Decarbonisation & Automation of your terminal operations

Baltic and Black Sea Ports and Shipping 2023 - Gdansk, Poland

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Uwe Pietryga

Sales Director Horizontal Transportation, Kalmar

“I am pasionate in evolutional solutions that set benchmarks in terminal automation and sustainability”

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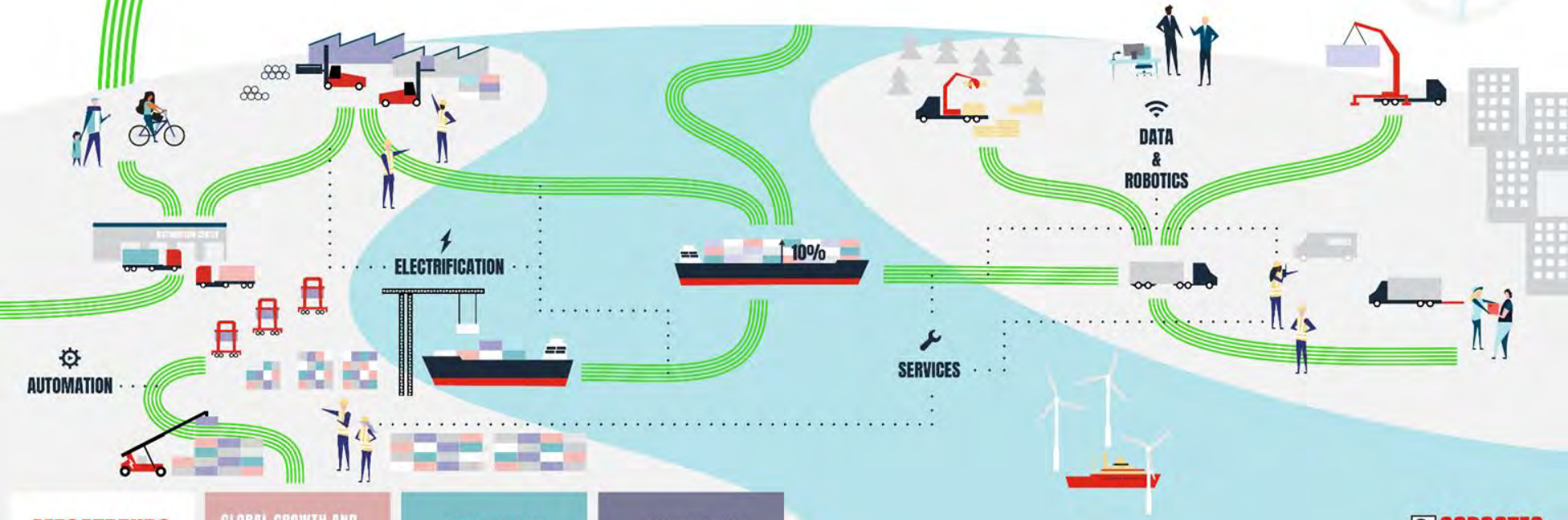
Agenda

- Megatrend Decarbonisation
- Kalmar approach towards zero emissions
- Real equipment cost comparisons
- AutoStrad Automation
- SmartPort Process Automation

GLOBAL LEADER IN SUSTAINABLE CARGO FLOW

WHERE TO WIN | WAYS TO WIN | HOW WE MEASURE

1.5°C COMPANY



MEGATRENDS

GLOBAL GROWTH AND ECONOMIC DEVELOPMENT

SUSTAINABILITY

DIGITALISATION

CARGOTEC

The shipping industry is at the heart of the global green transition

Today, an estimated 60% of the world's goods are transported by container. In total, about US$14 trillion worth of goods spend some time inside a big metal box every year.

As of 2020 per IMO, the emissions from the shipping industry were 1.1 gigatons of CO_2e, which is around 3 % of global emissions.

During the past 10 years the emission intensity of ships has declined, however, it is still forecasted that overall emissions will keep rising from the current levels.

According to the IEA the shipping industry is currently not on track to meet Net Zero by 2050 and additional actions are required.

With its strong maritime connections and large renewable potential, as the need for climate friendly shipping increases, South Africa finds itself in a unique position to benefit the global green transition.

