Black and Caspian Sea 2023
PORTS & SHIPPING

The Zero Emission Terminal – How to Connect the Green Future

Electrification & Automation Solutions for Port Equipment

VAHLE Group – Key Facts

845 employees worldwide

100 %

Family owned since 1912

13 VAHLE subsidiaries worldwide and representations in 52 countries

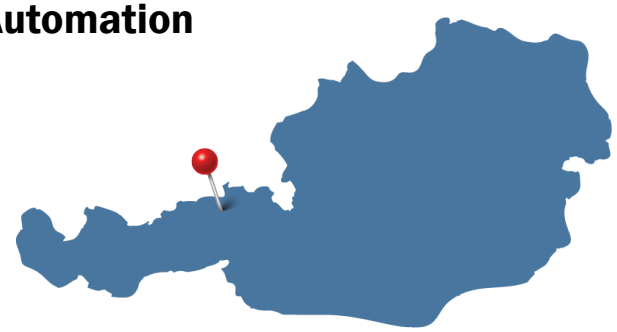
€ 170 mil. in sales

Headquarter
Kamen, Germany

- Engineering
- Production
- Sales

Technology Center Automation
Schwoich, Austria

- Engineering
- Trend Scouting
- Training



VAHLE Company Film

WHAT DOES SYSTEMS SALES

OVERVIEW MARKET SEGMENTS

Black and Caspian Sea 2023 PORTS & SHIPPING

VAHLE

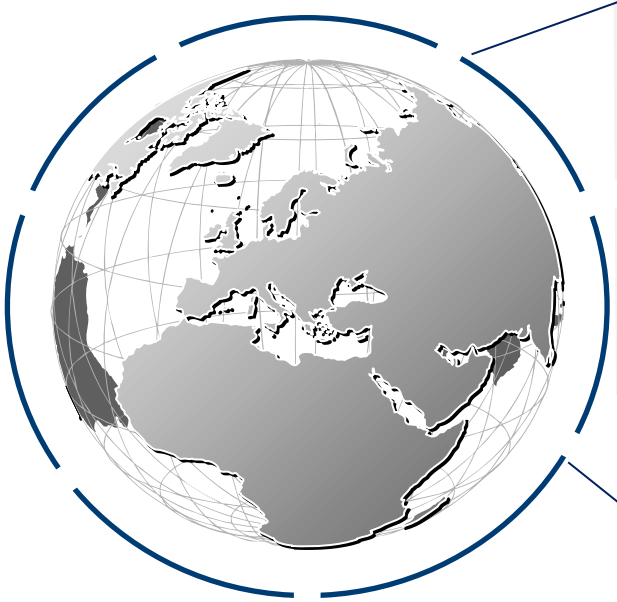
PORT TECHNOLOGY
CONTAINER HANDLING

Motorized Cable Reels

Festoon & USMG Solutions

eRTG Systems

Truck Charging

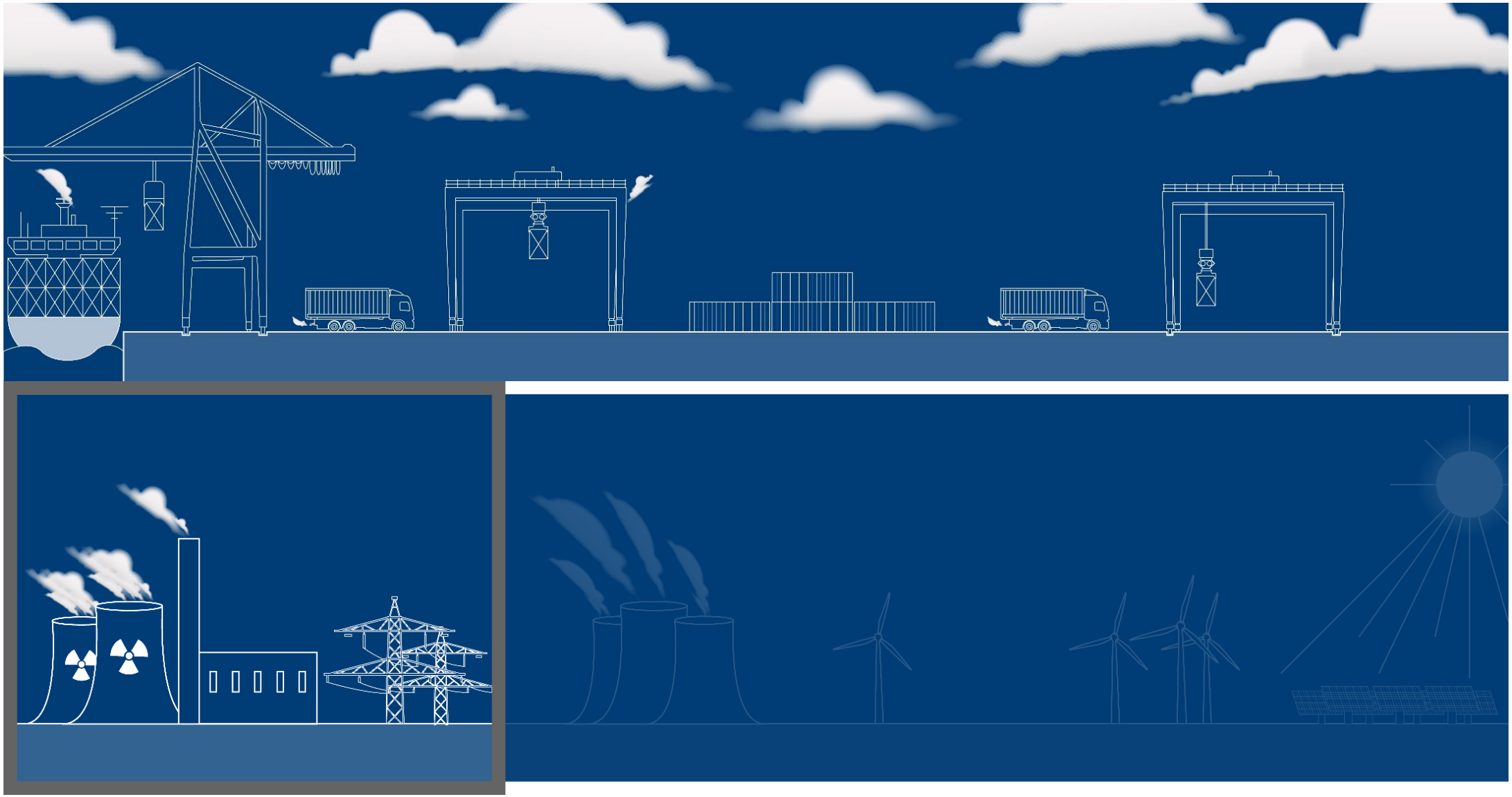


AMUSEMENT RIDES
ROLLER COASTER, ...

PEOPLE MOVER
TRAMS, TRAINS, ...

