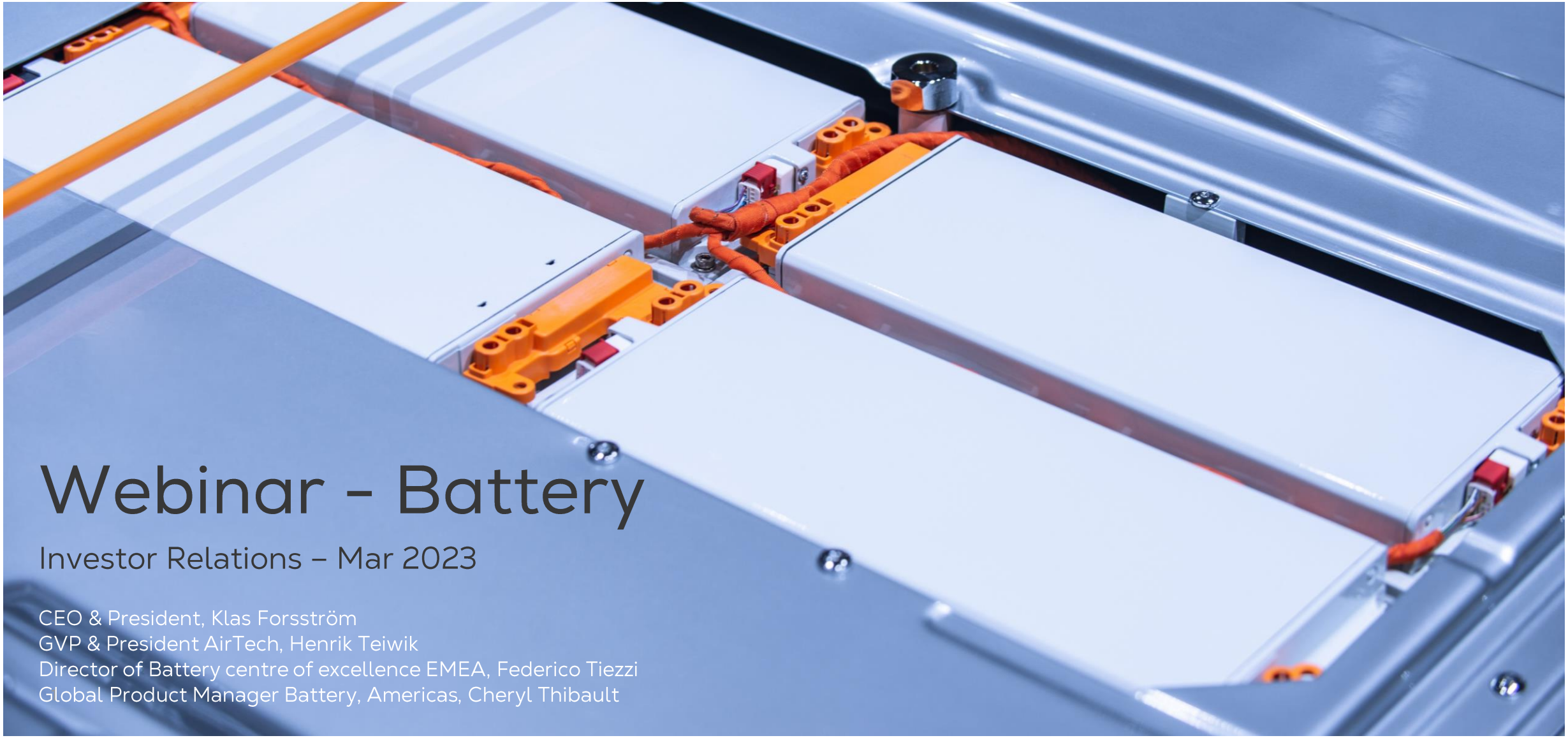
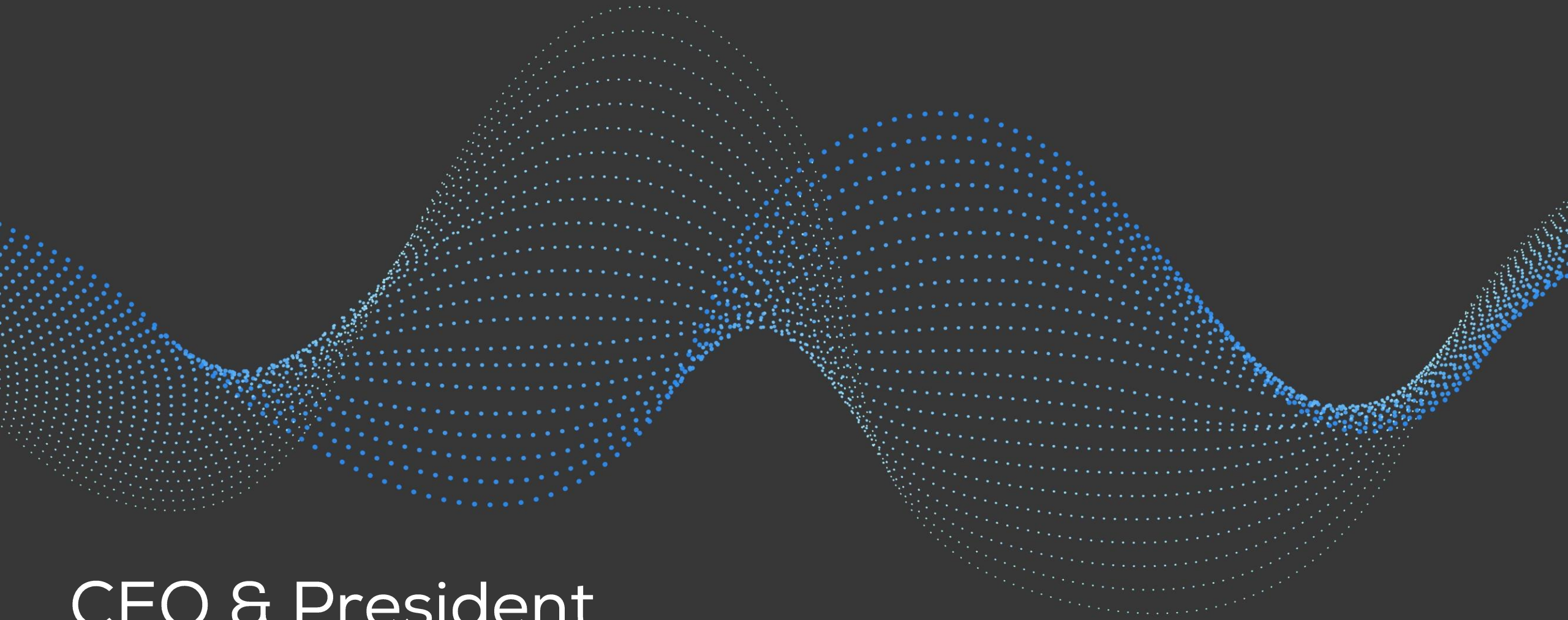
Munters



Webinar - Battery

Investor Relations – Mar 2023

CEO & President, Klas Forsström
GVP & President AirTech, Henrik Teiwik
Director of Battery centre of excellence EMEA, Federico Tiezzi
Global Product Manager Battery, Americas, Cheryl Thibault



CEO & President, Klas Forsström

Positioned for profitable growth

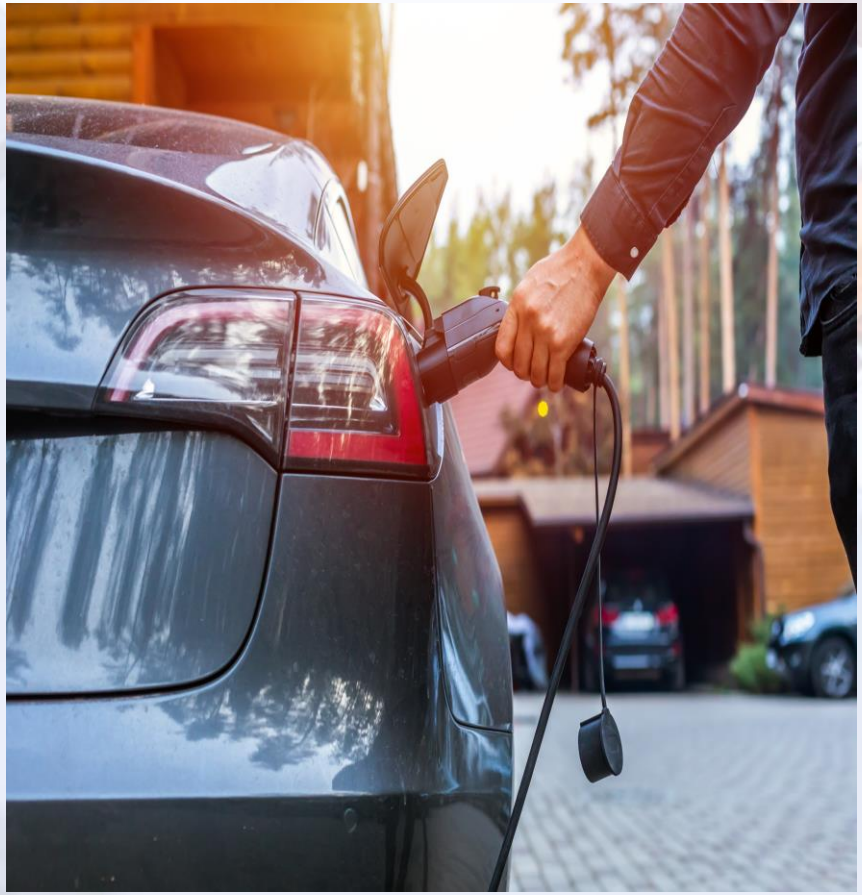
Clear strategy set for value-creating growth within battery in AirTech

Well-positioned for strong growth in markets driven by electrification

Record orders during 2022 confirm our strong position & offer

We deliver energy-efficient solutions that improves our customers climate impact

Strong offer confirmed by large orders in the battery segment

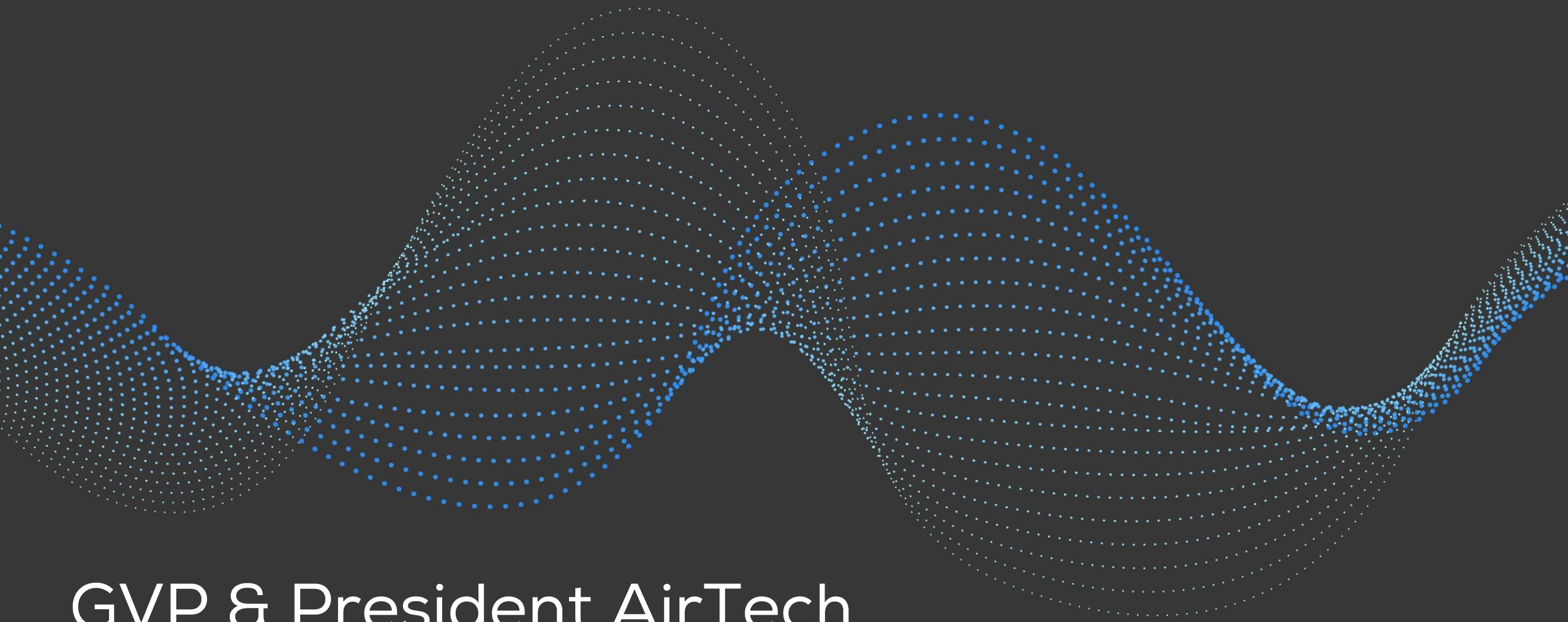


→ **Our largest orders in the battery segment ever**

- Q2 2022 – order from large US car manufacturer
- Total value ~MUSD 65 (including Munters climate control systems & field service work)
- Deliveries: Q2 2023 – Q3 2024
- Combining modularized products and customer specific solutions