Sources: IMO; IEA; WEF; Global Maritime Forum

Our approach towards Decarbonisation

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Kalmar’s electrification journey

40 years of proven experience - Full offering to be available as electrically powered options.

1971 — First-generation RMG

1980 — Light Electric Forklift (lead acid)

1989 — ASC combines electrification and automation

2000 — Straddle carrier with electric driveline

2002 — Kalmar Zero Emission RTG

2009 — Hybrid RTG and Straddle Carrier

2016 — Light Electric Forklift (li-ion) Kalmar FastCharge™ Hybrid Straddle and Shuttle Carrier & Kalmar ASC with no hydraulics

2017 — Medium Electric Forklift (lead-acid)

2018 — Kalmar Ottawa Electric Terminal Tractor
2nd gen Hybrid RTG
8th gen SC

2019 — Electric Empty Container Handler

2021 — **Introduction**
Electric Reachstacker
Electric Heavy Forklift

Medium Electric Forklift (li-ion)
Zero-Emission RTG with a battery pack solution

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Hybrid solutions

- Approx. 80% of straddle carriers currently deployed worldwide are diesel-electric machines
- Hybrid systems account for a significant portion of new units sold, and are rapidly becoming the default choice for terminals
- Hybrid machines typically operate on battery power with their engines switched off up to 30-40% of the time.
- The most efficient hybrid straddle carriers on the market consume up to 40% less fuel than diesel-powered models, and emit on average over 50 tons less CO2 per year.

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Operators' biggest concerns regarding zero emission equipment

- Will new zero emission equipment have technical failures in the beginning that will impact my productivity?
- Will there be enough grid capacity and green electricity to charge batteries?
- How much will battery powered equipment impact my operations if I need to charge several times per day?
- Very high investment to shift to both new equipment and new infrastructure
- What will battery cost and residual value be? And with that – how can I ensure a good total cost of ownership?

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ECO EFFICIENCY IN ACTION


CO_2
Annual CO_2 reductions versus diesel Reachstackers:
100 tons CO_2
The Electric Reachstacker
Wide cargo handling application portfolio
Energy-efficient design and performance
Modular battery solution
Wide offering of charging solutions
Safety measures for high voltage equipment
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ECO EFFICIENCY IN ACTION

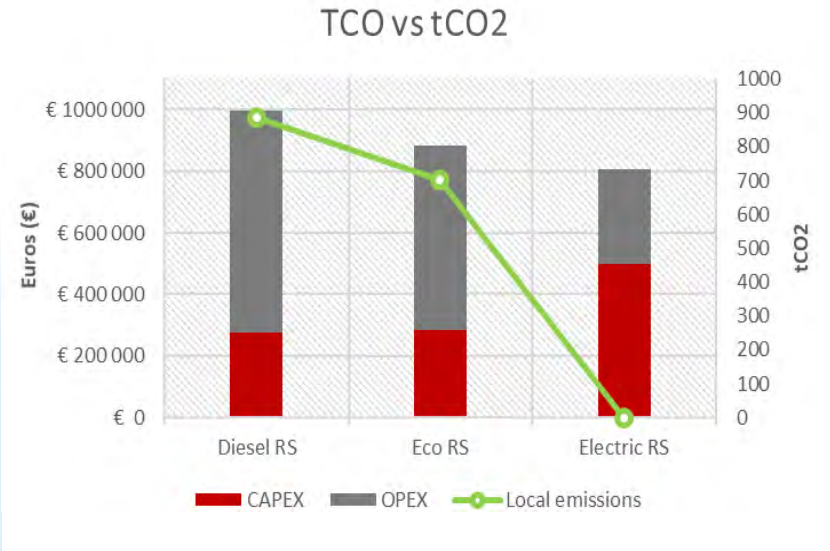
Comparing the total cost of ownership vs tCO2 emissions for Reachstackers

Operational & Financial considerations

- Higher CAPEX offset by significantly lower OPEX for the electric equipment
- Operational requirements have an impact on the CAPEX, due to differences in battery capacity requirements
- The electric Reachstacker enables local zero emission operations.

