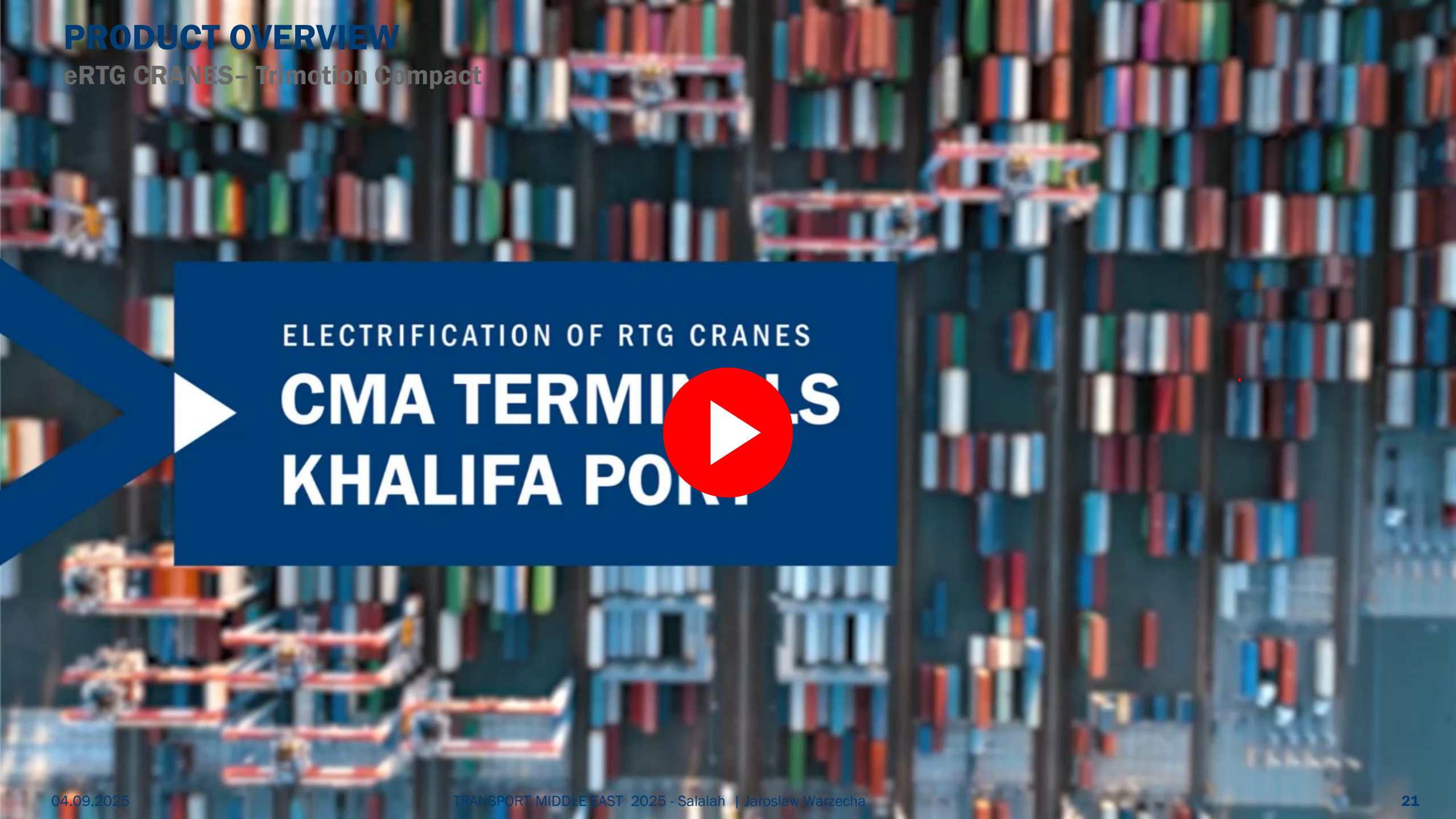
- Reduction of CO_2 emissions and noise pollution
- Sustainable and green – at best with renewables

EFFICIENT

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

PRODUCT OVERVIEW

eRTG CRANES– Trimotion Compact



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AVAHLE

YOUR VISION COUNTS:
WE ARE READY

MEET US AT:
BOOTH #24