
“Ways to profitable, sustainable and future-proof cargo handling operations”
Alejandro Martinez, Kalmar
KALMAR

DESIGNING

a future proof and sustainable terminal

Operational efficient

Productive, low handling unit cost.

Financially viable

Possible to adapt to changes in business environment.

Emission free

Zero emission at source.

Challenge: **How to manage all 3 aspects at the same time?**

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ECO EFFICIENCY IN ACTION

Our approach towards

DECARBONISATION

Operational

Transitioning to new technologies must be implemented carefully to mitigate operational disruptions

Financial

Decarbonising should be profitable long-term with good total cost of ownership

Environmental

Meeting environmental targets requires an investment plan matching decarbonisation pace

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ECO EFFICIENCY IN ACTION

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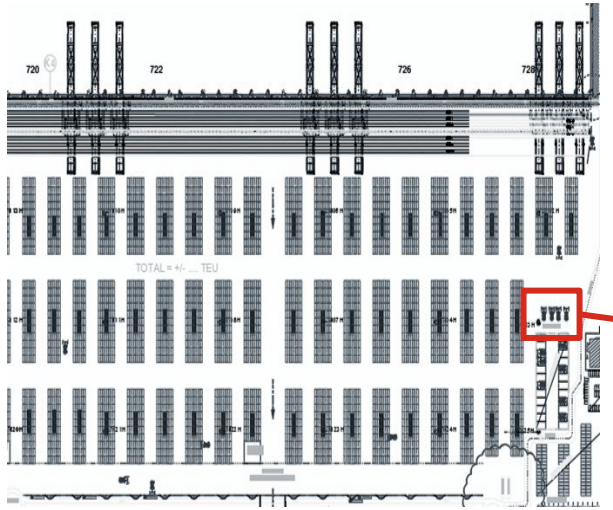
Operational needs and changes in the way of working

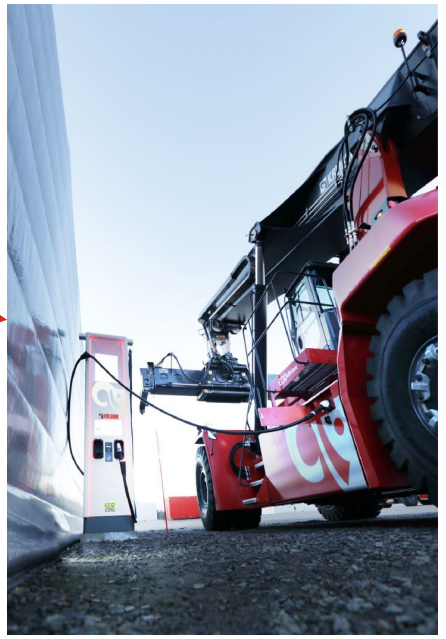
Operational considerations

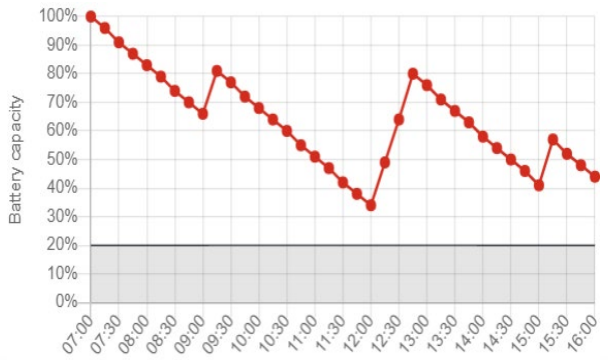
- Understanding of the current way of working
- Shift patterns, shift changes & breaks
- Local agreements
- Map current processes & flows

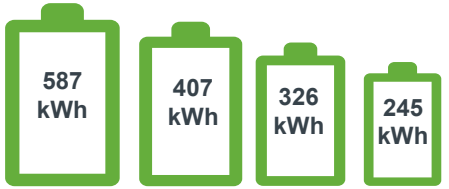
Understand the future way of working

- Identify the infrastructure requirements
- Identify green legal requirements
- Potential state of charge vs shift patterns for electric equipment
- Validate the operational KPIs



