## Battery Integration & Energy Management on Cranes For More Sustainable Operation

with SIMOCRANE ESSM





## **Key Initiatives De-carbonization**

#### UN SDG & Paris Agreement 2015

The race to combat climate change. To keep global temperature increase well below 2C, and if possible, below 1.5C.



Equally seminal for the future of our planet is the UN climate agreement signed in Paris. This saw the world community agree on key issues such as pursuing efforts to limit the global temperature increase to 1.5 degrees above the pre-industrial level, where possible.



#### **EU Emission Reduction strategy**

Mandated by the EU Directive on Energy Efficiency (2023/1791), industries must reduce GHG emissions with at least 55% by 2030 and achieve a climate-neutral in 2050.

## EU STRATEGY for long-term EMISSIONS REDUCTION

#### SBTi

Provide a clearly-defined path to reduce emissions in line with the Paris Agreement More than 5,000 businesses around the world are already working with the Science Based Targets initiative.





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# How do we approach decarbonization and contribute to the energy transition? Differentiation of crane types



- Hybridization (short term)
- ✓ Smooth transition of HY-RTG to E-RTG
- Full electrification with Battery used for
  Yard change operation & infeed peak shaving E-RTG(+) (mid- long term)

#### Facts

- RTGs, HMCs & Straddle Carriers represent a major part of the total fuel consumption for a port (~ 50- 60%)
- Each conventional RTG produces ~240 tons of CO2 per year
- Each mobile crane needs grid independent power supply for being flexible



- Peak Shaving (short term)
- Holistic planning & power utilization optimization (mid-long term)

#### Facts – Shore Powered Cranes

- Cranes are peak power consumers, harming the power grid in regards of stability and power reserves
- Grid fees for peak power demands
- Expandability connected to high investments
- Ratio between cost for motoric power and refund for energy fed back to the grid is unbalanced
- Regenerating energy back to the grid is less efficient then storing and reusing it locally
- High connected power compared to RMS power demand

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## **Transition to Electrification**

Step by step in line with operation and energy supply capacity



## LI-ION ESS – One standardized solution Covering all use cases with modular approach



### 3 Steps to sustainability in terminal operation and cargo handling Coverage from sizing to commissioning with digital solutions



#### Software engineering



**Standard Application** 

Modular design & construction



System integrator/ OEM

#### Virtual Pre-Commissioning



**HiL Simulation** 

Final commissioning





## The E - RTG (+) configuration

For Peak Shaving Yard change, Full Flexibility, Full Availability, Zero-Emission. Reduced Infeed Power by 83%, Reduce Energy Cost by 55%



## SIMOCRANE ESSM, Infeed and DCP

**Cutting Edge Energy Management** 



#### Full control of the infeed power in 4 Quadrants

- Advanced Peak-shaving with energy categorization
- Prioritization of regenerative energy to charge the battery
- Downsize Infeed enabling readiness of HY-RTG(+) to E-RTG(+) transition



#### Enhance energy management algorithms for 15 min Peak Power Value

- Advanced Peak-shaving with energy categorization
- Prioritization of regenerative energy to charge the battery

#### Unique Digital Solutions

- Crane Energy Balance Simulation
- Individual crane to terminal wide energy flow simulation, sizing & KPI forecast

#### Battery lifetime extension

- Cutting edge battery power management
- Dynamic close loop SOC control of battery

#### Integrated buck-boost converter

- Dynamic control of energy flow between battery and DC-link
- Compact, bi-directional DC-DC converter in parallel connection
- Redundancy set in Emergency mode

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#### In summary

#### Environmental



- Reduced fuel consumption
- Less noise & GHG emissions





- Increased efficiency
- Increased availability
- Short commissioning time
- Less maintenance costs
- Reduce electricity & demand charges



#### CapEx



- Downsizing of the power supply infrastructure & crane infeed units
- Jump in voltage level MV  $\rightarrow$  LV
- Future proven modular system design
- Scalable expansion

#### SUSTAINABILITY

# Right setup for electrification is the key to Sustainable Operation & Profitability





# Thank You!

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