→ **Two large orders received in Q4 2022**

- Q4 2022 – order to a multinational automotive manufacturer
- Total value ~ MUSD 54 (incl. systems developed specifically for battery segment & field service)
- Deliveries: Q3 2023 – Q4 2024



GVP & President AirTech, Henrik Teiwik

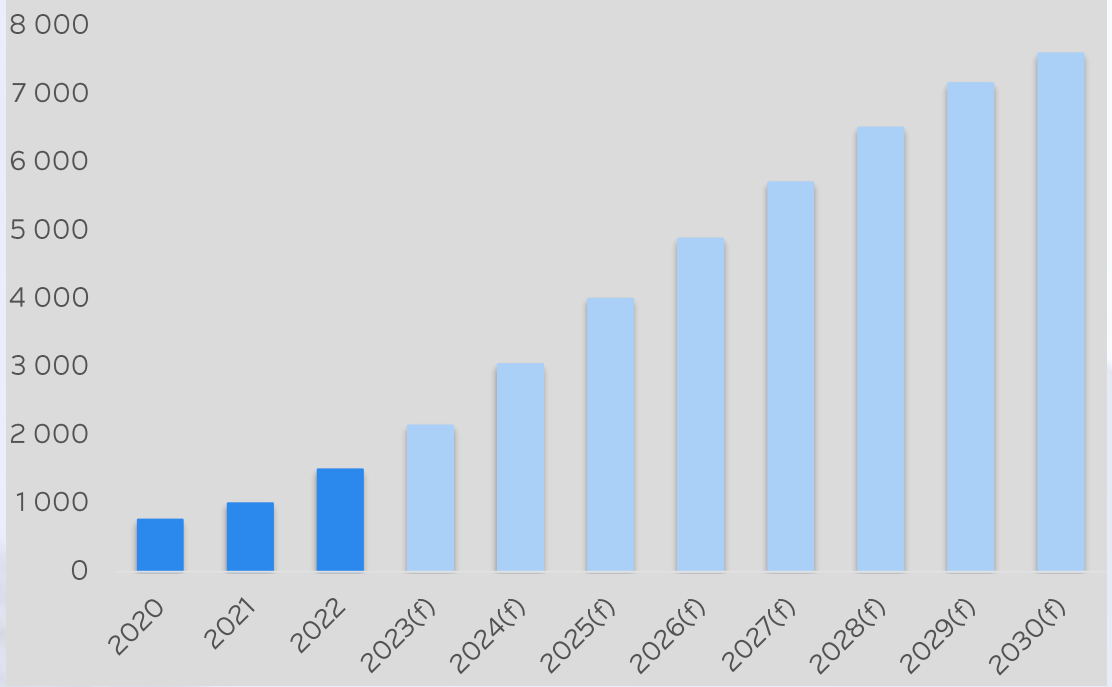
Battery market outlook

- Battery demand is expected to grow globally by 20-25% p.a. until 2030
- Driven by the rapid electrification of mobility applications and increasing need for stationary storage
  - EVs accounted for 14% of global auto sales 2022, on track to reach 30% market share by 2030
  - China's EV market grew +80% yoy, despite lockdowns & price increases
- Supply landscape is shifting, with cell manufacturing increasingly regionalizing (accelerating growth in EMEA & Americas)
- Requires significant Capex investments until 2030 with sector constraints (e.g., talent acquisition, equipment and raw material sourcing)

Strengthen core – by continued focus on profitable growth in battery

Underlying capacity forecasts continue to trend upwards…

Global lithium ion gigafactory capacity expected to grow globally by 20-25% p.a. until 2030



Source: Benchmark Mineral Intelligence

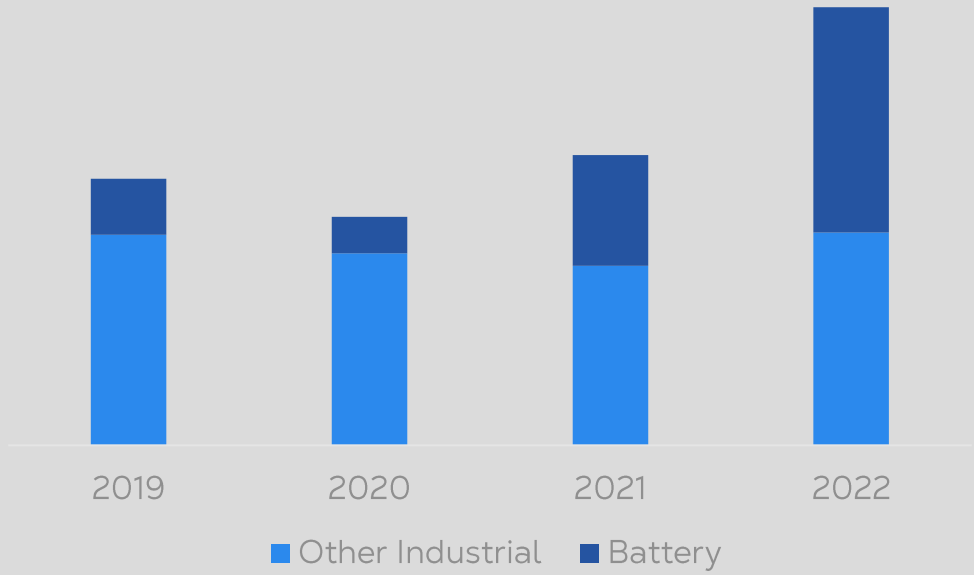
… and we continue to enhance both our offering & capabilities

- Continue to strengthen capabilities within our global battery Center of Excellence
- Harmonization of our offering and introduction of new innovations and solutions (e.g. DSS PRO)
- High focus on value engineering and energy efficiency
- Investments in capacity expansion to meet growing demand
- Capturing the full value chain opportunity

Strong order backlog in Battery

- High expansion of battery capacity in need of dehumidification solutions
  - Historically primarily in Asia
  - Accelerated growth in Europe & Americas
- Orders received for larger projects with longer lead times than the rest of Munters operations
  - But battery backlog a healthy mix of gigafactories and smaller battery labs

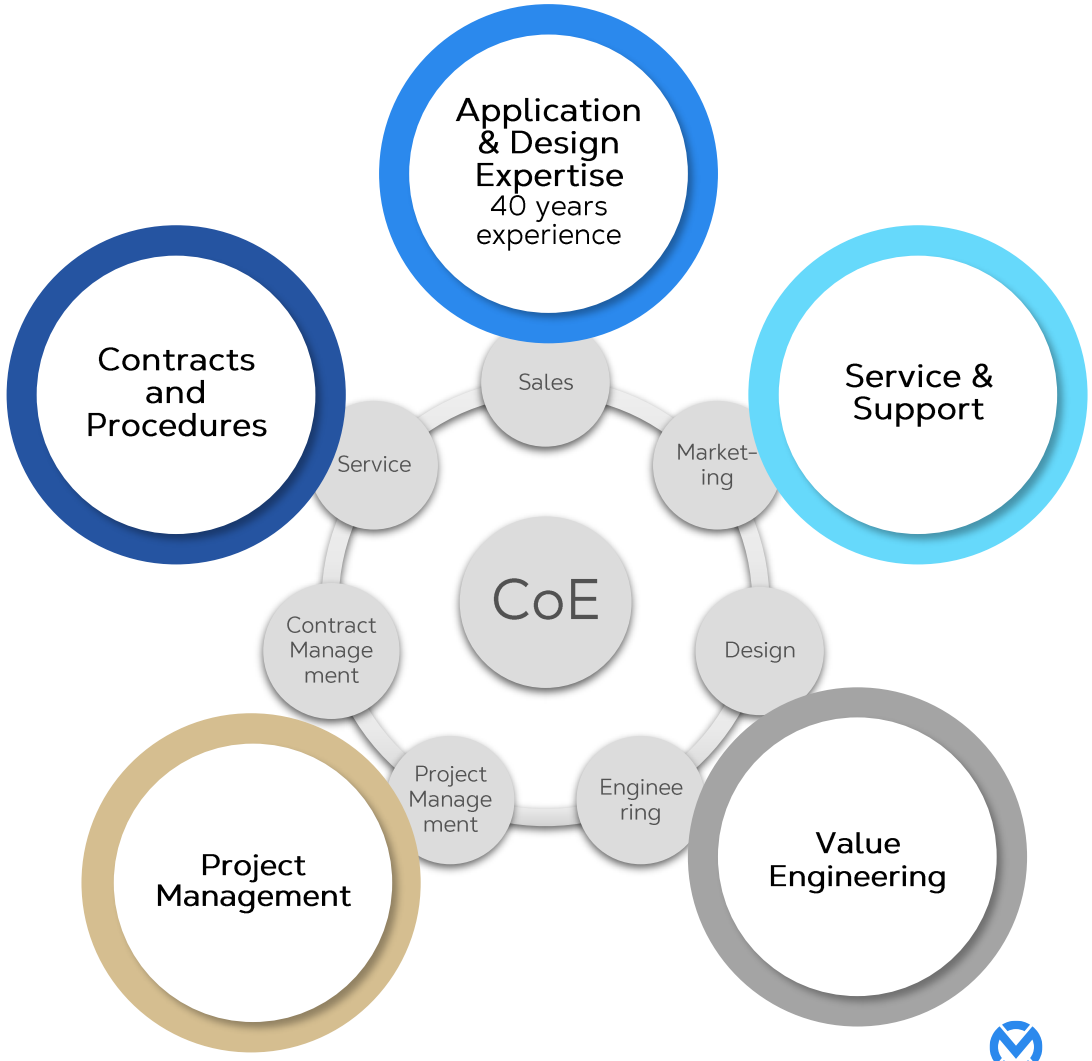
Net sales, Industrial segment in AirTech