Simplified Container Terminal Overview

In a changing world – 20 years ago

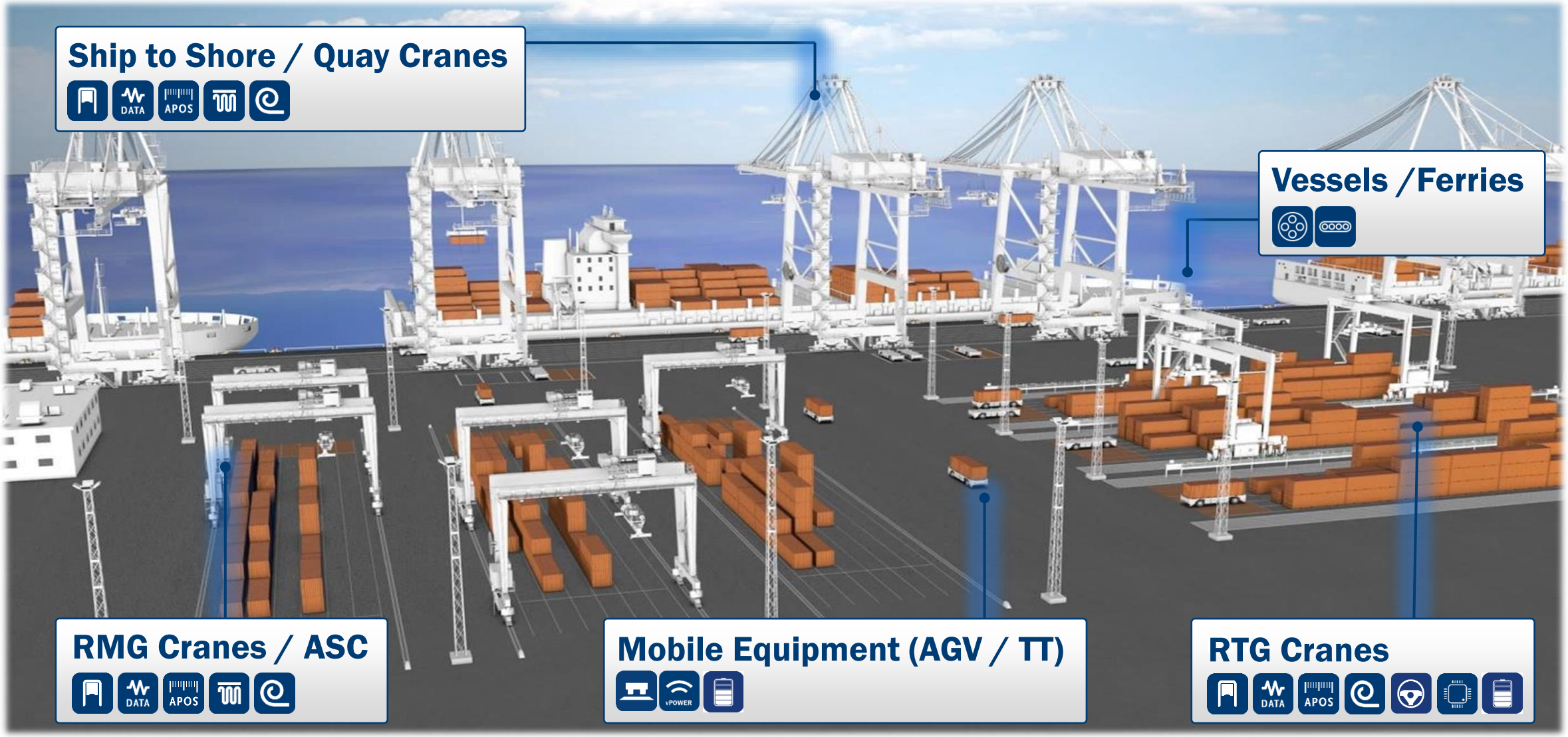


Simplified Container Terminal Overview

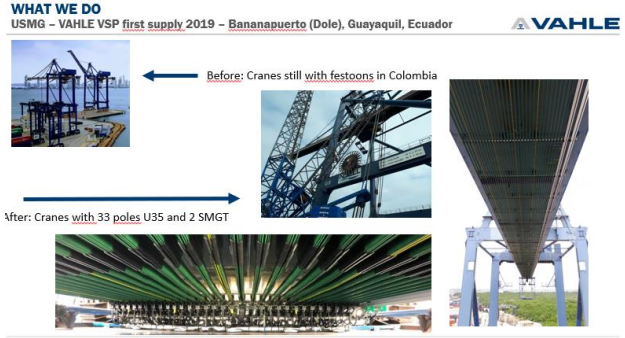
Nowadays and in the future

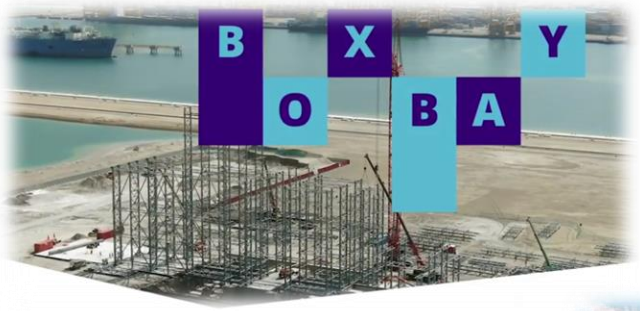
Simplified Container Terminal Overview

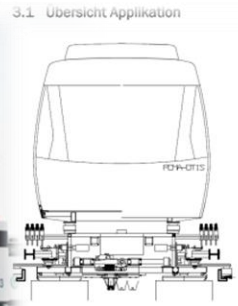
Portfolio of Equipment

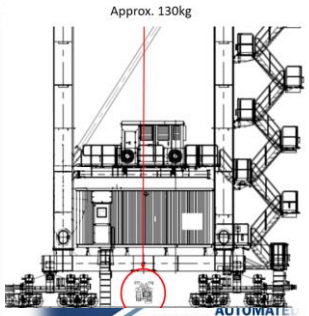


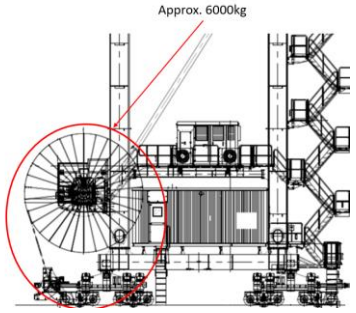
WHAT DOES SYSTEMS SALES
Concepts & Customizing