Equipment assumptions

- Same machine model sizes, configuration and capacities (DRG450-65S5)
- Same drive cycles



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FastCharge technology for straddle carriers

- Industry first fast charge electric power line
- Cost-efficient, safe and scalable solution
- Idle times enables the fast-charge technology
- Locally emission free
- High availability through flexible charging sequences
- Low noise levels
- Eco-efficient solution

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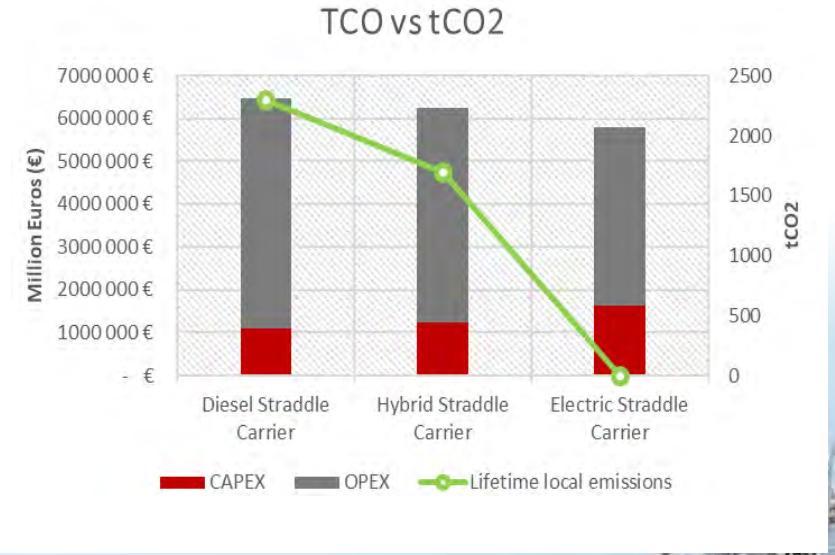
Comparing the total cost of ownership vs tCO2 emissions for a Straddle carrier

Financial considerations

- Most of the time the investment costs for carbon neutral technologies are higher than conventional equipment.
- However, the higher investment costs are often offset by significantly lower operating costs, this is especially due to the electric equipment.
- Cost savings comes mainly due to OPEX reduction (maintenance, fuel consumption.)



Environmental considerations

- Hybridization offers a quick/easy emission reduction
- Electrification enables local zero emission operations