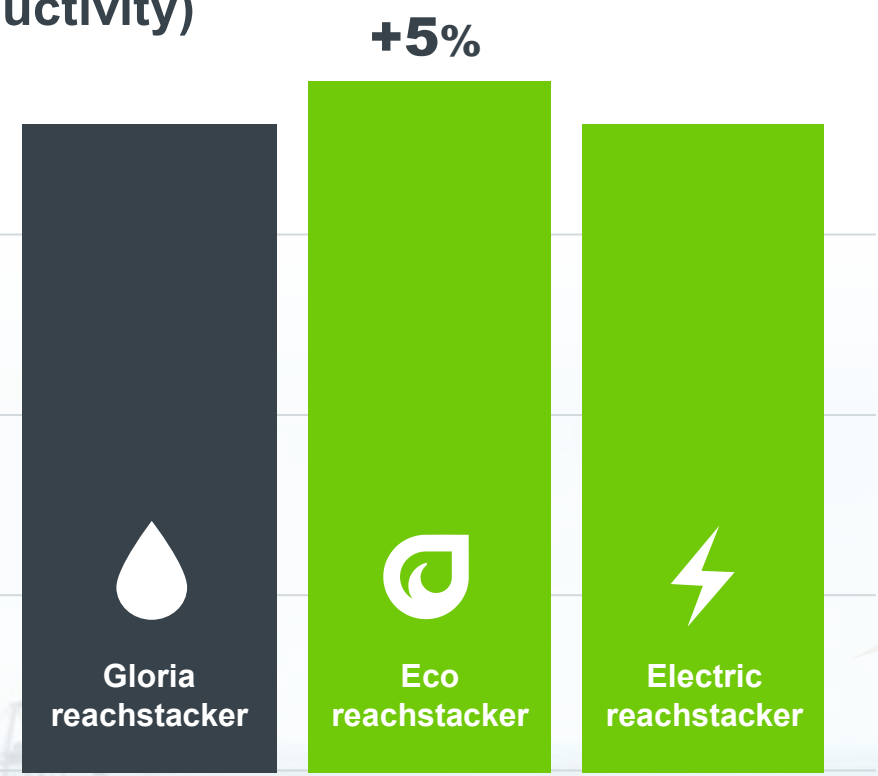






Comparing the operational performance of Reachstackers

Operational performance (machine productivity)



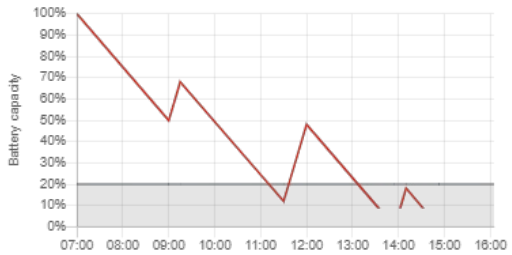
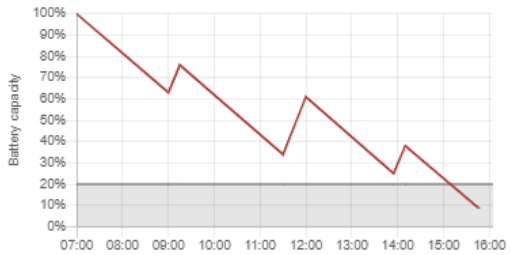
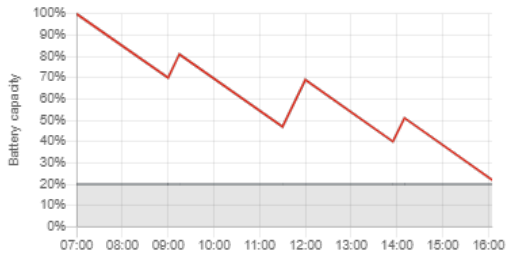
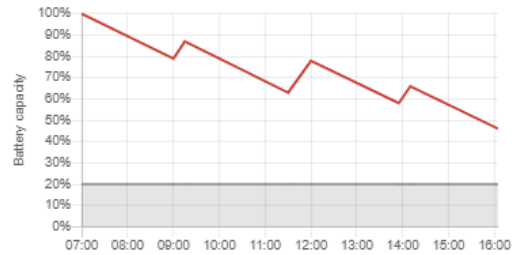
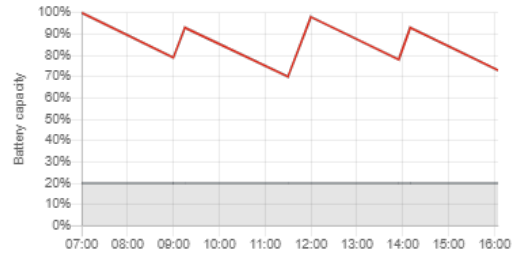
Electric needs time for charging!