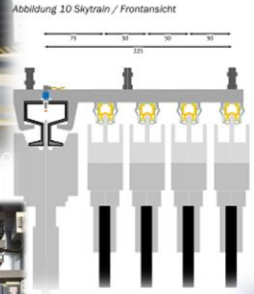


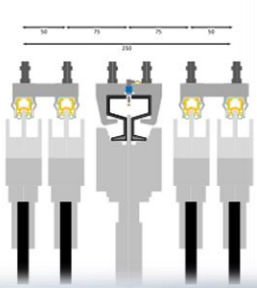


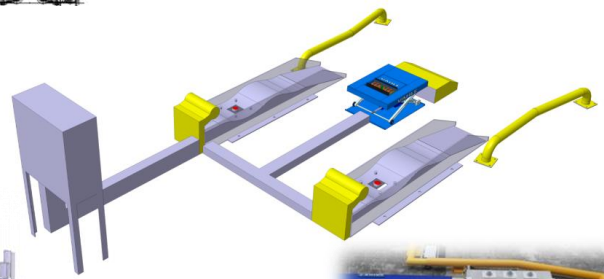


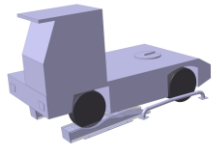












WHAT DOES SYSTEMS SALES

Customer Support & Project Management











Electrification of Port Equipment

Upgrade your Yard Cranes | Increase of flexibility

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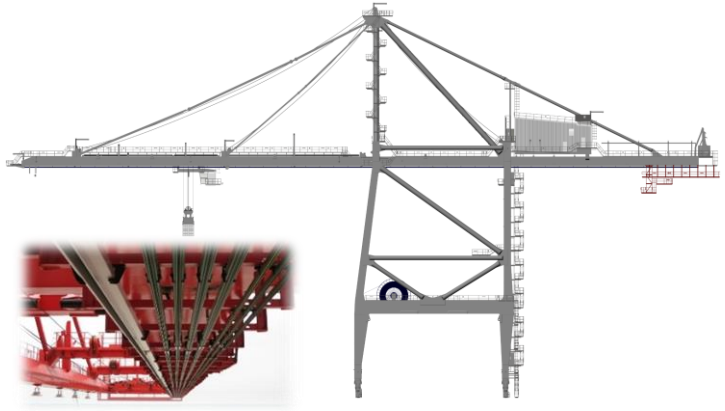
Ship to Shore Crane



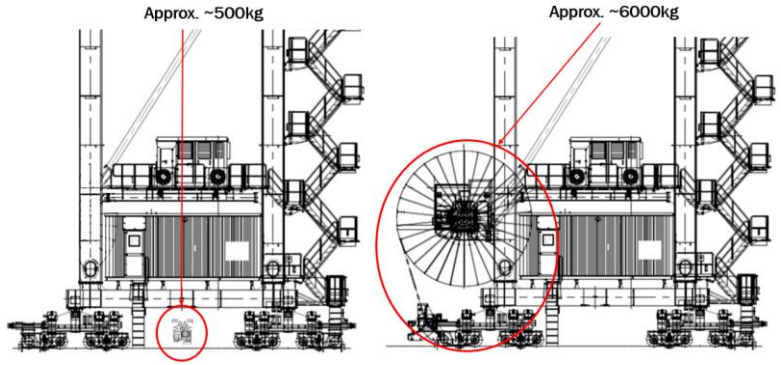
Technical benefits...

- ✓ Minimize weight movement
- ✓ High trolley speed, up to 600 m/min
- ✓ No influences by wind / heavy rain / ice
- ✓ No cable loops and no storage area
- ✓ Extremely low maintenance

Operator´s benefits...

- ✓ Faster container handling through speed increase of the main hoist (trolley & lift)
- ✓ Higher container stacking level
- ✓ High availability and absolute reliable
- ✓ Optimized Total Cost of Ownership

RMG/ ASC



Technical benefits...

- ✓ Reduce weight on board of the ASC and cost of the ASC
- ✓ Reduce cost of control system (no cable reel drive, considerable smaller transformer and switch gear)
- ✓ Increase speed & performance
- ✓ Extremely low maintenance

Operator´s benefits...

- ✓ Faster container handling through increased travel speed
- ✓ High availability and absolute reliable Data Communication & Positioning system
- ✓ Optimized Total Cost of Ownership

eARTGC

Technical benefits...

- ✓ Flexible yard operation
- ✓ Automatic connection system
- ✓ Autosteering
- ✓ Seamless synchronisation
- ✓ Reduced GenSet maintenance cost

Operator´s benefits...

- ✓ Flexible yard operation
- ✓ Optimized OPEX by reduced fuel cost and idle time
- ✓ Reduction of CO2 and Noise Pollution
- ✓ Smart / Remote Maintenance
- ✓ Optimized Total Cost of Ownership

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

- ✓ 2016 – 40 Mbps
- ✓ 2017 – 80 Mbps

2020- 300 Mbps

2023- 600 Mbps

4.0 - Automation

Combination of electrification, positioning and data com. for remote control

Increase of energy and resource **efficiency**

Great Britain, HPH UK – Port of Felixstowe

Project success stories

2015 – today

Retrofit

66 ZPMC RTGs

Greenfield

Berth 9: 8 new remote ZPMC eRTGCs

17 new Konecranes aeRTGCs

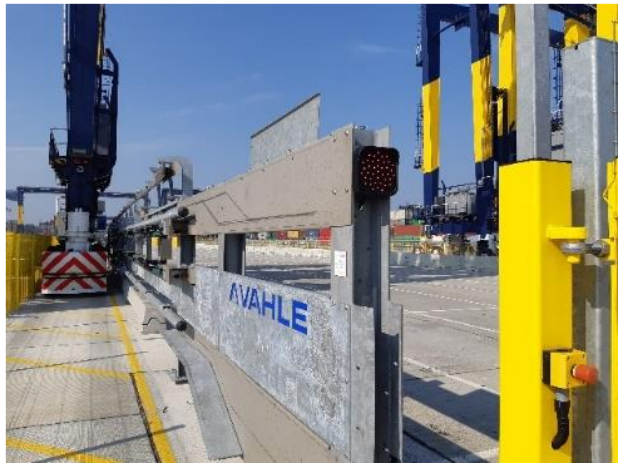
Retrofit

59 blocks (15,322 m)