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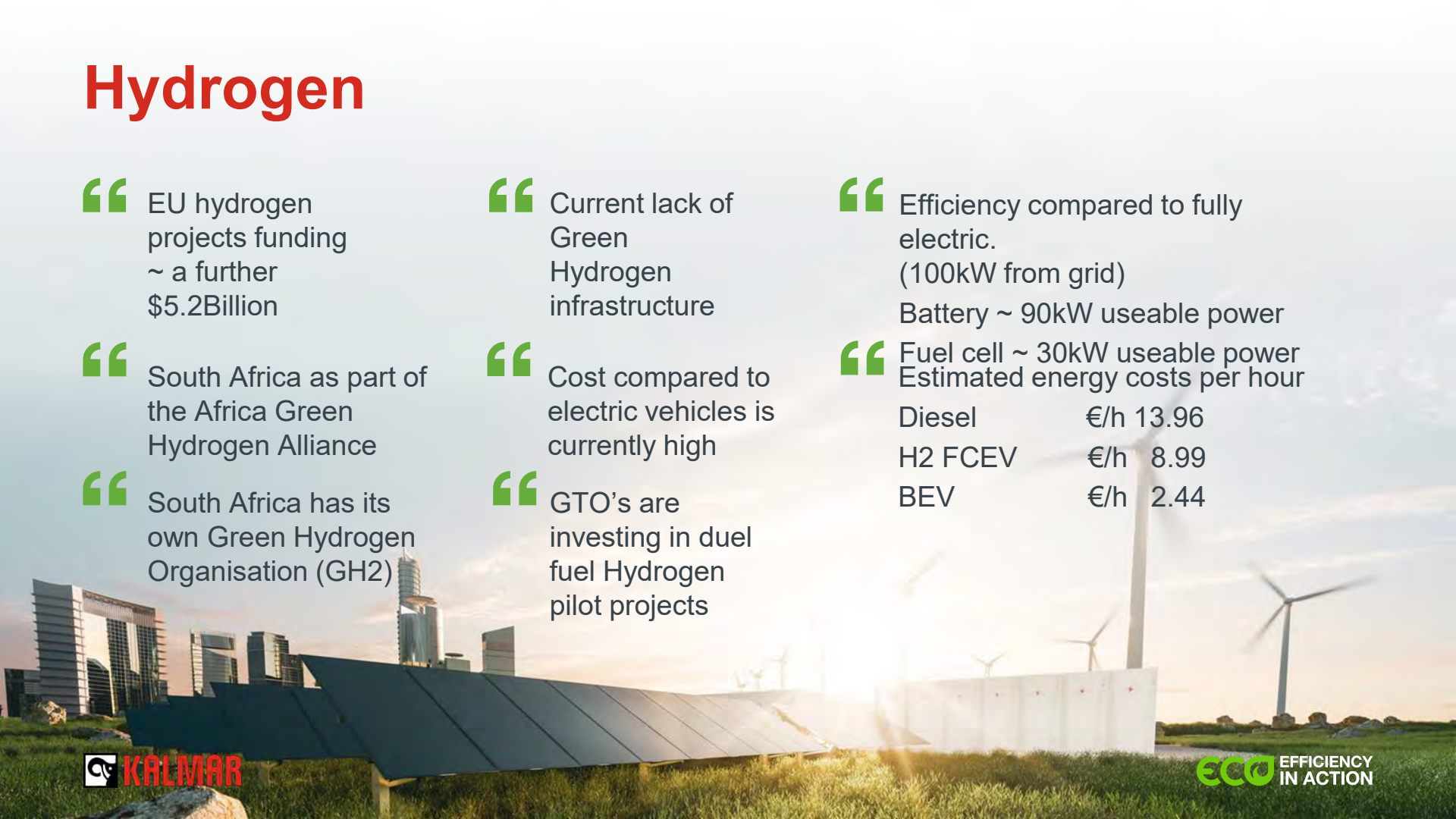
Hydrogen

- EU hydrogen projects funding ~ a further $5.2Billion
- South Africa as part of the Africa Green Hydrogen Alliance
- South Africa has its own Green Hydrogen Organisation (GH2)
- Current lack of Green Hydrogen infrastructure
- Cost compared to electric vehicles is currently high
- GTO's are investing in duel fuel Hydrogen pilot projects
- Efficiency compared to fully electric.
  (100kW from grid)
  Battery ~ 90kW useable power
- Fuel cell ~ 30kW useable power

Estimated energy costs per hour

Diesel	€/h	13.96
H2 FCEV	€/h	8.99
BEV	€/h	2.44



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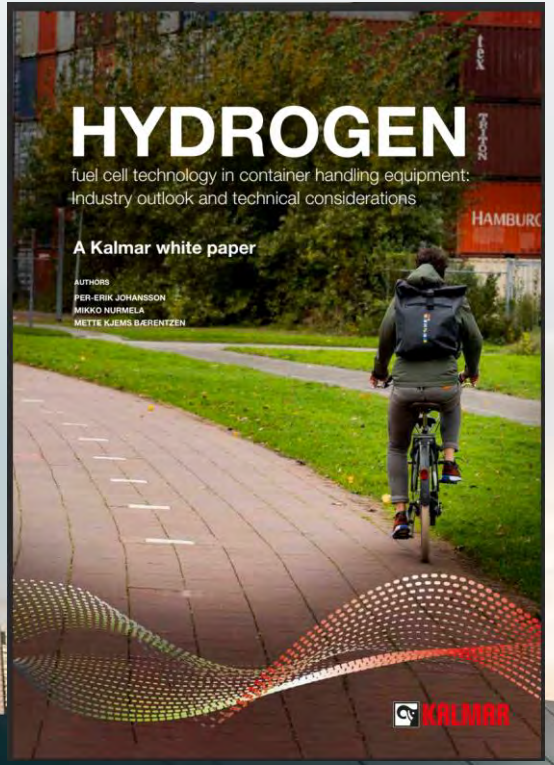
ECO EFFICIENCY IN ACTION