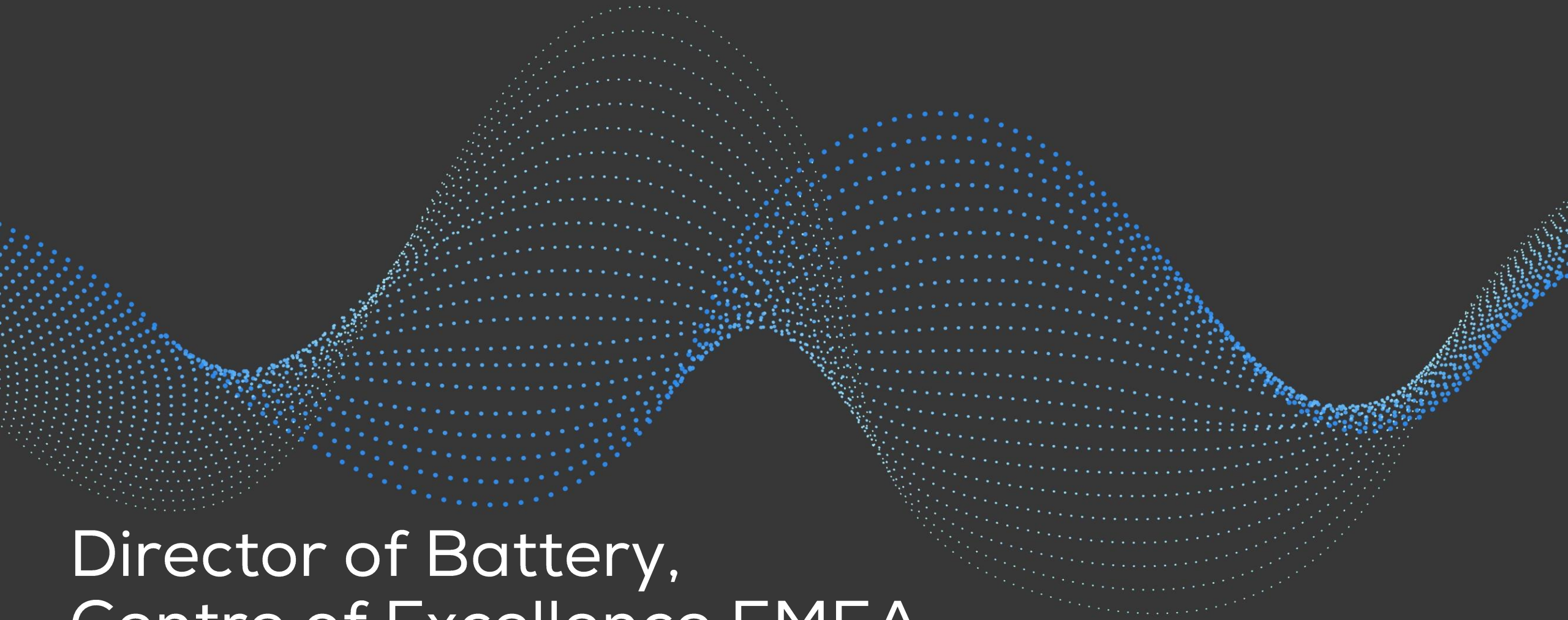


Munter's Centre of Excellence for Battery pivotal for capability building and best practice sharing

Centre of Excellence (CoE)- a team of experts focusing on battery applications, large gigafactories, cutting edge R&D facilities and turnkey projects of different scopes

- → Application know-how to ensure maximum customer value & performance
- → Project management experience to ensure requirements are correctly integrated into a practical, cost effective and efficient solution
- → Manage & integrate partnerships (dry rooms, install, subcontractors, outsourced manufacturing)
- → Facilitates best practice sharing and coordination across Americas, EMEA & APAC





Director of Battery, Centre of Excellence EMEA, Federico Tiezzi

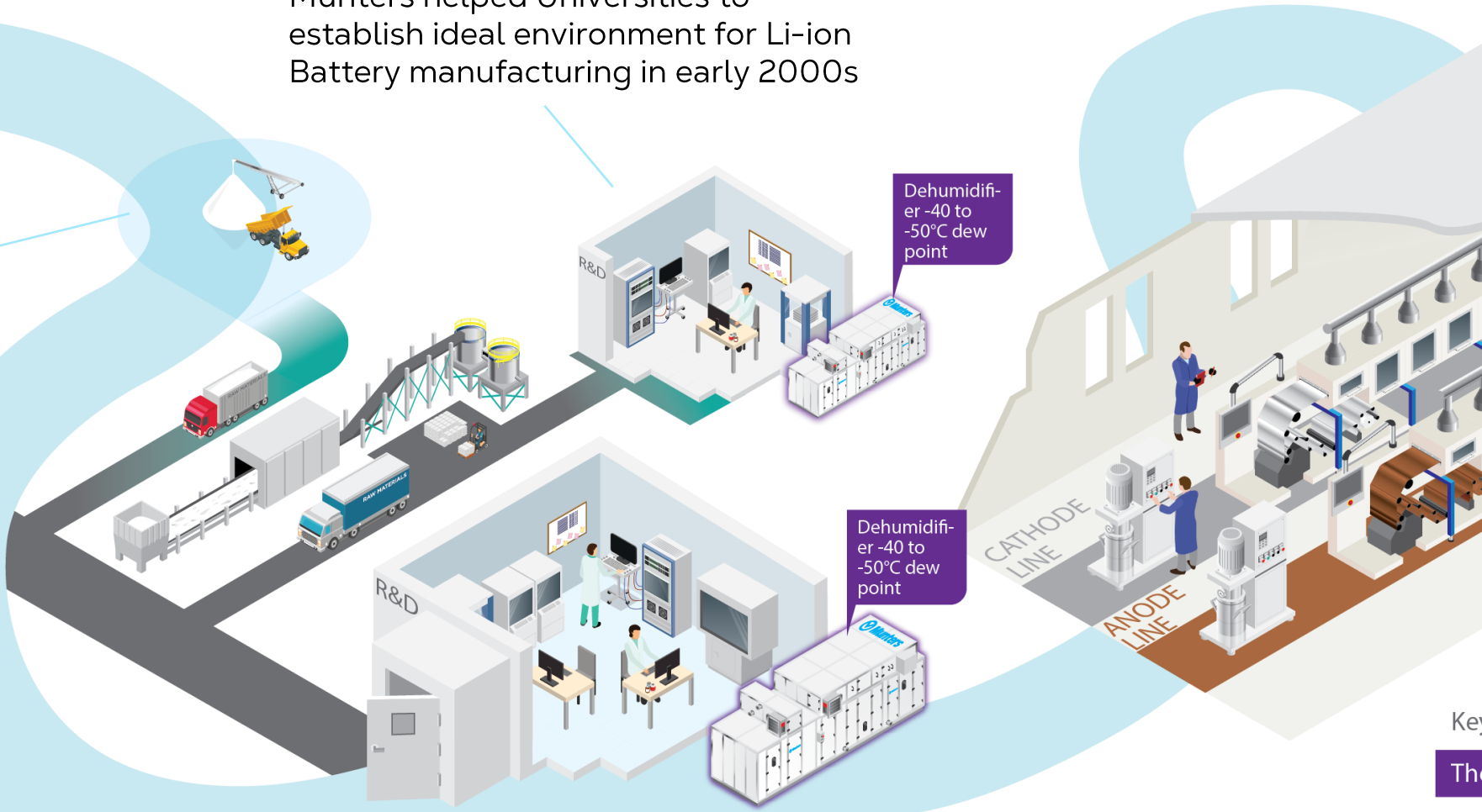
Munters journey in Battery manufacturing

Journey started 27 years ago
First Battery Laboratory in Oxford UK - 1996

Lithium-ion highly sensitive to water, moisture trapped inside increases risk of thermal runway and fire.

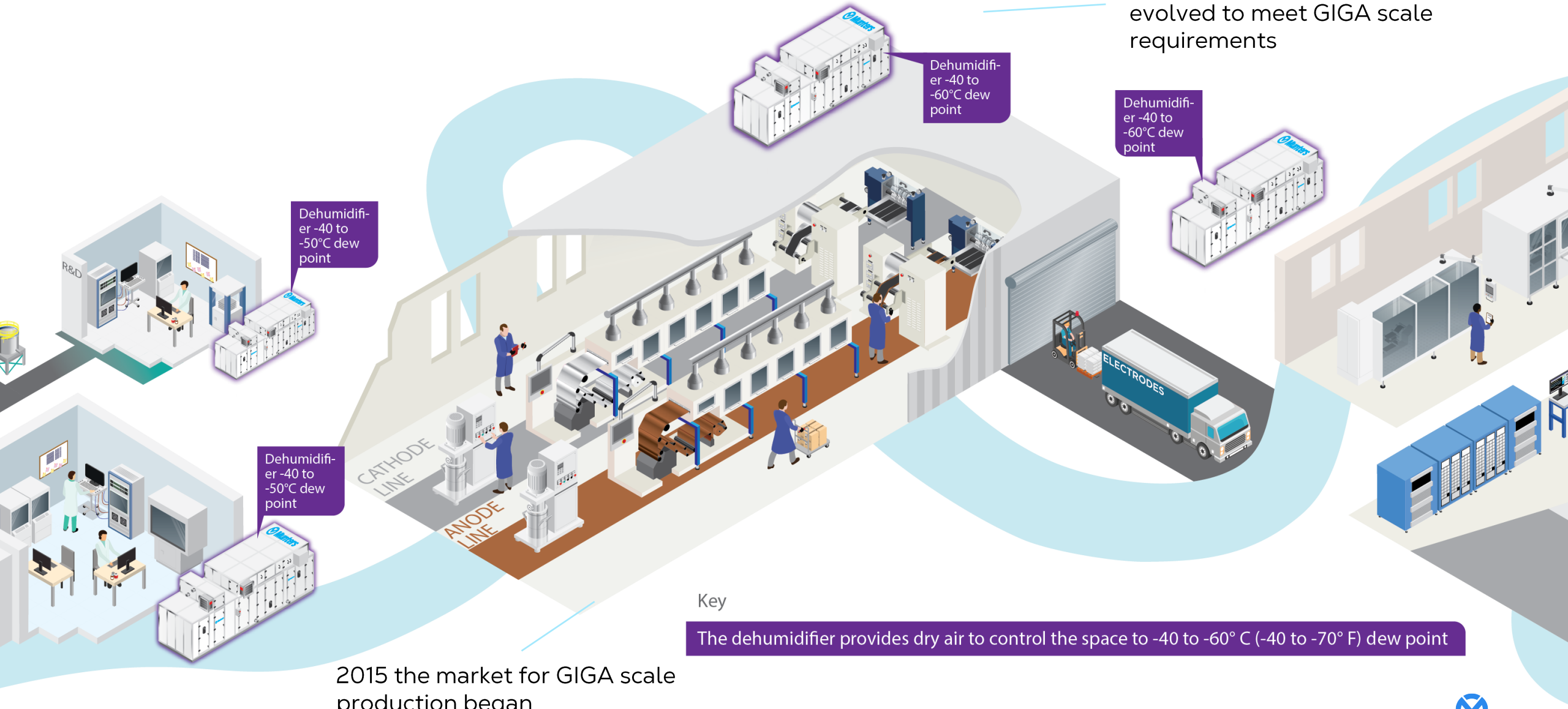
Lowest possible moisture contamination increases durability, performance and quality of the battery pack.