Equipment assumptions

- Same machine model sizes and capacities
- Same drive cycle
- Same Drive Mode setting for all machines

Operational simulation of an electric Reachstacker

Medium drive cycle | 1 shift 7:00-16:00 | Scheduled breaks for opportunity charging

CHARGER	BATTERY 245 kWh	BATTERY 326 kWh	BATTERY 407 kWh	BATTERY 587 kWh
175 kW				
350 kW				

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Our approach towards

DECARBONISATION

Financial

Decarbonising should be profitable long-term with good total cost of ownership

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Comparing the total cost of ownership for Reachstackers

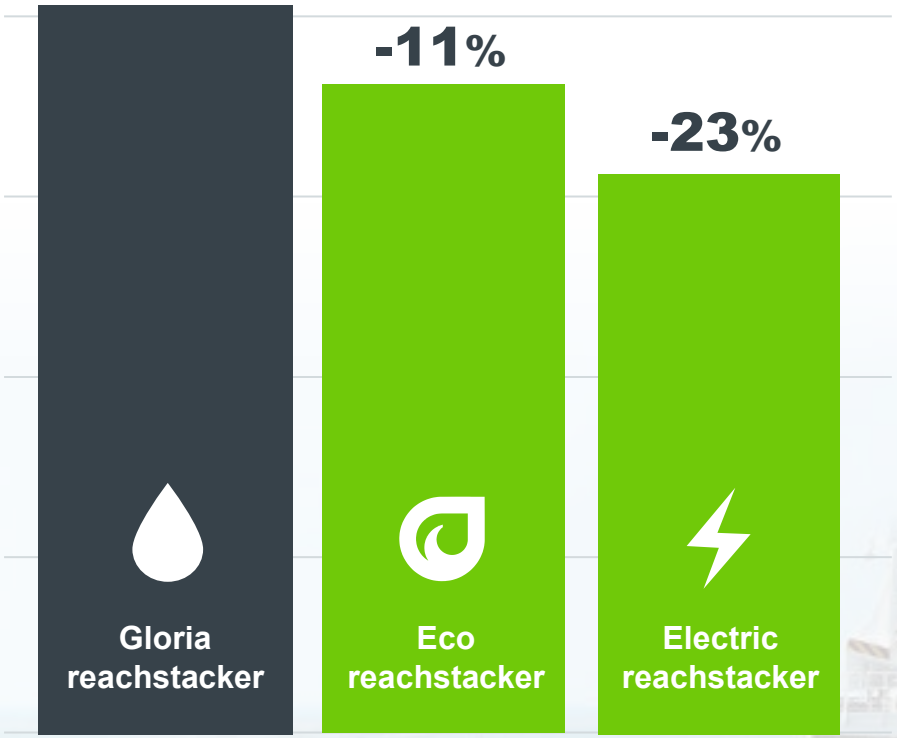
Equipment assumptions

- Same machine model sizes and capacities
- Basic configurations for all machines
- 326 kWh battery for ERG450
- Same drive cycle and energy consumptions
- 3000 running hours/year

Cost assumptions

- Diesel cost: 1,4 EUR/liter
- Electricity cost: 0,15 EUR/kWh
- No charger or infrastructure cost included

5 year total cost of ownership comparison



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Environmental

Meeting environmental targets requires an investment plan matching decarbonisation pace