Greenfield

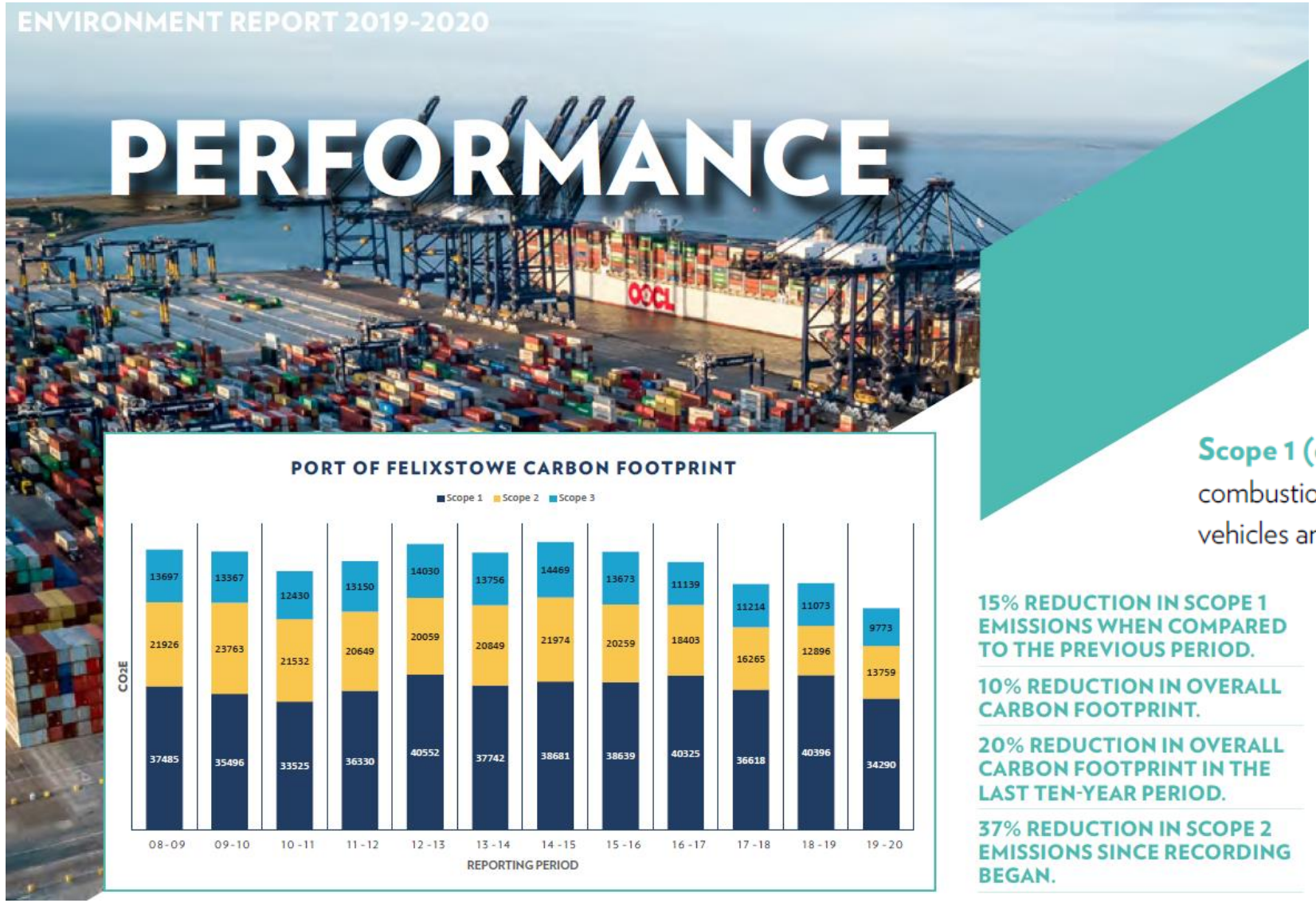
Berth 9: 8 container blocks

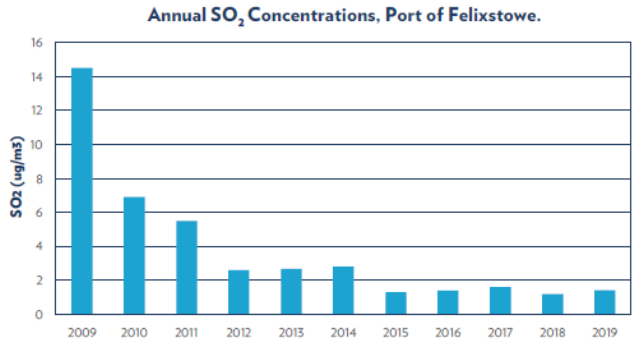
Automation with **SMGX data communication** and positioning



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:

89.620 tons CO_2

Source: PoF Environment Report 2020

Electrification of Port Equipment

Upgrade your Equipment| Increase of flexibility

TRUCK CHARGING
STATIONARY CHARGING SOLUTION

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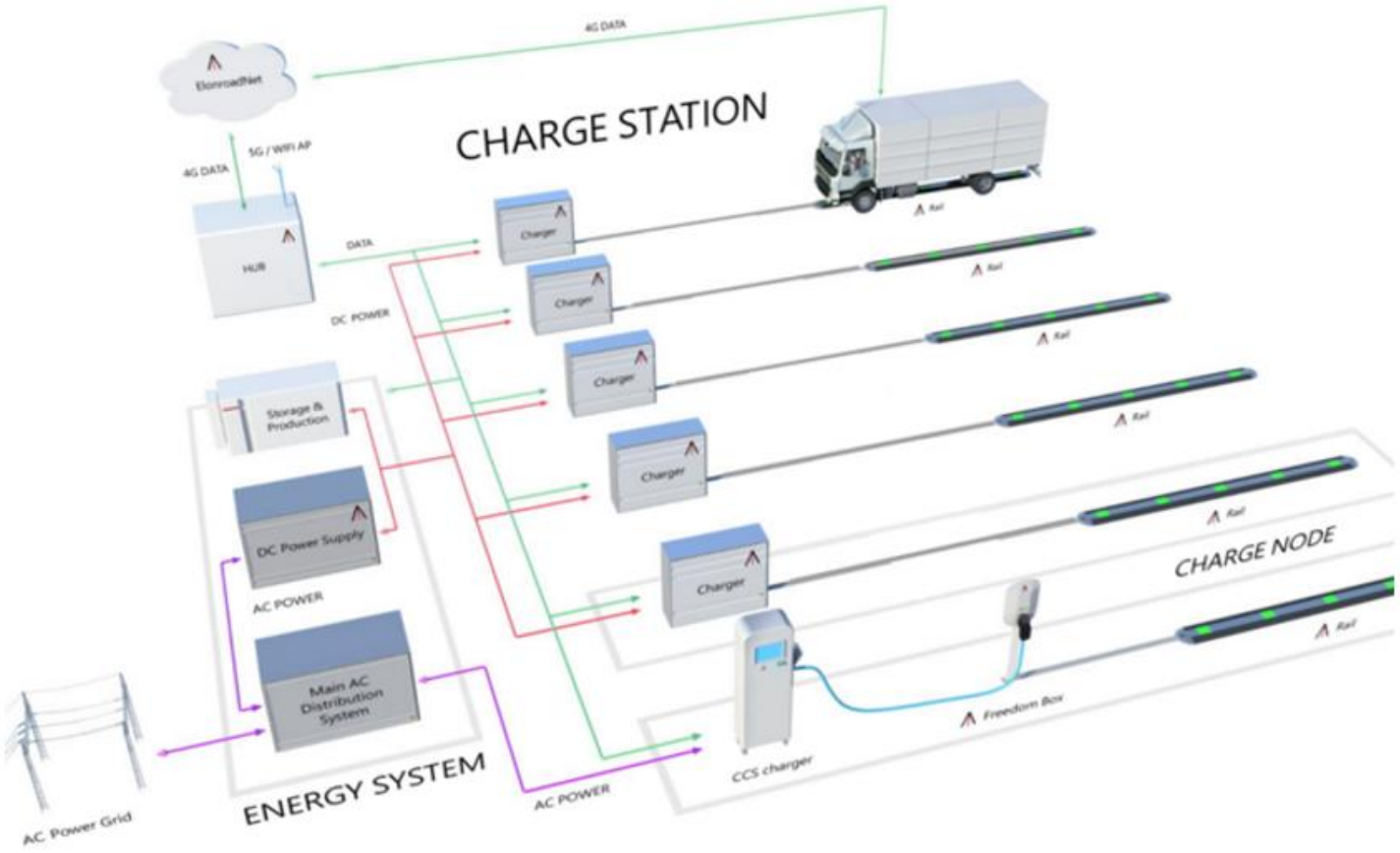
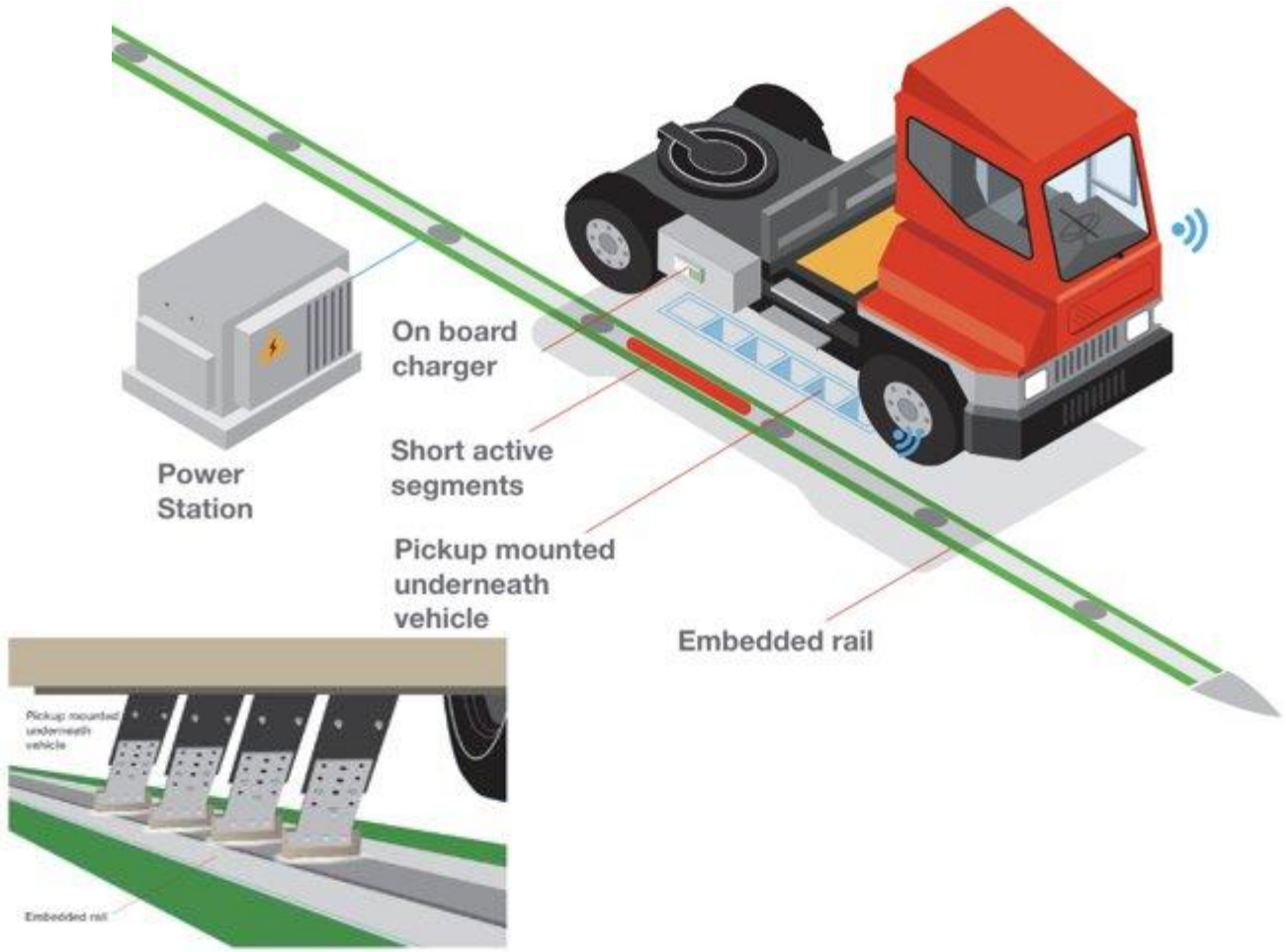
CHARGE STATION