Munters helped Universities to establish ideal environment for Li-ion Battery manufacturing in early 2000s



Munters journey in Battery manufacturing

Munters DHU and solution evolved to meet GIGA scale requirements

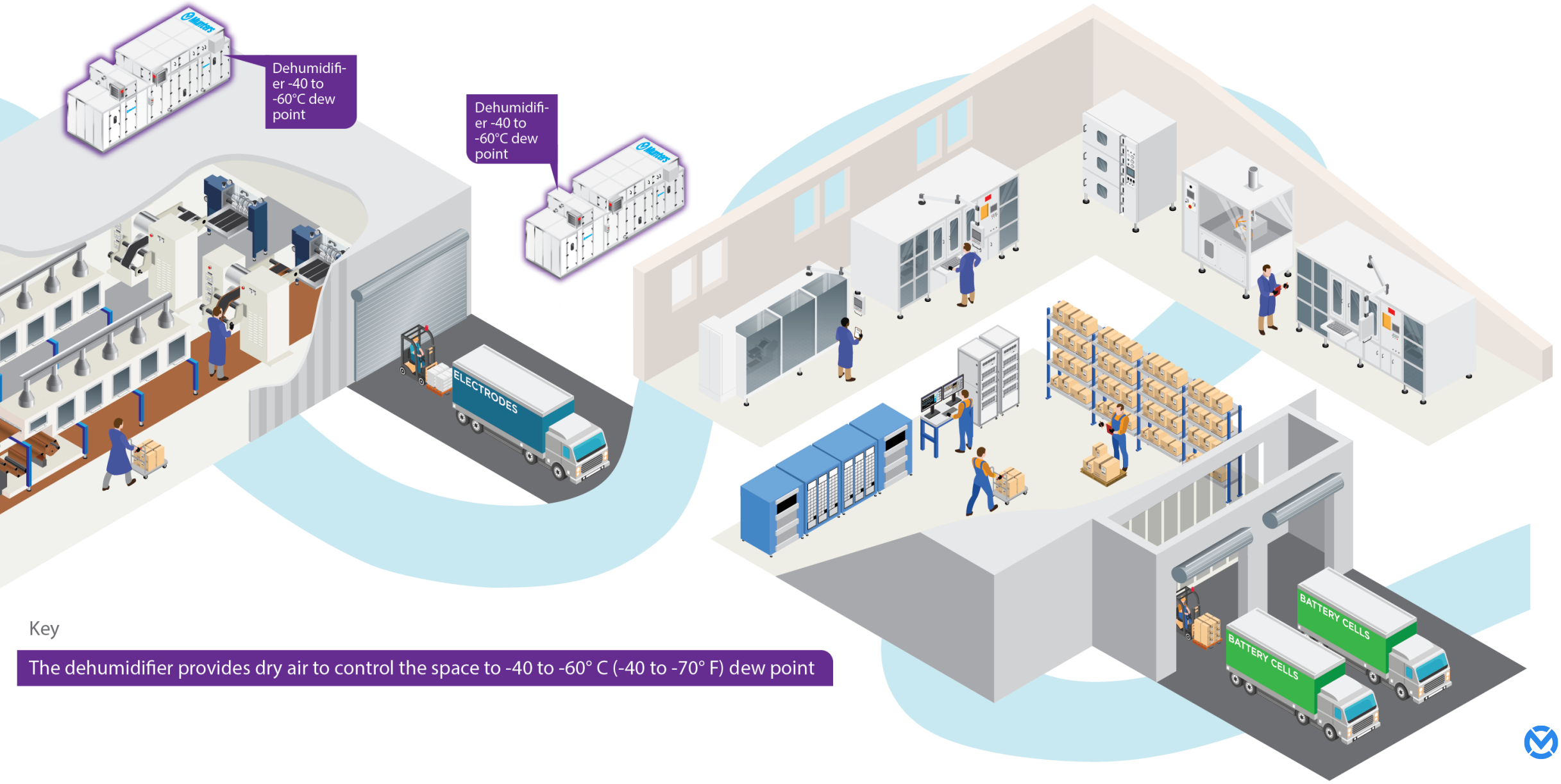


Key

The dehumidifier provides dry air to control the space to -40 to -60° C (-40 to -70° F) dew point

2015 the market for GIGA scale production began

Munters journey in Battery manufacturing

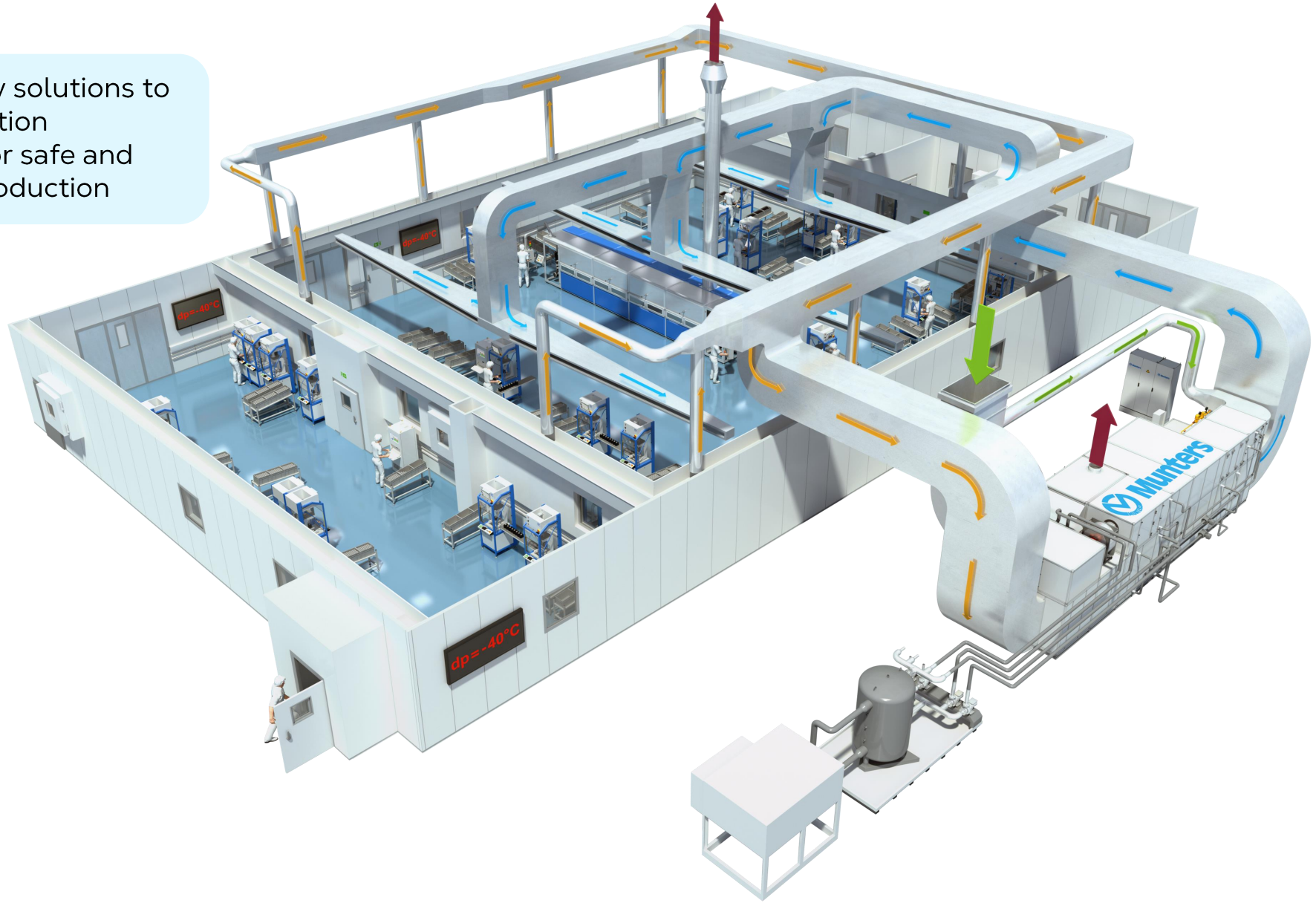


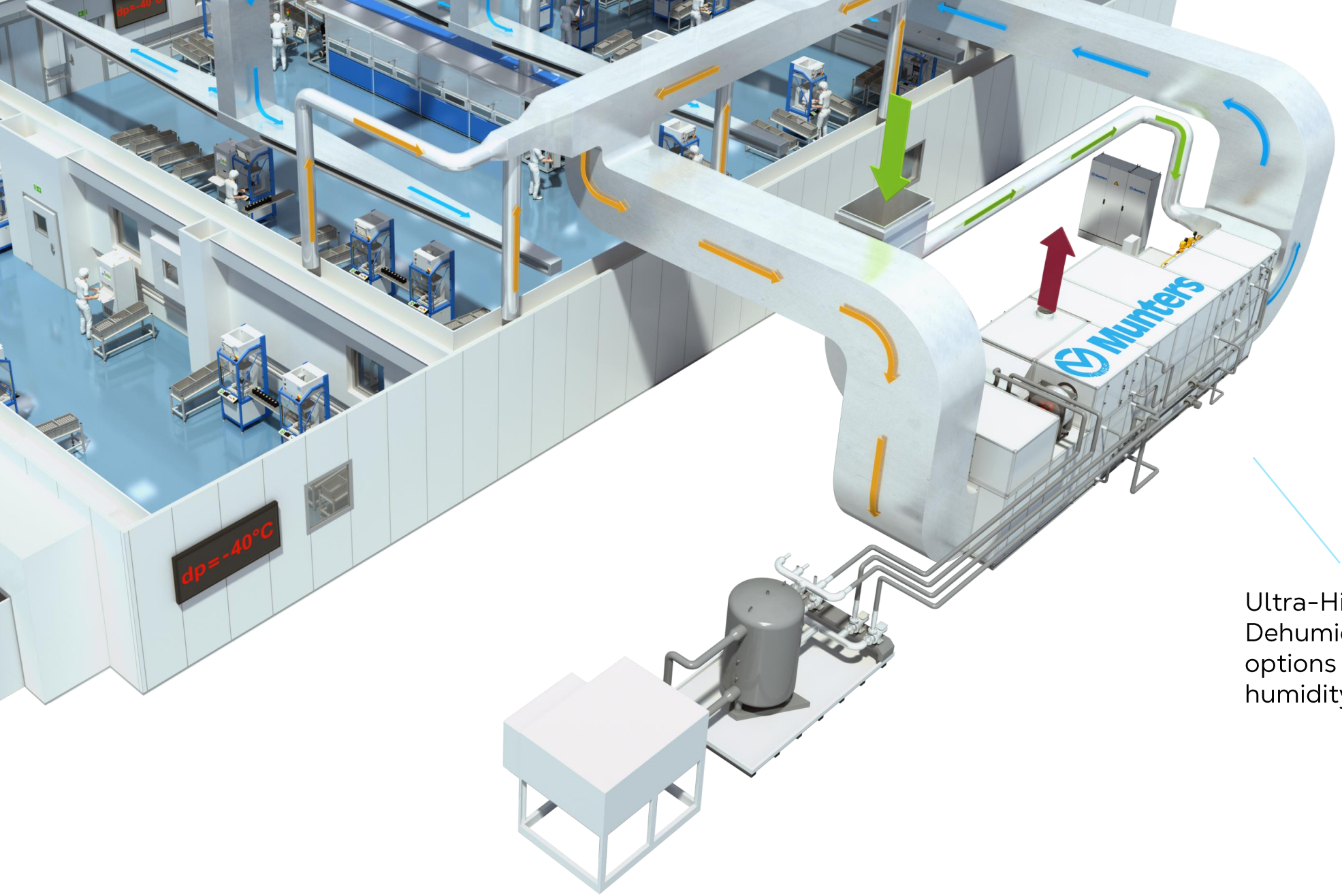
Key

The dehumidifier provides dry air to control the space to -40 to -60° C (-40 to -70° F) dew point