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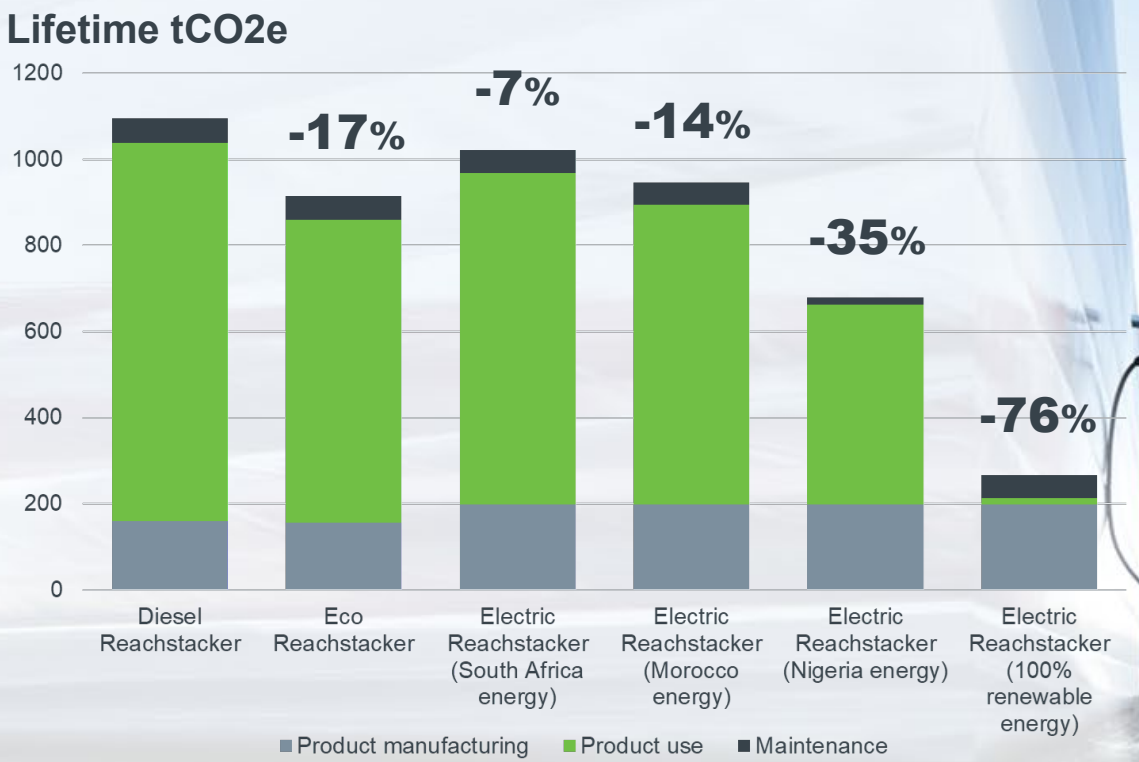
LIFETIME EMISSIONS for Reachstackers

Environmental considerations

- The Eco Reachstacker offers a quick and easy emission reduction
- Electrification enables local zero emission operations, but depends on available electricity



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Operational, financial and environmental

COMPARISON

	Operational performance (must be high)	Financial impact (must be low)	Environmental impact (must be low)
Diesel Reachstacker	100	100	100
Eco Reachstacker	105	89	67
Electric Reachstacker	100	77 (not including chargers and infrastructure)	65-93 (Nigeria, Morocco or South Africa)

Valuable option for green transition

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Strong interest in the new

Kalmar Electric Reachstacker

> The new Kalmar Electric Reachstacker will play a key role in helping us to achieve our target of zero emissions by 2030. Our investments in electrification, hybrid solutions and biodiesel will enable us to reduce our emissions by 56%.

Kurt A. Ommundsen, CEO Westport Norway

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ECO EFFICIENCY IN ACTION

Kalmar Eco Reachstacker.

