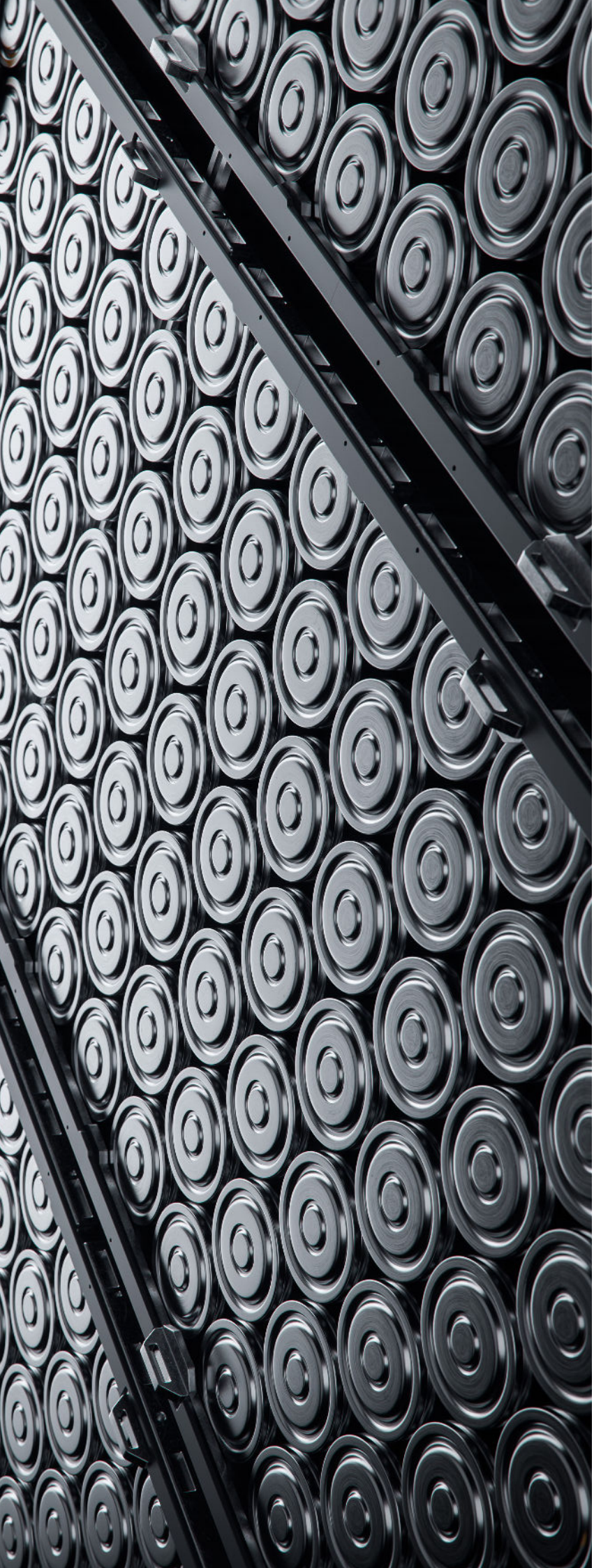


BATTERY RECYCLING SOLUTIONS

MTB®

- More Than Business -

IN A FEW WORDS...

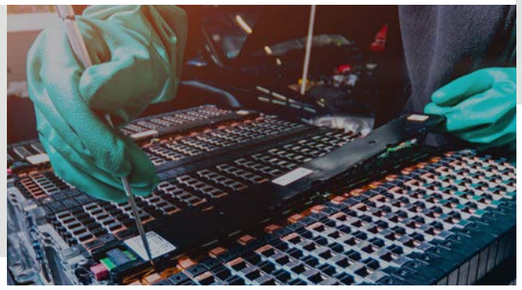
OVER 40 YEARS OF EXPERIENCE
IN FERROUS AND NON-FERROUS RECYCLING

MTB has become a major player in the management of current and future industrial waste.
Driven by a deep concern for our planet, our development is guided by the values of **Zero Waste, Premium Quality, and For Our Children**.

Electric mobility often faces criticism for shifting pollution from the use phase to the end-of-life phase of lithium-ion batteries. To address this, MTB has dedicated significant R&D resources to developing effective battery recycling solutions.

REQUIREMENTS FOR THE **MTB PRE-TREATMENT PROCESS:**

- Collection of battery packs, modules, cells and production scrap
- Discharging of the packs, modules and cells to a low voltage to reduce the electrical and chemical hazards
- Dismantling the packs to the modules for handling



MTB RECYCLING **PROCESS:**

DISMANTLING & DISCHARGING — **SHREDDING** — **ELECTROLYTE EXTRACTION** (Continuous operation) — **DENSIFICATION** — **REFINING & RECOVERY**

GAS TREATMENT

Solution suited to industrial installations complying with polluant emission standards.

DUST COLLECTION

Elimination of dust with filter

ROBUST AND RELIABLE Equipment / **CLEAN AND SAFE** Air quality control / **AUTOMATION** Control system

MANUFACTURER **& INTEGRATOR**

We have extensive experience in recycling solutions, excelling in both **equipment manufacturing** and the **integration of recycling lines**. MTB designs and manufactures robust, high-performance recycling equipment, tailored to meet the specific needs of battery recycling.

SHREDDING

BVR is used in an inert atmosphere (nitrogen)

Airlock system : Ensure sealing of the cutting chamber.

Inerting system : Controlled atmosphere under nitrogen.

Safety : Fire extinguishing system Flame and infrared (IR) detectors.