- Fully automated charging while loading/unloading and during night parking, with no need for human intervention
- Following standard CCS-based DC fast charging with low-impact vehicle integration, up to vehicle's charge power limit
- Convenient for drivers so they can focus on doing their actual job without additional work environment challenges
- Optimizing operations by removing waiting times for cable charging, decreasing fleet redundancy needs
- System flexibility with modular architecture to follow electrification journey and integrate with local energy network (storage, production, DC grid)
- Deployment readiness for fully autonomous vehicles with an automated charging system already in place
- Smooth installation to enable e-Depots by minimizing operational interruptions and offering a small footprint

TRUCK CHARGING
DYNAMIC CHARGING SOLUTION

ELECTRIC ROAD TECHNOLOGY



Charging infrastructure
- Electric rails integrated in road surface
- Conductive power transfer at 600-800 V with 97% efficiency
- Up to 300 kW charging power while moving or standing still
- Power Station every 1,5 km for power feeding
- Safe – power is only turned on when vehicle present

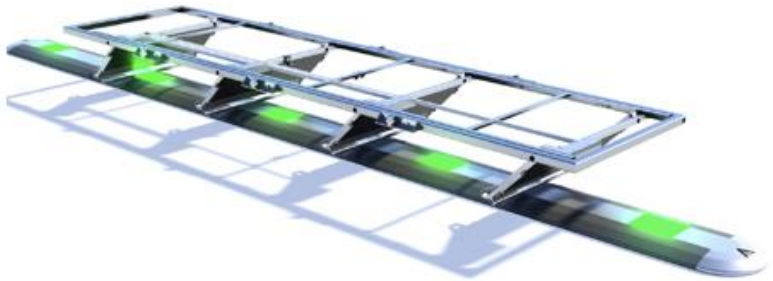
Vehicle module
- Vehicle-agnostic technology adaptable for both trucks, reach stackers and conventional cars
- Automatic lateral position adjustment

The system
- Well tested for wear & tear, foreign objects and diverse weather conditions
- Real-time monitoring of vehicle power level, location and other various data collected by sensors
- Charging management system to enable dynamic load balancing

ONBOARD SYSTEMS II

THE PICKUP

Our **Onboard Systems** and **Pickup** are available as a retrofit system that integrates "as if using a cable", with no changes to vehicle systems needed. Cable charging capabilities are fully retained in parallel with our upgrade. We use conduction (physical contact) to completely avoid energy transfer losses.