Guaranteed to reduce fuel consumption and emissions

Kalmar's eco-efficient Reachstacker is **guaranteed** to substantially **reduce your fuel consumption** and **cut your costs.**

Supply chain emissions reduction actions

SUPPLY CHAIN

Components

Alternative materials

Alternative technologies

Green solutions

Suppliers

Supplier engagement

Innovation through partnership

CO2 requirement setting

Processes

Supplier selection criteria

RFP processes

Supplier development

Solutions

Innovative solutions

Circular economy

Support electrification

SUPPLIER ENGAGEMENT

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- **Electric reachstackers** are available, but decarbonisation potential depends on the charging electricity

- **Eco Reachstackers** is a great way to ensure a green transition towards electrification

  - It can provide decarbonisation until green electricity becomes more available
  - Does not require any infrastructure investments
  - Comes with a fuel saving guarantee

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THANK YOU

for your attention

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The CO2 reducing potential of Eco Reachstackers

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Kalmar Eco Reachstacker.

Guaranteed to reduce fuel consumption

Our new Eco-efficient Reachstacker is **guaranteed** to substantially **reduce your fuel consumption** and **cut your costs**. **Enhancing your environmental credentials** and **helping you meet current and future emissions standards**.

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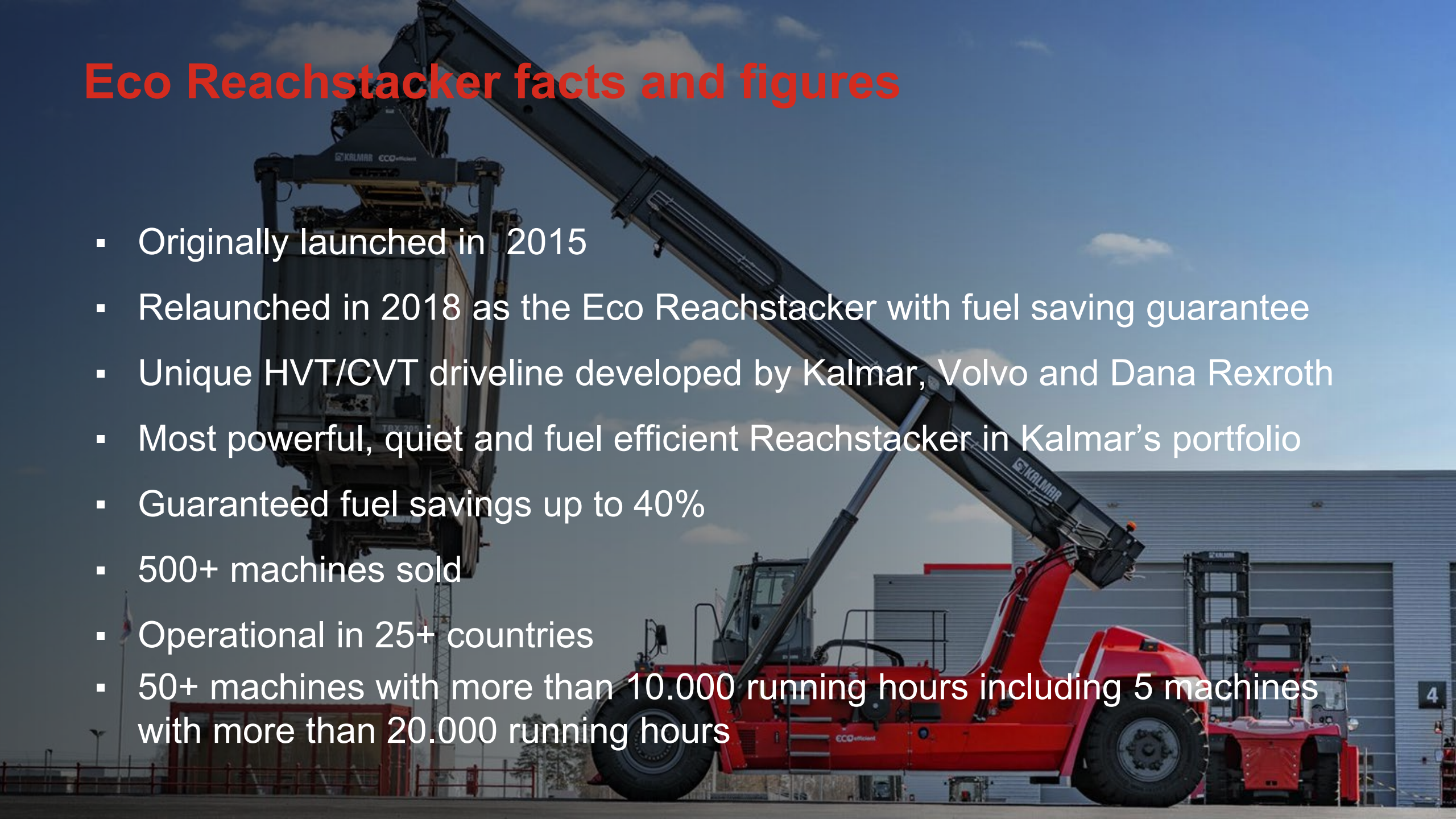
Eco Reachstacker facts and figures



