

Propulsion technology for the future

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4 December 2017
VAROQNEP17057R00

BOMBARDIER

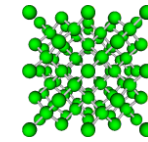
Propulsion technology for the future – SiC

SiC converter technology shows significant customer values in comparison with today's converter technology.

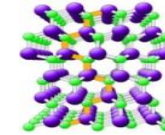


MITRAC SiC traction converters
Single axle drive
Energy optimized traction motors

Power semiconductor evolution and revolution

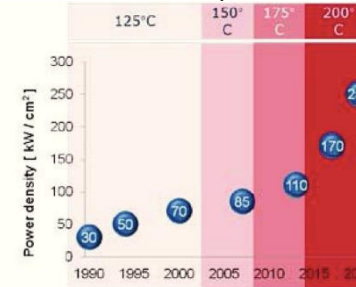


Si continues to evolve



SiC promises a revolution!

Evolution of power density



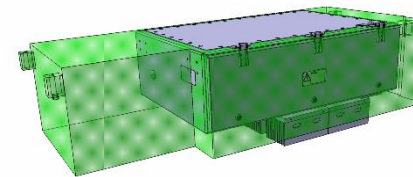
Increased **Efficiency** and **Power density**
with new standard for packaging

Reduced propulsion weight, volume and losses
→ **High capacity, low energy consumption and noise**

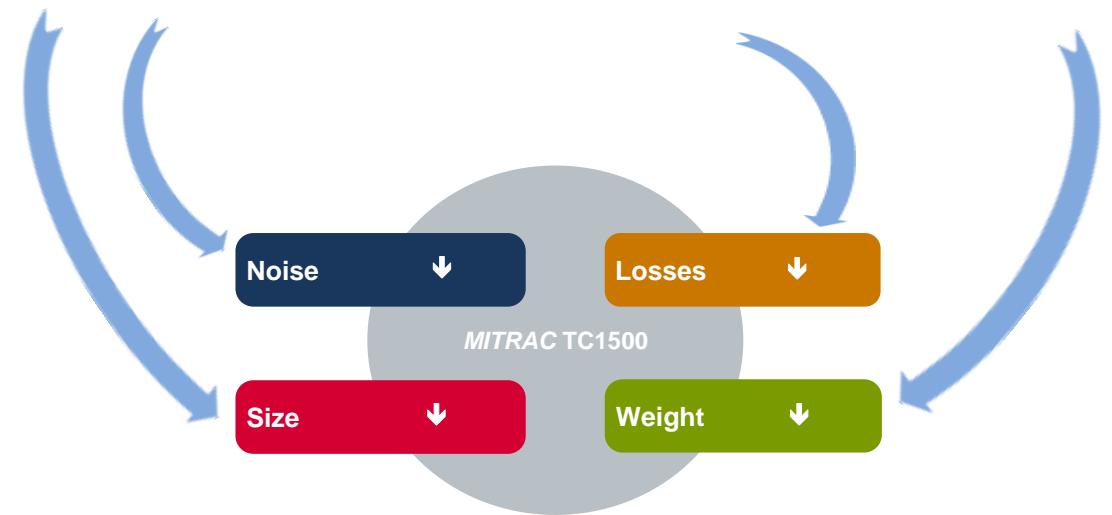
Propulsion technology for the future – SiC going live

- Bombardier with partners will demonstrate next generations **MITRAC SiC traction converter** on a **C20 MOVIA vehicle**.
- The **Swedish Energy Agency** granted in May 2017 co-funding support for a field test in Stockholm Metro
- Field test planned to take place Dec 2017 – Mar 2018 on the **Stockholm Metro Green line**
- Study shows significant customer values with next generation **MITRAC SiC traction converter**:
 - **Lower losses and maintenance**
 - Reduced volume and weight
 - **Reduced noise**
 - Potential **energy saving of up to 24 M kWh/year for the C20 vehicle fleet** (more than 20 MSEK/year with an energy cost of 1 SEK/kWh)
- In addition to energy savings the introduction of new converter and **single axle control will increase the wheel life significant** (no wheel diameter dependence)

MITRAC TC1500 SiC



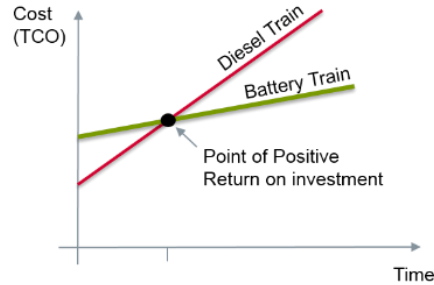
Stockholm Metro 2017-2018



Propulsion technology for the future – Battery propulsion

Advantages for Operator and Passenger

Cost reduction



Reduced “Total Cost of Ownership” (TCO) of xxx Battery trains compared to diesel trains

Reduced Emissions



Reduction of CO2, NOx and particle emission due to operation of electrical trains on non electrified sections.

Noise reduction



Sound power level reduced by approx. 7 dB compared to diesel trains

Improved and flexible operation



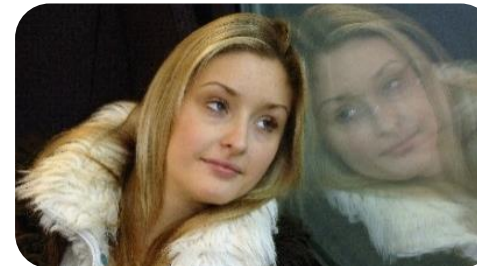
More flexibility for operators having no need anymore to buy and operate electrical and diesel trains in parallel. By that new lines new connections can be offered.

Reduced infrastructure



No need for electrification causing cost (one time and maintenance) as well as time consuming processes

Increased passenger comfort



Direct connections no need to change trains and reduced travel times.

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