Max Voltage	1000VDC
Max Current	250A
Power Interface	Conductive quad-arm current collectors
Supported Charging Standards	CCS
Network Interface	4G Mobile Data Connection
Pickup Dimensions (LxWxH)	225x 85x3cm
Max Weight	20kg
Operating Temperature	-20°C to +40°C
Protection rating	IP 66
Safety	Physical safety curtain Electro-mechanical tamper switch
Compliance	CE (2023) and UL (2024) OEM Integration Requirements

The onboard systems and pickup is an open design with an architecture that integrates well with any vehicle. For instance, the pickup frame can be customized for a better fit and support for additional charge systems can be added.

All specifications and designs are subject to modification, more details available on request.

SIDEMOVING PICKUP

BUSINESS CASE: PORT TERMINAL

Example case assumptions

Customer	A container terminal in a port in Europe
# of vehicles	Replacing 50 ICE tractors to EVs
Vehicle size	Terminal tractors
Power grid	Current capacity = 800 kW
Use case	• No existing EVs or chargers • 24h continuous operation • Newly introducing charging solution; installing 600m*2 of dynamic charging road based on vehicle behavior heatmap
Case result:	➢ Vehicle optimization: new mechanism to keep vehicles charged saving cost of EVs and batteries ➢ Space saving: avoiding facility cost ➢ Power saving: grid capacity - both initial investment (could take ~2 years) and annual power tariff

CAPEX & OPEX Savings

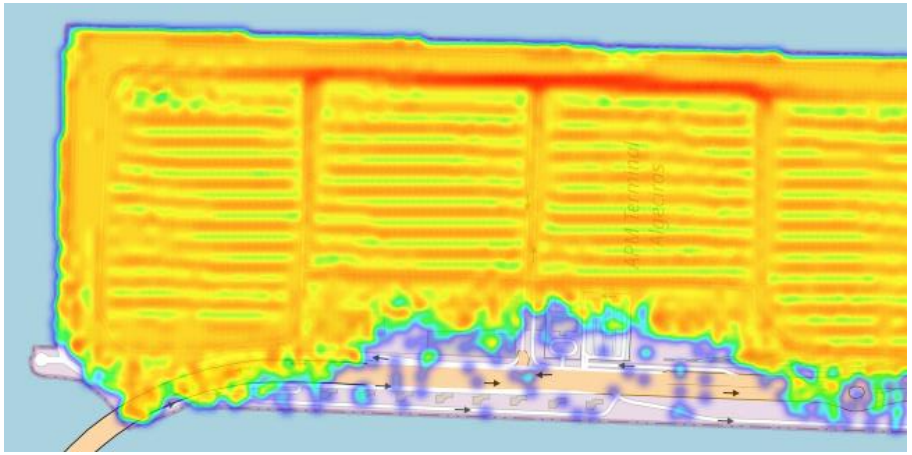
Please contact us!

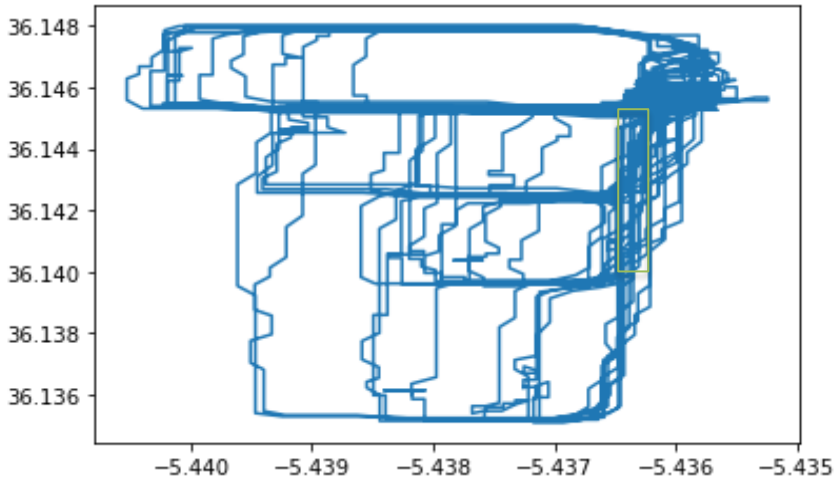
By using our technology, port terminals can save over 30% on only EV vehicle investments and save 1000 tonnes of CO2-equivalents, just by reducing battery sizes

Both feasibility studies shows huge potential for dynamic charging in container terminals

Data analysis

- Gathered GPS data from connected assets
- Created a fictive electric road based on heatmaps
- Analyzed movements and standing time
- Simulated time on road
- Involved TCO calculations





Results

- 20-25% time on electric road
- OBC of 75 kW enough to avoid static charging for a TT
- Reducing battery with 65 kWh saves 100 000 € per TT
- Peak load on grid reduced by factor 5
- Significant effect on TCO above ~10 vehicles

Zero Emission Terminal

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

THANK YOU FOR YOUR ATTENTION

VAHLE

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