Munters Dry-room solutions

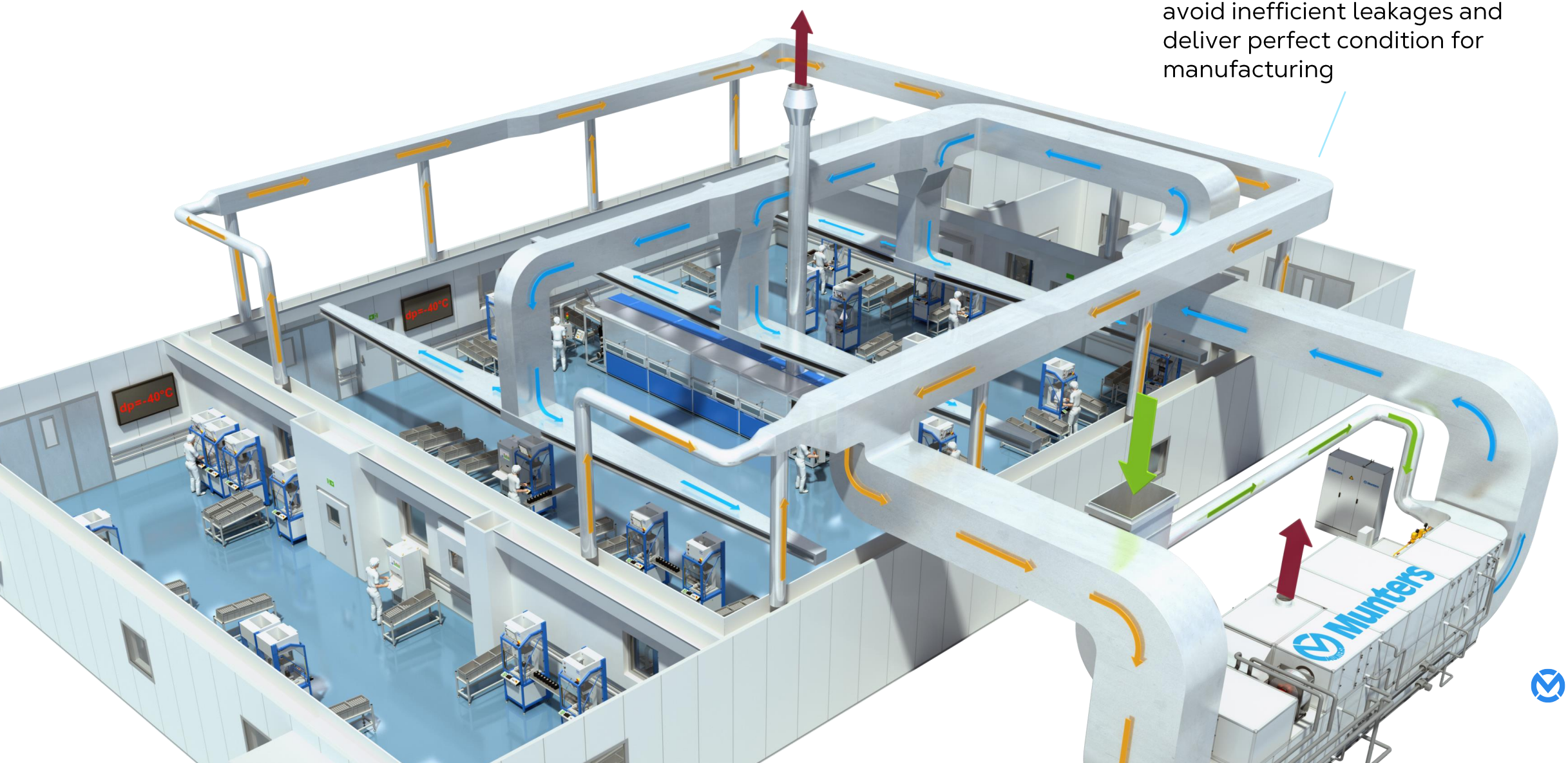
Munters supply solutions to control production environment for safe and high quality production

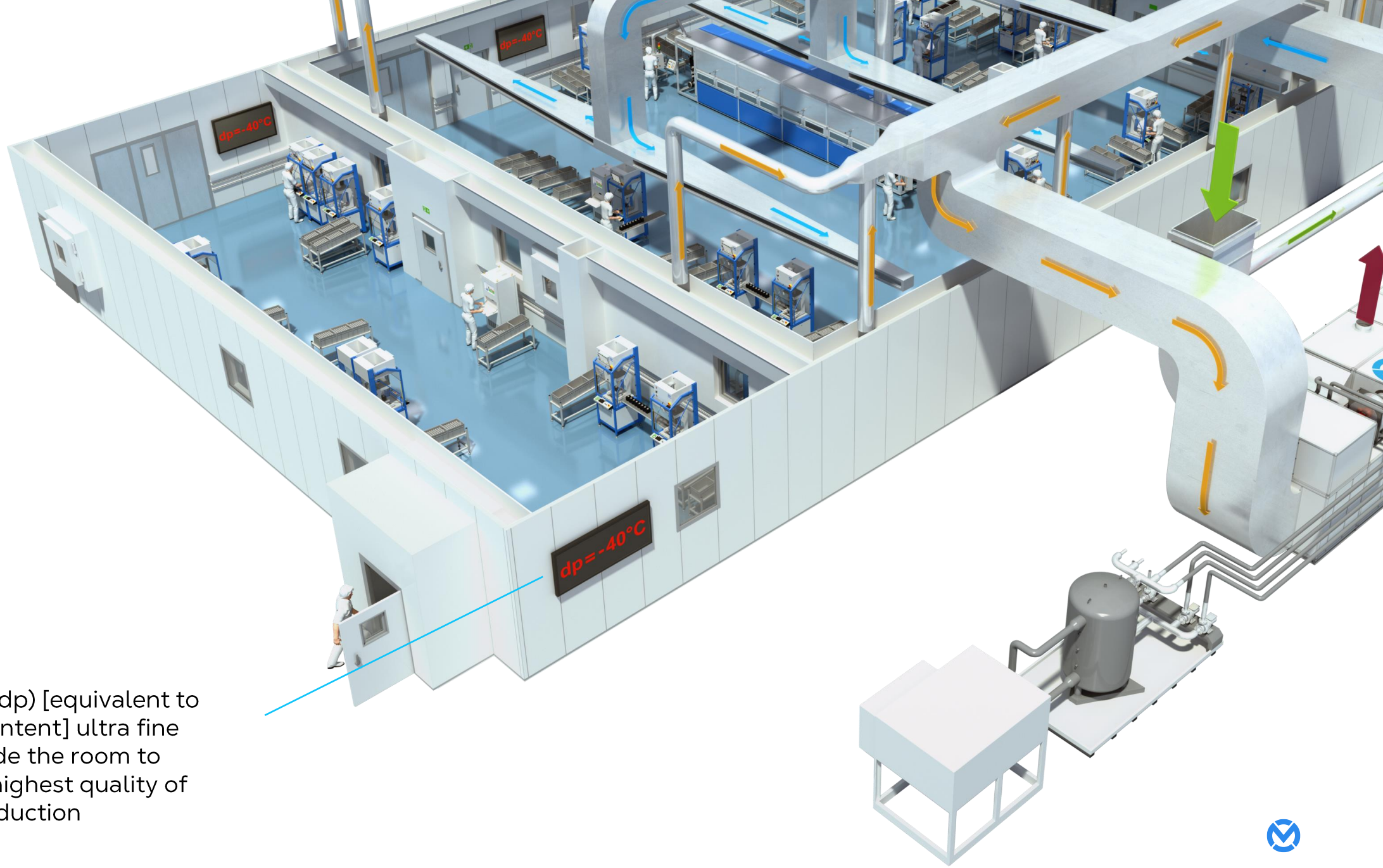




Ultra-High Efficient Munters Dehumidifiers with vast range of options and feature for optimal humidity and temperature control

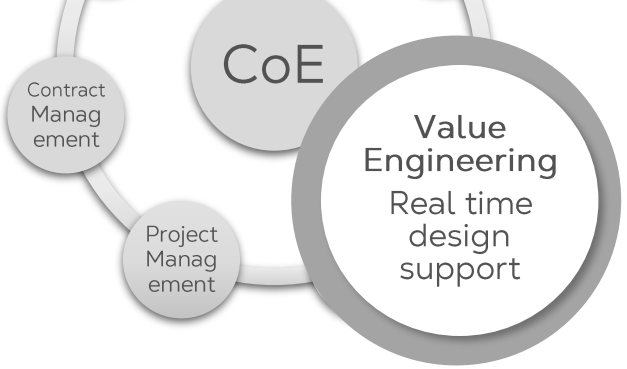
Capillary and precise air-distribution to the environment to avoid inefficient leakages and deliver perfect condition for manufacturing





Dew Point (dp) [equivalent to humidity content] ultra fine control inside the room to guarantee highest quality of battery production

Design for optimal CAPEX and OPEX



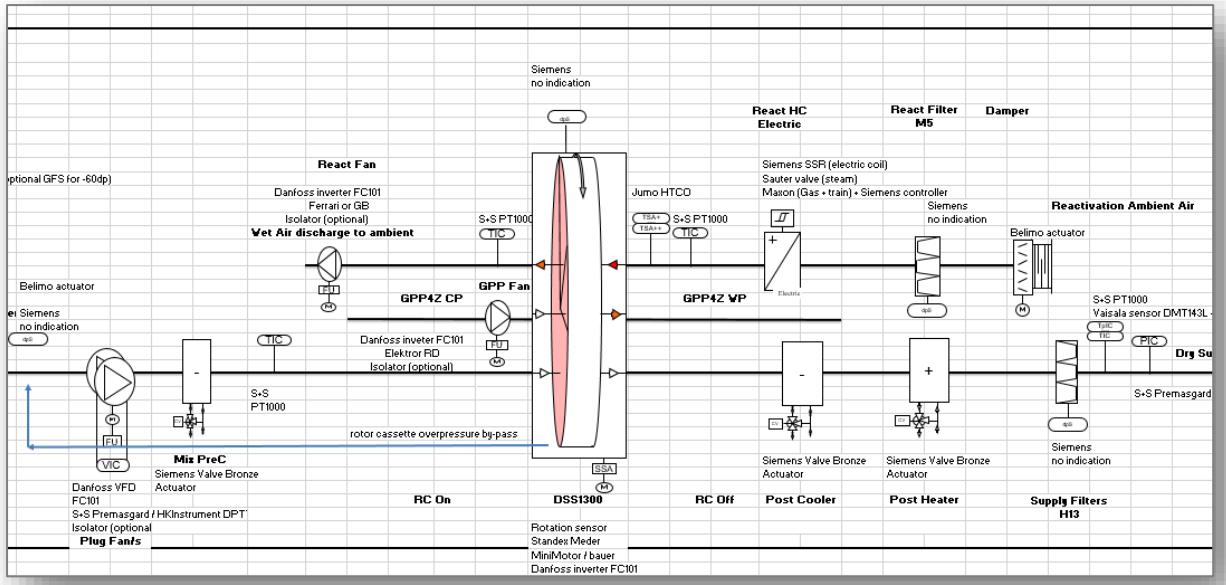
CAPEX

- Munters provides options for value-added engineered solutions
- Close customer collaboration to clearly define essential needs & identify suitable areas for savings without compromising performance
- Initial project cost can be reduced by > 25%

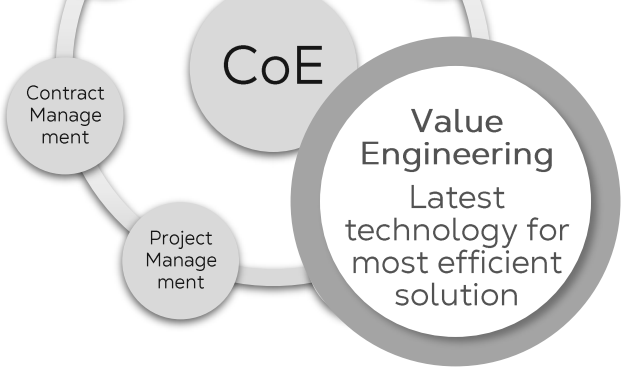
OPEX

- Design iterations focusing on best value, including life cost initiatives i.e., energy consumption, service response, total lifecycle management & critical spares