Kalmar Whitepaper: Hydrogen



https://www.kalmarglobal.com/news--insights/whitepapers/hydrogen-fuel-cell-technology-in-container-handling/

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ECO EFFICIENCY IN ACTION

Automation

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AutoStrad Application benefits

POWERED BY Kalmar One

Safety

People segregated from hazards

No drivers - no human factor

Safe access

Work ergonomy

Cost competitiveness

Low deployment cost

Low operation costs

Extended asset life

Shorter time to value

Assets can be relocated

Operational flexibility

Decoupled operation

Simple automated end to end container flow which is managed by one automation system

Single container handling equipment type at the yard

Flexible and scalable use of assets

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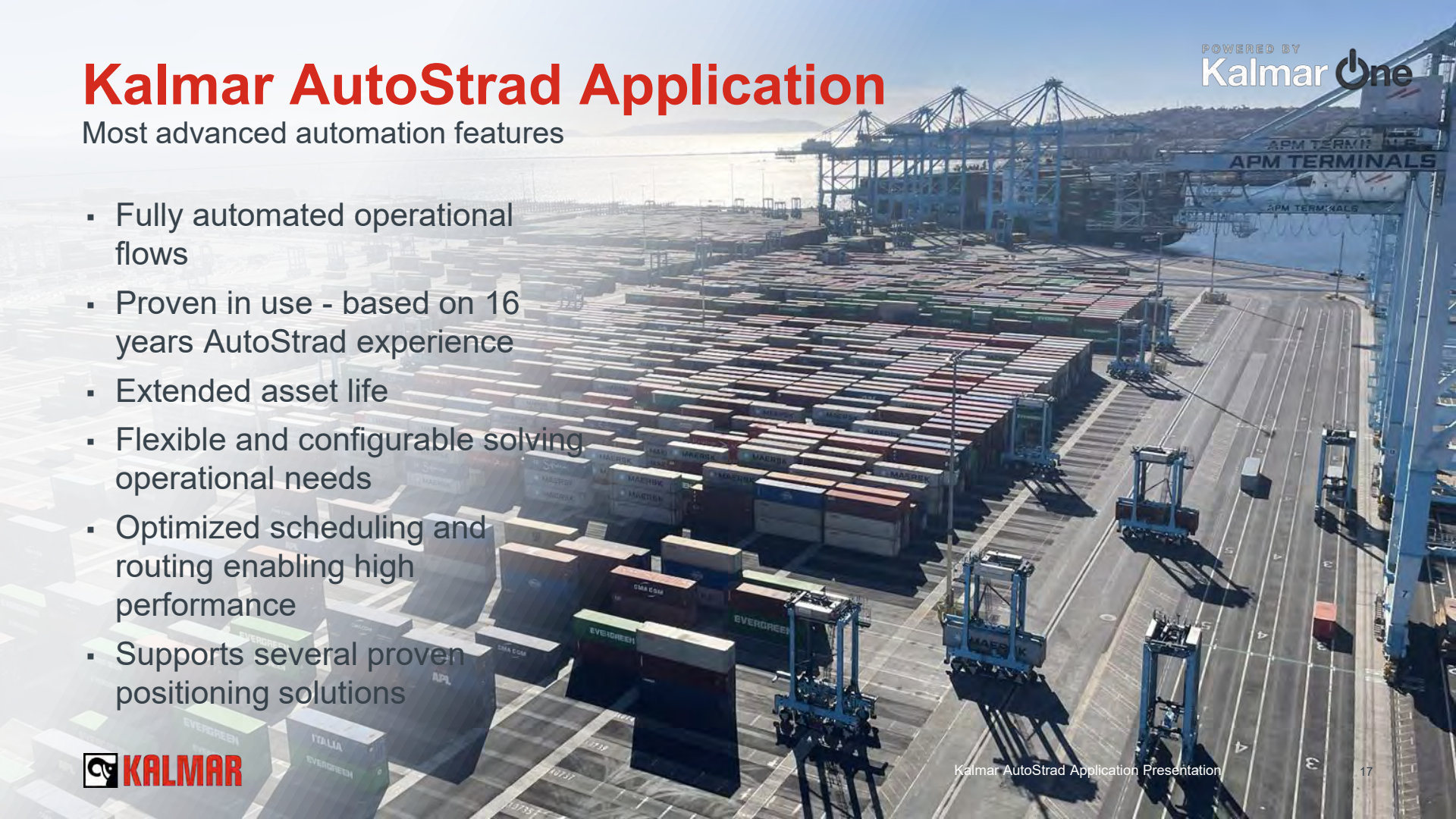
Kalmar AutoStrad Application