- Originally launched in 2015
- Relaunched in 2018 as the Eco Reachstacker with fuel saving guarantee
- Unique HVT/CVT driveline developed by Kalmar, Volvo and Dana Rexroth
- Most powerful, quiet and fuel efficient Reachstacker in Kalmar's portfolio
- Guaranteed fuel savings up to 40%
- 500+ machines sold
- Operational in 25+ countries
- 50+ machines with more than 10.000 running hours including 5 machines with more than 20.000 running hours

Eco Reachstacker vs. normal Kalmar Reachstacker

Performance according to Kalmar test drive cycle

	Eco vs. Normal
Acceleration 0-20 km - no load	~15% faster
Acceleration 0-25 km - no load	~10% faster
Acceleration 0-15 km – loaded	~15% faster
Acceleration 0-20 km – loaded	~25% faster
Productivity (containers/hour), power mode	4,5% higher
Productivity (containers/hour), normal mode	3% higher
Productivity (containers/hour), eco mode	3% higher
Noise inside (dBA)*	1 - 4 dB reduction
Noise outside (dBA)*	2 - 5 dB reduction

*Extra noise reduction kit will offer an additional 3 dB outside cabin and 1 dB inside cabin

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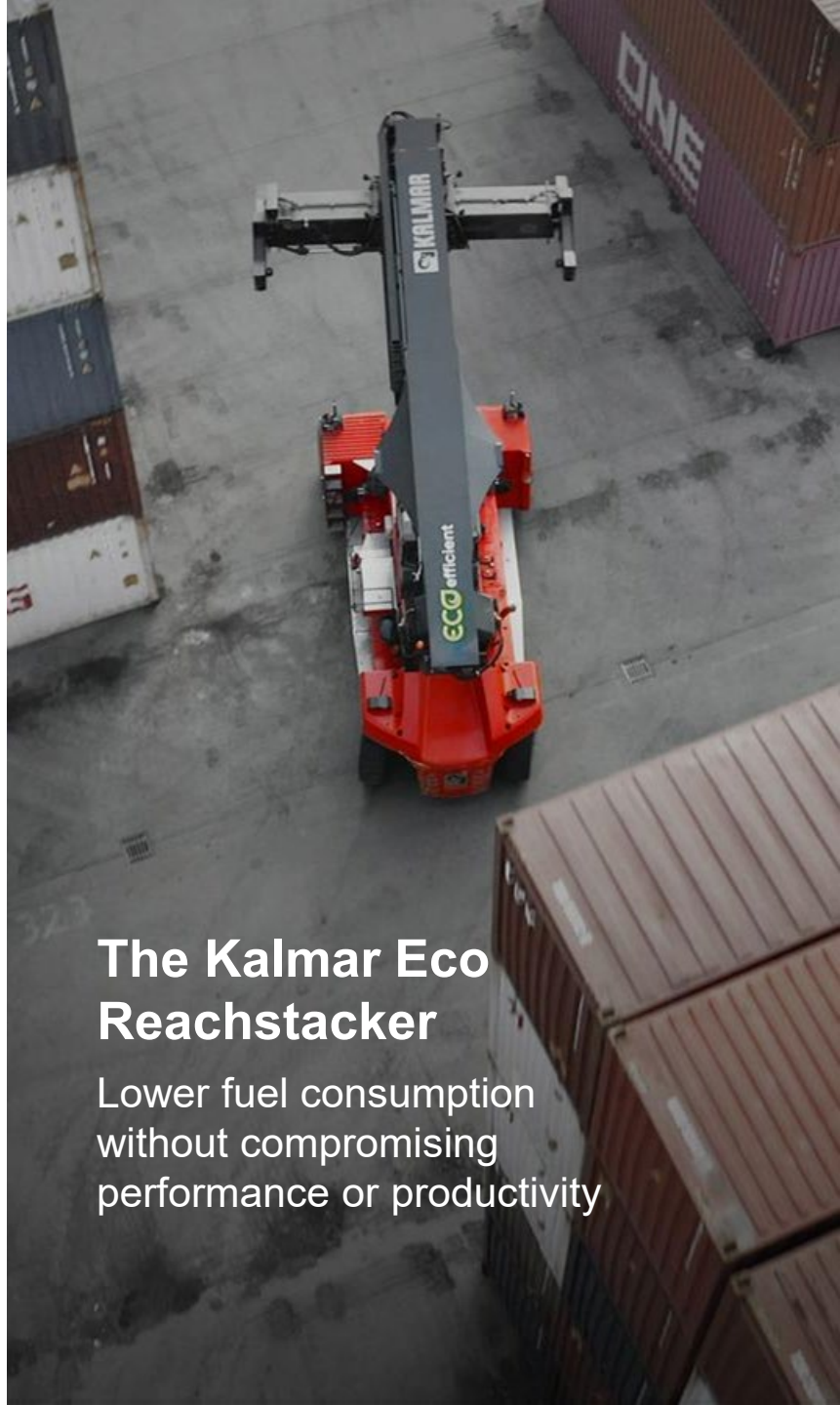