Latest engineering tools

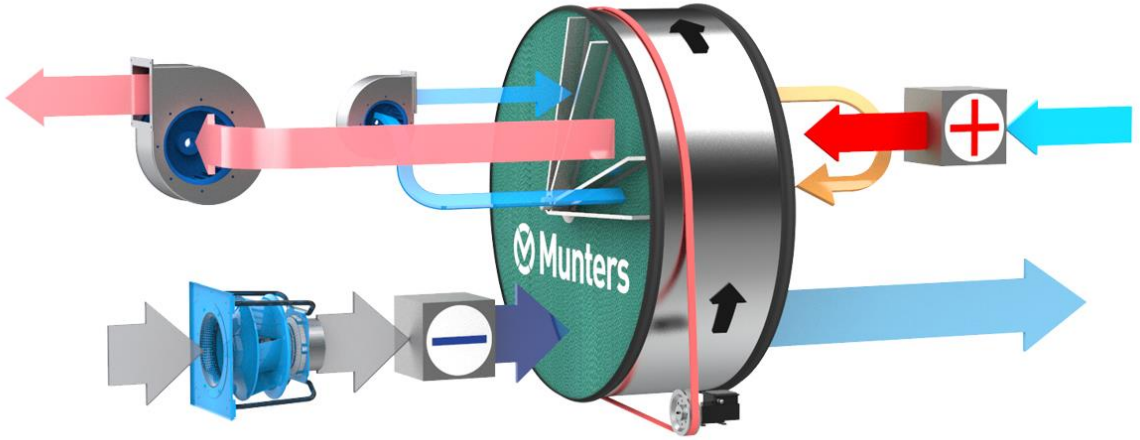


Design for energy savings



Green PowerPurge™ technology – offers the best possible energy efficiency

- → improved performance
- → energy efficiency
- → significant cost savings
- → the reactivation energy reduced by 30%



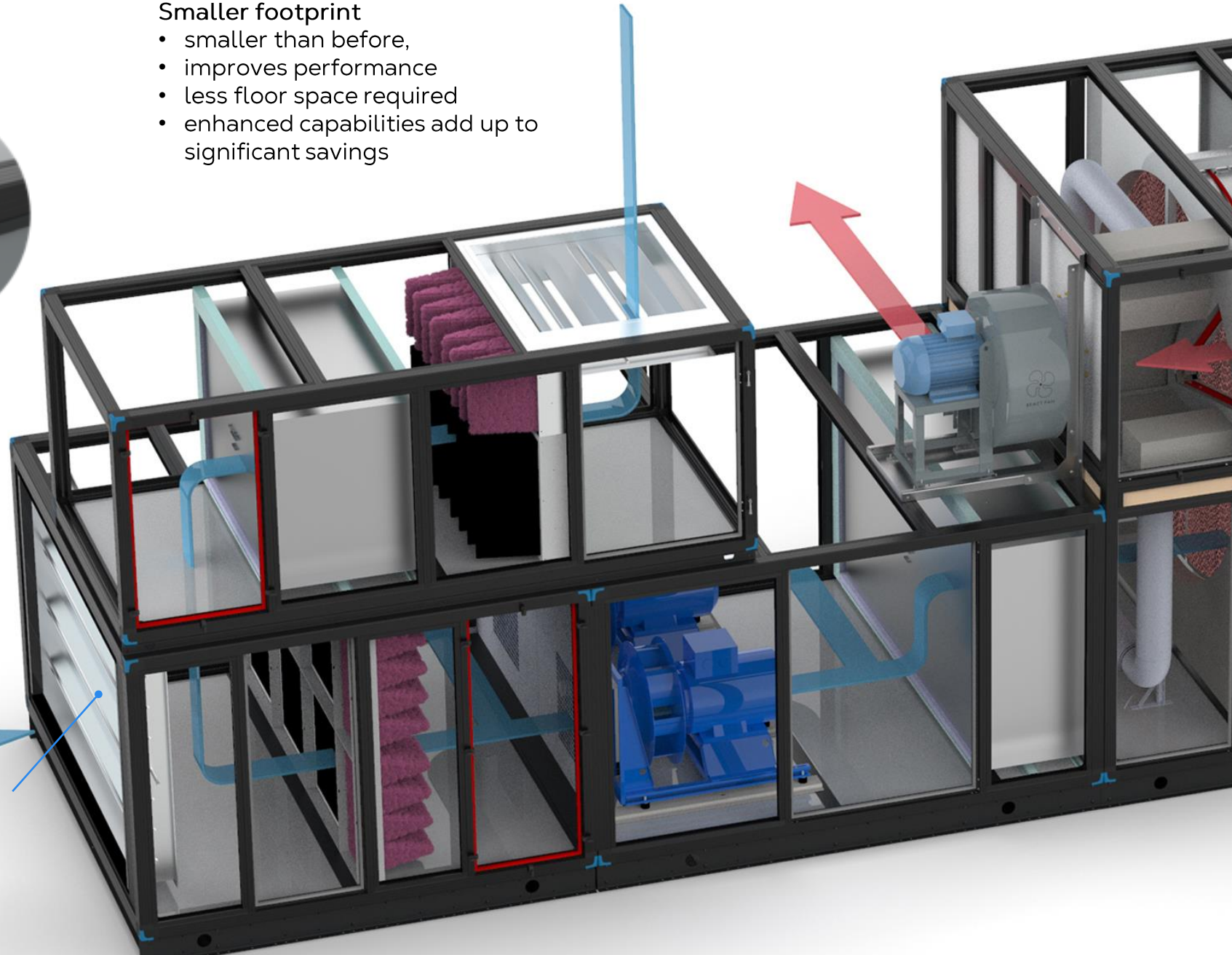
By purging air & utilizing recirculation technology, Green PowerPurge reduces energy needs while improving desiccant performance

Munters dehumidifier

Munters dehumidifier

New enclosure
- brand new casing, 50% stronger
- offeres outstanding reliability & efficiency over a longer period
- improves thermal-break & insulation by 20%
- ensures 4 times less air leakage
- resulting in 8% lower energy consumption alongside longevity & reliability being improved by 15%

Smaller footprint
- smaller than before,
- improves performance
- less floor space required
- enhanced capabilities add up to significant savings

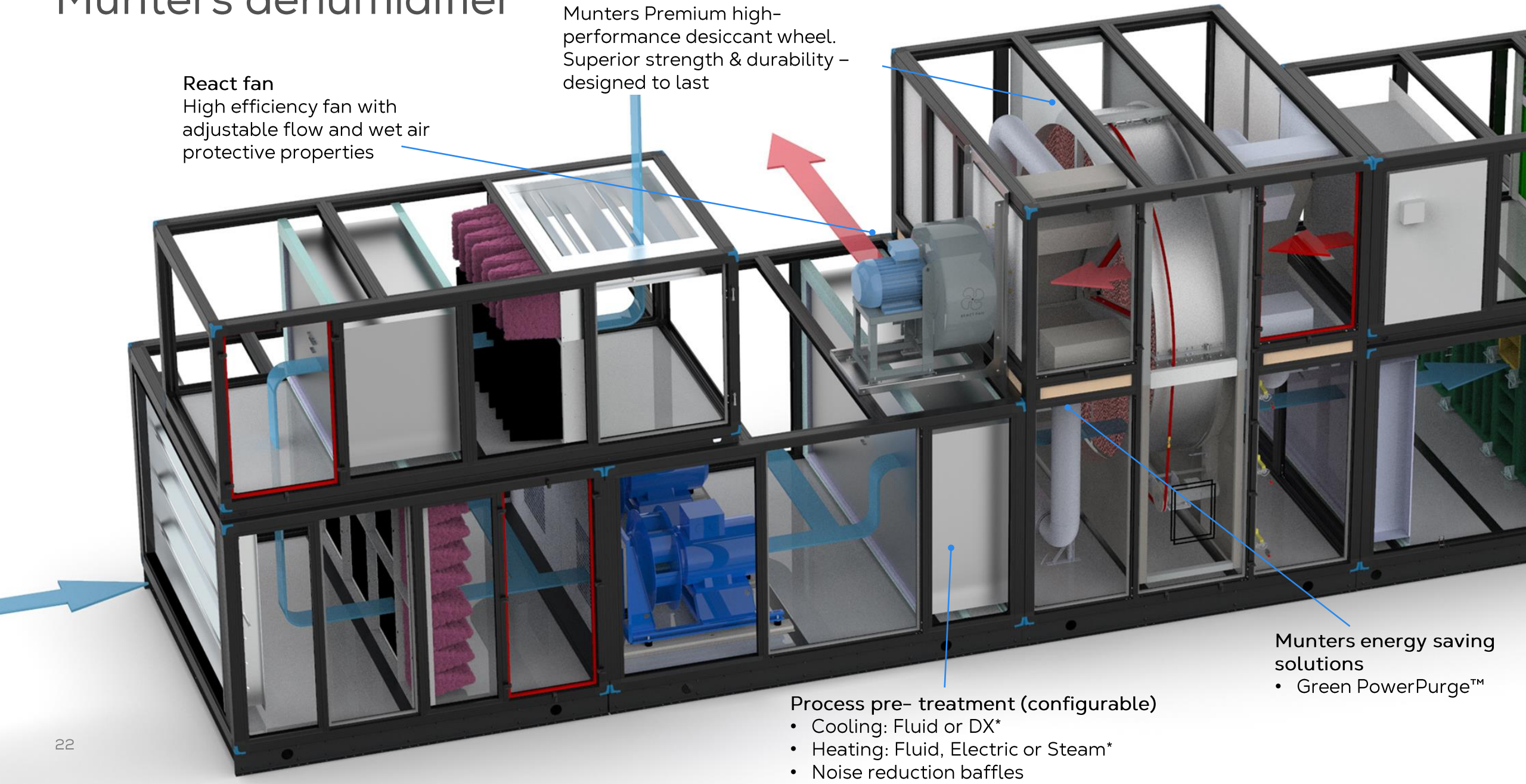


Air damper
- Robust & maintenance free
- Configurable position, leakage class & operation mode
- hand or motor controlled

Munters dehumidifier

Performance
Munters Premium high-performance desiccant wheel. Superior strength & durability – designed to last

React fan
High efficiency fan with adjustable flow and wet air protective properties



Process pre- treatment (configurable)
- Cooling: Fluid or DX*
- Heating: Fluid, Electric or Steam*
- Noise reduction baffles