Most advanced automation features

- Fully automated operational flows
- Proven in use - based on 16 years AutoStrad experience
- Extended asset life
- Flexible and configurable solving operational needs
- Optimized scheduling and routing enabling high performance
- Supports several proven positioning solutions



Kalmar AutoStrad Application

Smart Safety

- Safety rated geofence enabling flexible area segregation
- No residual hazard zones required
- Adaptable to local operational use cases
- Meets all applicable standards in Europe, Australia and US
- 3rd party approved (DNV)

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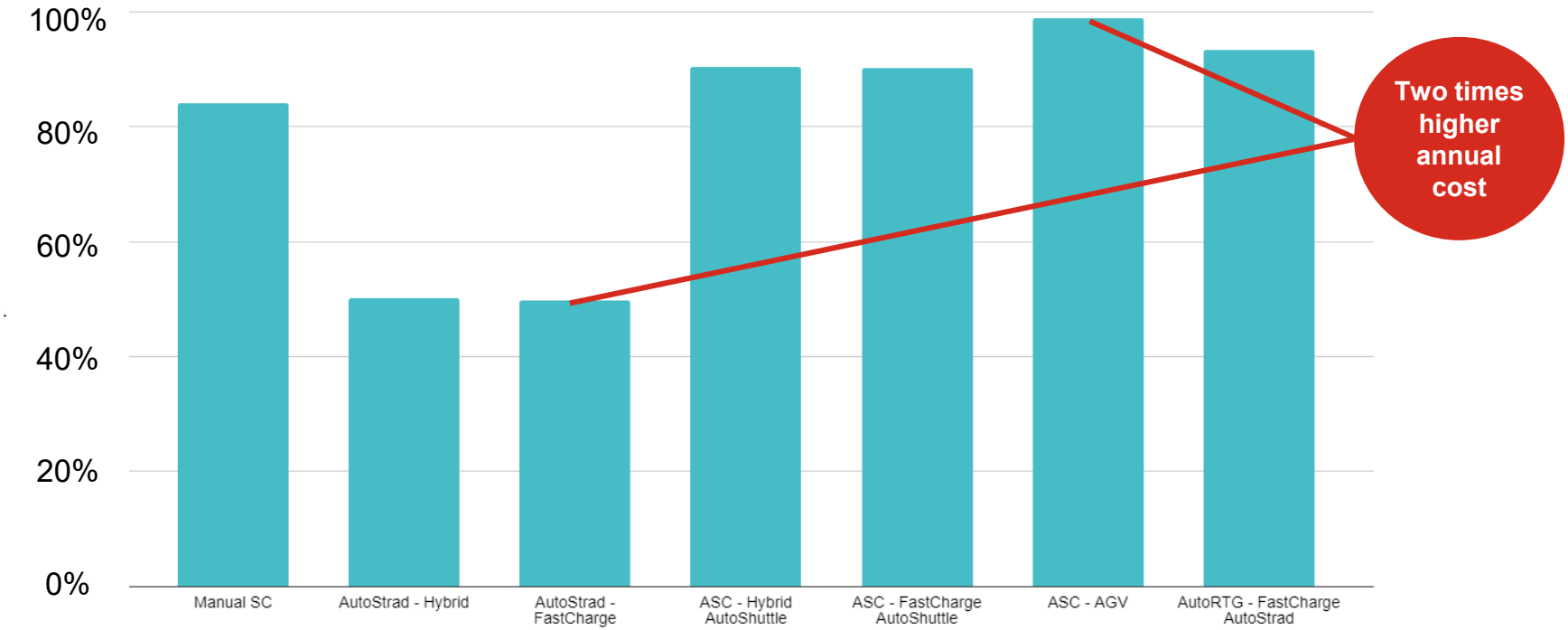
TCO calculation for the automated terminals

Total annual cost combination in 10 STS crane operation



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Exact source numbers might contain max 20% error, but difference between solution is still undeniable.