The Kalmar Eco Reachstacker

Lower fuel consumption without compromising performance or productivity

CO_2 emissions per 1 liter diesel

720g Carbon

1920g Oxygen

2,64kg CO_2

COMBUSTION

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Fuel consumption differences

- Traditional reachstackers consume 18-22 l/h for an average drive cycle
- The Eco Reachstacker's fuel consumption will be:
  - 14,8 l/h in Power Drive Mode
  - **13,7 l/h in Normal Drive Mode (default)**
  - 12,6 l/h in Eco Drive Mode

4,3 - 8,3 l/h difference
at comparable performance/ power level (see slide 3)

	Fuel consumption	Running hours/year	Fuel/year (liters)	Cost/year (EUR)	Difference	CO2 @ diesel (tons)	CO2 @ HVO100 (tons)
Eco Reachstacker	**13,7**	**2 000**	**27 400**	**32 880**	**-**	**74**	**7**
Other Reachstacker #1	18,0	2 000	36 000	43 200	**31%**	97	-
Other Reachstacker #2	20,0	2 000	40 000	48 000	**46%**	107	-
Other Reachstacker #3	22,0	2 000	44 000	52 800	**61%**	118	-

* Difference compared to fuel consumption of DRG450-65S5XE

Paraffinic diesel fuel: HVO100

90%
CO2 reduction

What is HVO100?

- HVO = Hydrogenated Vegetable Oil
- HVO is a premium fossil free diesel product made of 100% renewable raw materials, which does not release any new carbon dioxide into the atmosphere.
- It is produced by vegetable oils and/or animal fats, and the result has a chemical structure almost identical to regular diesel and can replace fossil diesel.
- EU Directive ensures oils are not coming from sources with negative environmental impact
- Reduces CO2 emissions by up to 90% (including from all producing processes from source to combustion)
- Mainly available in Sweden, Norway, Finland, Germany, Estonia, Latvia, Lithuania, The Netherlands, The United Kingdom - more countries to come

A Reachstacker driving on 100% HVO100 has lower negative climate impact than an electric Reachstacker powered by European mix of brown/green electricity