Munters energy saving solutions
- Green PowerPurge™

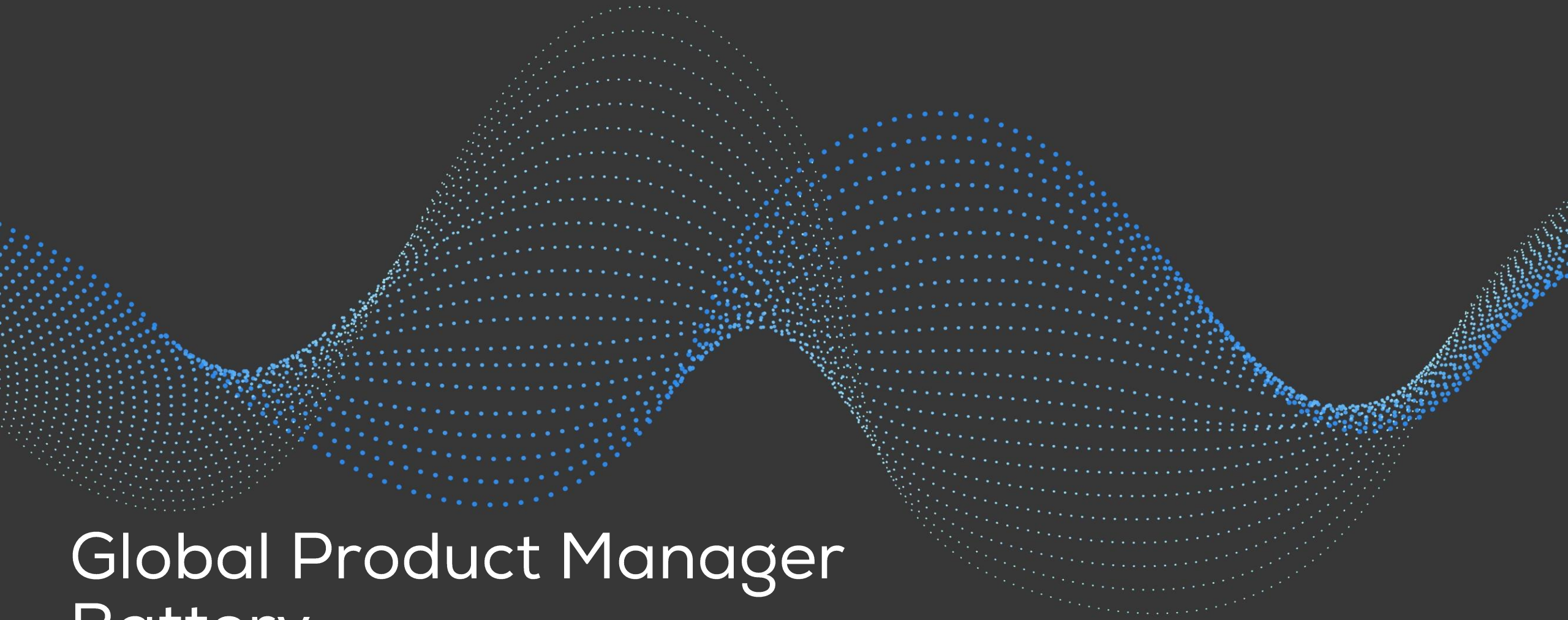
Munters dehumidifier

React heater
- Steam, electrical, gas
- Ready for sustainable energy
- Configurable size and power

Process post- treatment (configurable)
- Cooling: Fluid or DX*
- Heating: Fluid, Electric or Steam*
- Humidification: Steam or Munters evaporative humidifier / cooler
- Noise reduction baffles

The journey continues…

	Today	Few years	10 years	Few decades
Market				
Battery Technology	 Lithium-Ion		Li – S Lithium Sulfur	 Sodium-Ion
Munters	Lithium highly reactive to water		Sodium highly reactive to water	



Global Product Manager Battery,
Cheryl Thibault

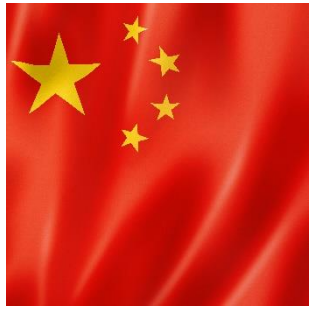
Consumer demand and decarbonization efforts are driving regional growth

European movement towards climate neutrality in 2050

- Cutting emissions by 55% this decade
- EU commission working towards compromise to keep 2035 ban of fossil fuel cars
- Cutting CO_2 emissions by 55% for new cars sold after 2030 vs 2021 levels

US Infrastructure Law & Inflation Reduction Act (IRA) EV Tax Credits

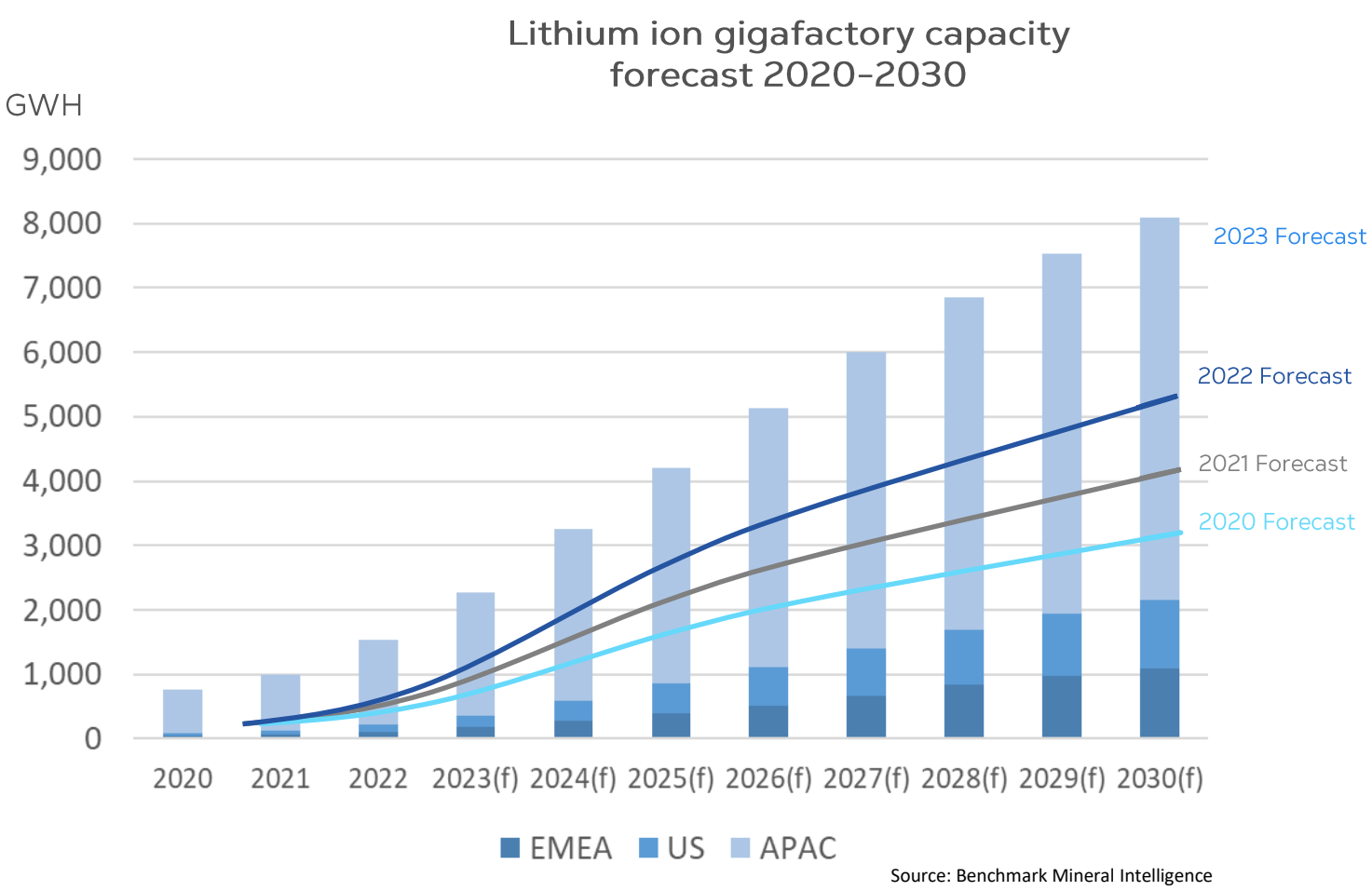
- $7B for domestic battery processing, cell manufacturing & recycling
- › 50% value of battery pack must be assembled in the US
- EV tax credit for › 40% battery critical minerals from US or free trade partners



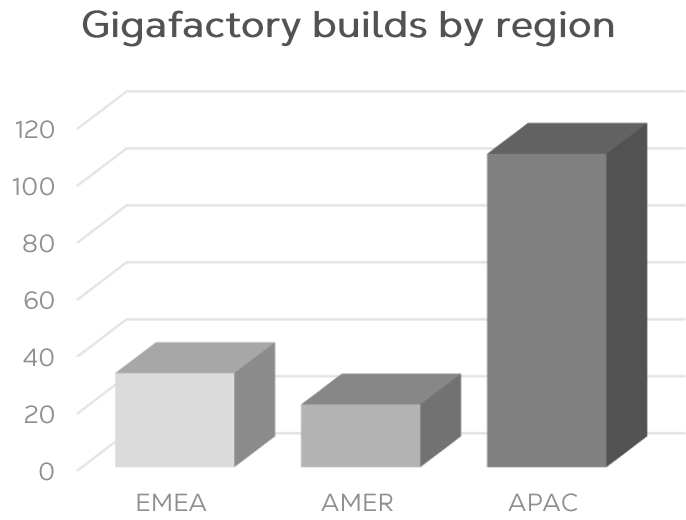
China's new energy vehicle (NEV) standard

- Auto manufacturers exceeded sales targets even with subsidies decreasing
- EVs are already cheaper than combustion cars over the life of the vehicle

Battery production capacity forecast doubles since last year



Source: Benchmark Mineral Intelligence



- 160 gigafactories
  +6,000 GWh to 2030
- $300 billion of factory investments announced last 4 years

Our focus is a mix of gigafactories and research labs

Top Tier EV battery producers

CATL
Envision AESC
Panasonic
LG Chem
SK on
northvolt
BYD
SAMSUNG

High-volume battery producers

CALB
SUNWODA 欣旺达
LISHEN
amte
saft
FREYR
ITALVOLT
Maxwell TECHNOLOGIES
Gotion
TESLA
VERKOR
SVOLT
FARASIS
EVE
Leclanché Energy Storage Solutions
MORROW

Small labs, universities & pilot lines

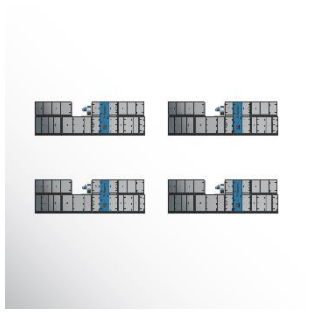
VARTA
Argonne NATIONAL LABORATORY
CELLFORCE
CUSTOMCELLS®
ProLogium
WWU MÜNSTER
UNIVERSITY OF BIRMINGHAM
UNIVERSITY OF MICHIGAN
SILA
SCB+ Swiss Clean Battery AG
SES Beyond Li-ion
Solid Power
QuantumScape

The above are a selection of players in the market, not specifically Munters customers

Customer segments have different requirements

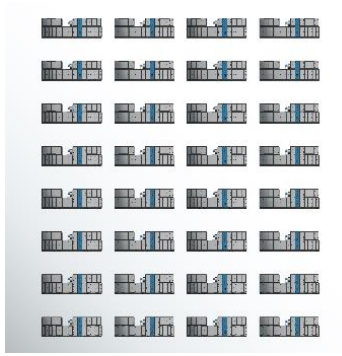
Small – R&D labs & universities

- New chemistries and unique requirements require custom solutions
- Performance requirements vary by project (low dew point and ultra low dew point)
- Can include installation support, dry room integration, commissioning, on-going service support



Medium – Test labs, pilot lines

- Batch production (but small, < 1 GWh) requires multiple DH units & higher level of integration
- Some automation with varying requirements
- Can include installation support, dry room integration, commissioning, on-going operating support