Kalmar Terminal Design Service: Commercial representation of the design process / Fact base added value

Investigate

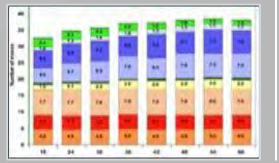
Map the options for Terminal Design alternatives to meet the objectives

- Understand the current way of work.
- Identify pain points and operational limitations.
- Identify different layout options at a high level.
- Terminal capacity calculations and fleet size estimations

Qualify

Research the alternative solutions and numerically assess the feasibility of the options

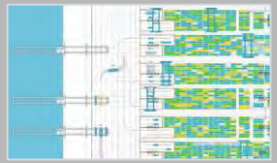
- Full range of layout options
- Full business case calculations including CAPEX, OPEX and ROI analysis on preferred options
- High level delivery and project plan



Demonstrate

Demonstrate and validate that the selected option can meet the objectives

- Terminal simulations to demonstrate the design
- Verify the design in different scenarios & 3D modelling of preferred terminal design.
- Terminal Emulation Tool to test systems integration.



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What is Process Automation compared to Automated Equipment?

Process Automation
allows terminals to benefit of automation without spending the higher upfront costs of full automated equipment. And it allows brownfield terminals to maintain uninterrupted operations and keep valuable yard space during implementation since no civil work is needed.

Process Automation provides a timely ROI with significantly less investment

Automated Equipment
enables the full potential a terminal needs in the future. With driverless and automated equipment in combination with Kalmar ONE Terminal Automation software a seamless overall automated operation can be realized.

The full potential of automated operation can be enabled. A more predictable operation with less manual interaction results in a planed good performance and allows continuous measureable KPI improvement

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Upgrade your manual operations with Kalmar Smarts Solution

SmartLanes

SmartTruck NEW

SmartLift

SmartStac

SmartPath

SmartRail

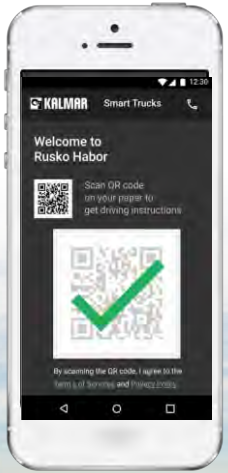
SmartTrack

SmartMap

SmartFleet

SmartProfile

SmartWeight



Improved Operational Visibility

Better Asset Utilization

Improved Safety

Increased Information Accuracy

Eliminated Delays

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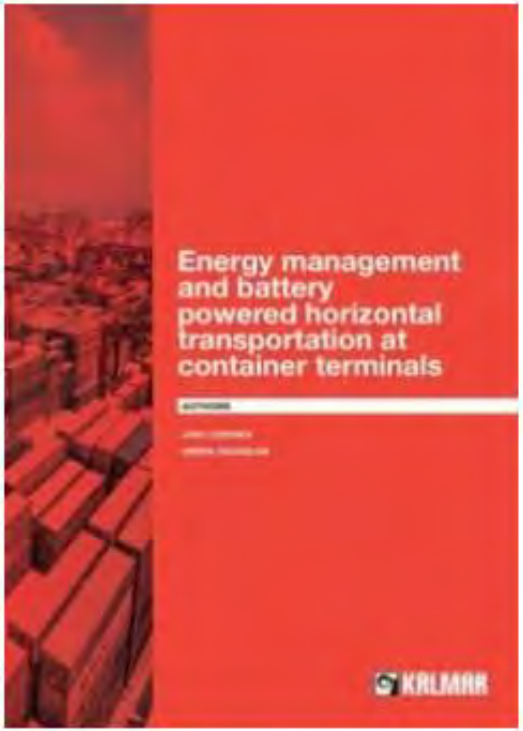
White papers for further reading

Kalmar white papers: https://www.kalmarglobal.com/news--insights/whitepapers/



Thank You!

CONNECT WITH ME!
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Making your every move count.