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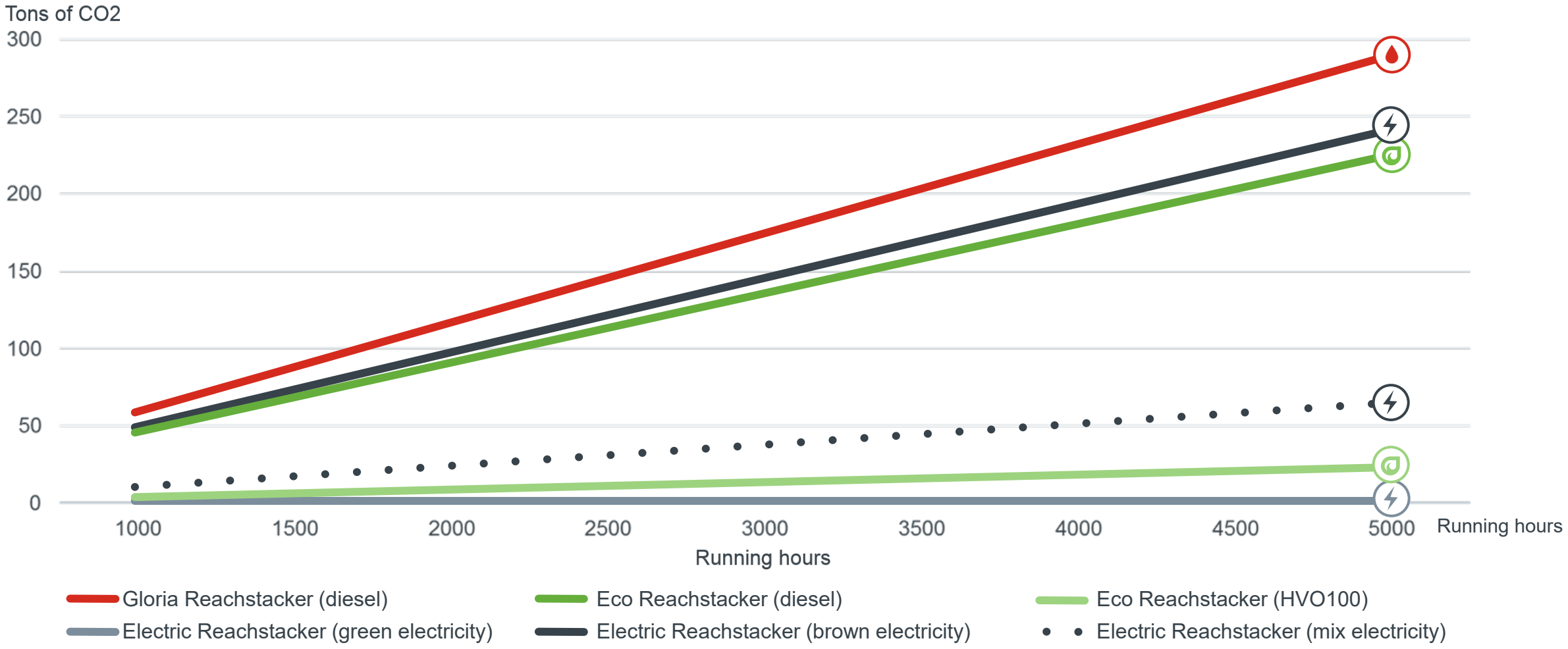
Comparison of CO2 emissions

tCO2e versus running hours



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Available for all your handling needs

Wheelbases 6,0 m | 6,5 m | 7,0 m | 7,5 m

19 models

Container handling

(yard and barge)

- Up to 45 tons
- Up to 6 high and 4 deep

8 models

Intermodal handling

- Up to 45 tons
- Up to 5 high and 3 deep

6 models

5 models

Industrial handling

(tool carrier and lifting hook)

- Up to 60* tons for tool carrier
- Up to 70* tons for lifting hook

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An Eco Reachstacker will:

- Automatically prepare drivers for a new way of driving and operating (more similar to electric machines than traditional diesel machines)
- Give a carbon footprint almost as green as electric reachstacker charged with green electricity (if using HVO100)
- Allow market prices for batteries to stabilize
- Allow for initial product updates to have been completed

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