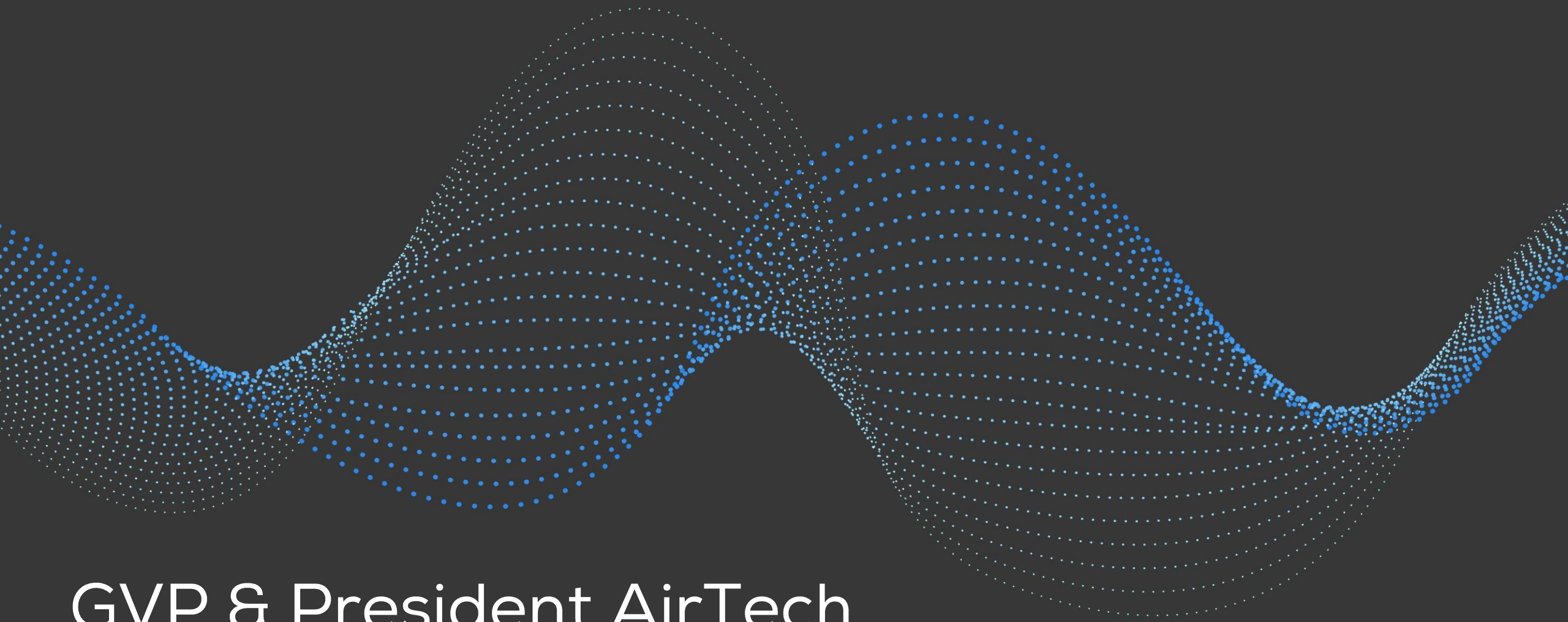


Large – High-volume manufacturing

- 24/7 continuous operation with more automation and several dry room areas/conditions
- Stable and precise room conditions even with varying outside air conditions (summer/winter)
- Working with contractors and designers to optimize the design, costs, energy usage and footprint
- Commissioning, controls integration, and on-going parts & service support for high up-time

Morrow Batteries' first cell production in Norway

- Munters chosen as partner for energy-efficient climate control for their Battery Research Center (BRC) in Grimstad, Norway
- Important collaboration with Equans – as turnkey construction contractor
- Munters Battery CoE – provide expertise and project competence
- Delivery and installation in early 2023
- Morrow next stage - gigafactory in Norway with annual production 43 GWh battery cells by 2028



GVP & President AirTech, Henrik Teiwik

Capturing the full value chain opportunity

Additional opportunities

Service and After-Sales

Additional Opportunities

Raw material

- Raw material mining & handling
- Environmental RH/T control
- Even lower dewpoint

Electrode Cathode and Anode manufacturing | Assembly | Finishing

Slurry prepara-tion → Coating & drying → Calender -ing → Cutting electrodes → Cell assembly → Electrolyte filling & formation

Munters Dry-Room

Additional opportunities

Battery recycling

Additional opportunities

CO_2

Cathode with low CO_2 (less than 10 ppm) for ultra high quality battery and increased capacity-durability

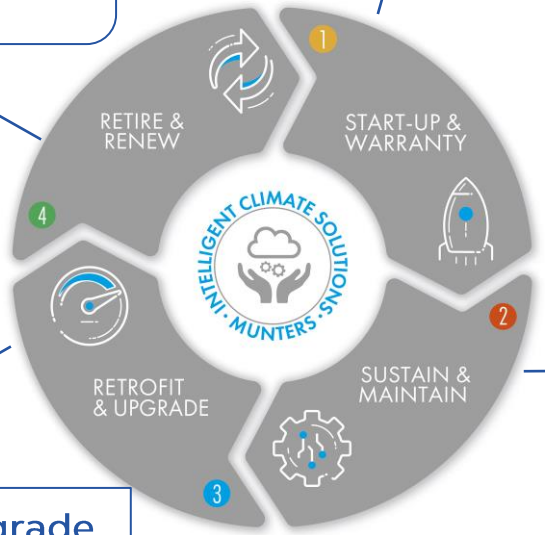
Munters Service Offering – with our customers all the way

Review & Renew

- Smooth transition to new product
- Decommissioning
- Rental Solutions

Start-up & Warranty

- Installation Support/Assembly Supervision
- Start-up Services & Guaranteed performance
- Service Agreement with Extended Warranty
- Training
- Rental Solutions



Retrofit & Upgrade

- Controls Upgrade
- Rotor Replacement
- Rotor Energy Recovery
- Fan Upgrade
- Remote Assist
- EC Cool
- Rental Solutions

Sustain & Maintain

- Service Agreement
- Rotor Performance Check
- Energy Audit
- Reconditioning/Repairs
- Remote Assist
- Spare Parts
- Rental Solutions

→ Well established service offering and local service presence across all regions

→ Adapted for the battery industry

→ Continue to invest in technology to meet future demand

Beyond Electric Vehicles

→ Trucks, buses, heavy machinery

- Will be biggest growth area in 2023 for li-ion batteries
- Hydrogen fuel cell use < 2%

→ Energy storage

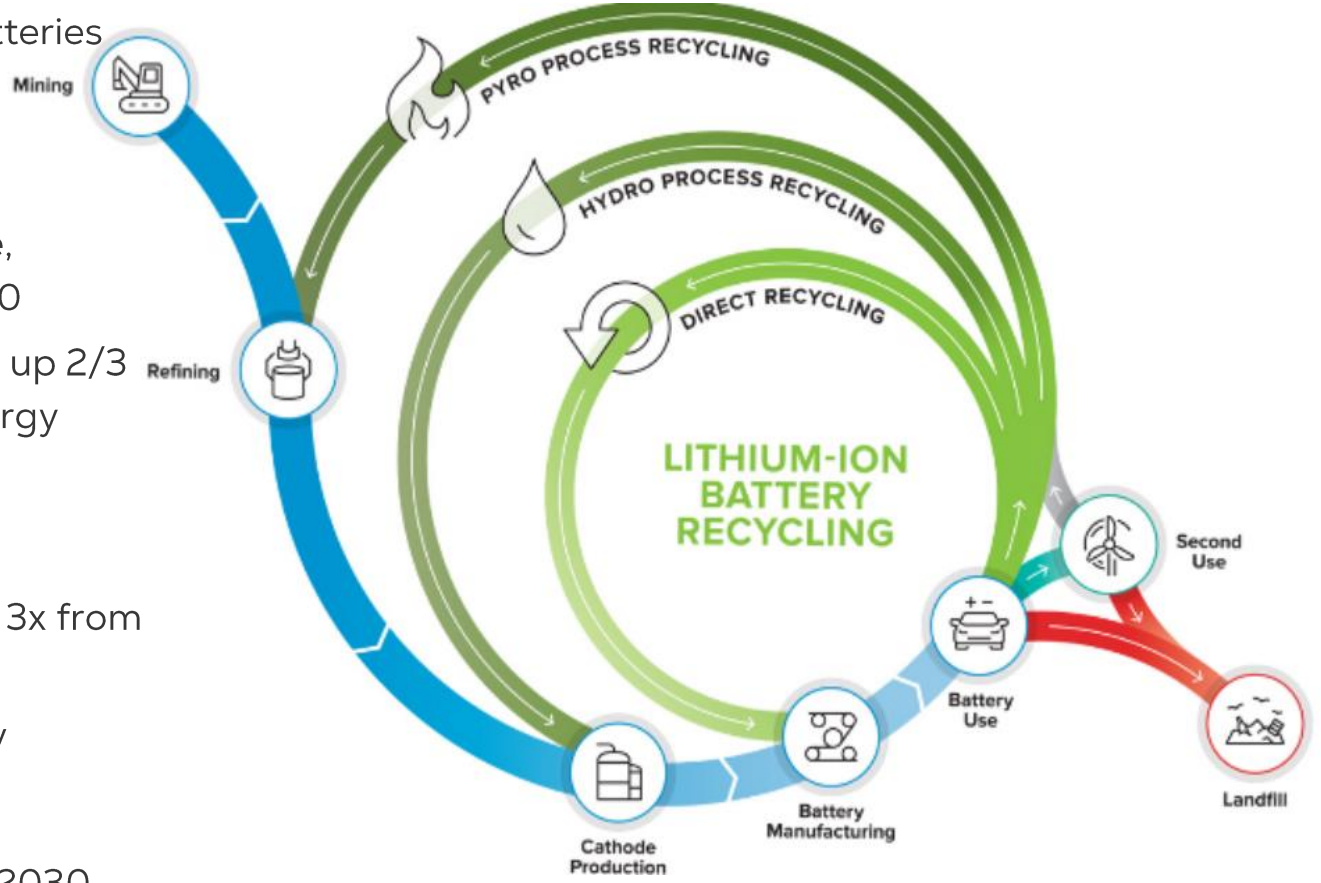
- Makes up < 5% of the global battery market share, projected to grow 15x to reach 1,194 GWh by 2030
- Demand to surpass EV demand by 2050, making up 2/3 of total demand due to growth of renewable energy (wind, solar)

→ Battery recycling

- Essential for circular economy, expected to grow 3x from 2030 to 2040
- DH & CO_2 treatment will help ensure high quality

→ Solid-State-Batteries (SSBs)

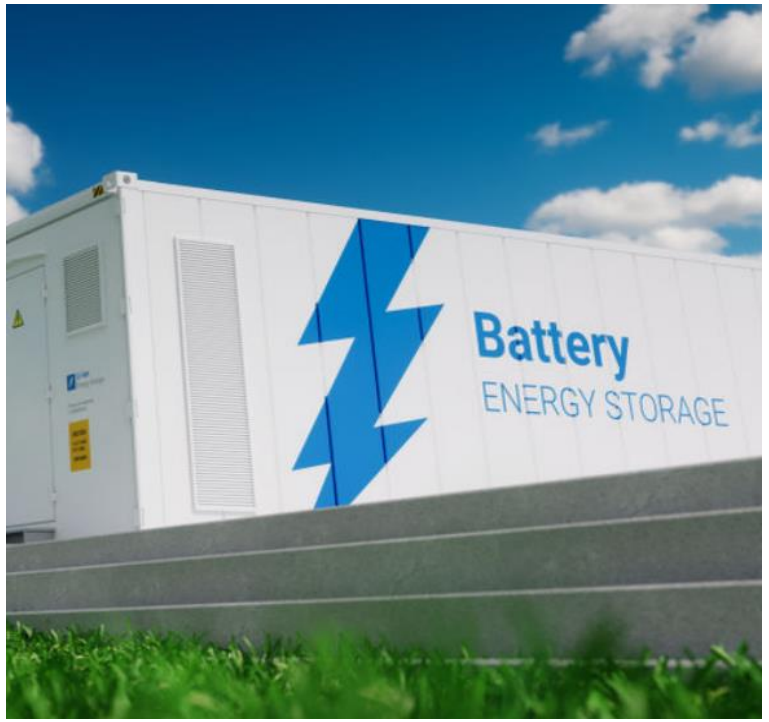
- Expected to reach commercialization at scale by 2030
- Several potential technologies in development



Battery - a prioritized area for Munters

Well positioned for growth

Market is dynamic – continued investments in capabilities, capacity & innovation



Ample opportunities beyond the dryroom