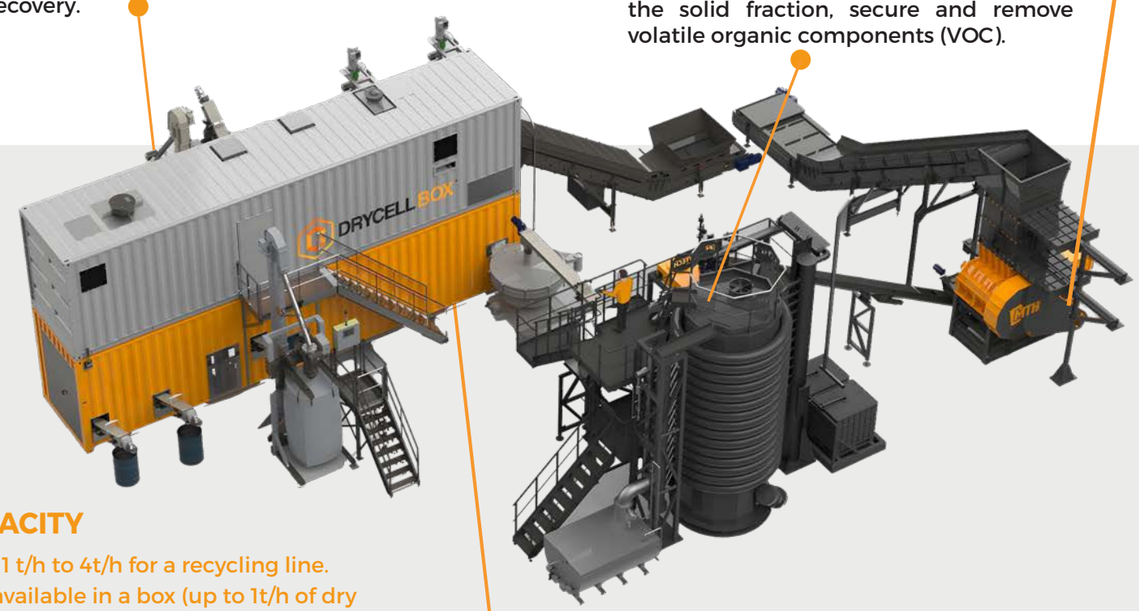
1 SINGLE SHREDDING STAGE for battery reduction

DENSIFICATION

Cathode and anode delamination for optimal copper and aluminum recovery.

EXTRACTION

Extract and separate the electrolyte from the solid fraction, secure and remove volatile organic components (VOC).



CAPACITY

From 1 t/h to 4t/h for a recycling line.
Also available in a box (up to 1t/h of dry products).

SORTING

Light fraction sorting unit : separate & refine the multilayers from cells present in the battery and obtain the best purity of output.
Sorting option : Air, Magnetic, Sieving.

Heavy fraction sorting unit : separate & refine the casings and PCB present in the battery and obtain the best purity of output.
Sorting option : Magnetic, Eddy current, Optical.

TRANSFORMING BATTERIES INTO SECONDARY RAW MATERIALS

INPUT **MATERIALS**

Our process is suitable **for all cell geometries**. It is designed to manage different battery chemistries, the main ones being :

- **NMC** (Nickel, Manganese, Cobalt)
- **LFP** (Lithium, Iron, Phosphate)

Maximum module size : **1100 x 580 x 215 mm**

The MTB process is efficient for processing all elements of the battery value chain, **from production scrap to end-of-life modules.**

MORE SPECIFICALLY:

- Lithium-ion battery modules from electric cars **(EVs)** and hybrid electric cars **(HEVs)**
- Battery production scraps: **anodes**, **cathodes**, **jelly rolls**, dry cells and wet cells.

ERGONOMIC AND **EFFICIENT SOLUTIONS**

We adjust our recycling unit to meet the specific needs of gigafactories by integrating equipment designed progressively from our experience, in order to manage production scrap in the best possible way. **This approach promotes continuous and iterative innovation.**

OUTPUT **MATERIALS**

Our process is designed to deal with dry cells, wet cells and end-of-life (EoL) batteries. It adapts perfectly to the **specific composition of your products**.

Thanks to our innovative technology, we can **guarantee significant recovery and purity rates**, ensuring optimal recovery of your materials.

European Regulation (EU) 2023/1542, which aims to promote the sustainability and responsible manufacture of batteries, sets ambitious targets. It includes a **target of recovering 95%** of the materials (cobalt, copper, nickel) contained in used batteries by the end of 2031. **We have already reached this target.**

DRY SCRAP : **HIGH-QUALITY RESULTS**

ANODES :

✚ **Copper** : **97%** recovery rate, **92%** purity rate

CATHODES :

✚ **CAM*** : **96%** recovery rate, **98%** purity rate

**Cathode Active Materials*

JELLY ROLLS :

✚ **Blackmass** : **95%** recovery rate, **98%** purity rate

OUR BLACKMASS RECOVERY RATE REACHES 95%

« Best liberated blackmass we have ever analyzed. Great delamination by MTB of aluminum and copper foils from Lithium Ion Batteries. This recycling process liberates the active particles graphite and lithium metal oxides (here NiMnCoO2) of the blackmass. Without any impurities of foils in the fine fraction, it's exactly what you wish to have! » **ERZLABOR Advances Solutions GmbH**

OUR DEMONSTRATOR

MTB Recycling,
Isère (38)

ZWB

ZERO WASTE BATTERY

Since September 2023, we have been operating a **1 t/h pilot unit at our recycling site**.

This unit serves as a **demonstrator** for the commercialization of industrial lines and as a **test center** for validating the best battery recycling techniques.

A PILOT UNIT **IN OPERATION**

Our battery recycling process begins with **mechanical shredding** of modules, followed by drying and sorting to recover blackmass and other materials such as copper, aluminum and plastics.

Discharged battery modules are shredded into 10 to 30mm fractions in the BVR 1200 shredder, under a **nitrogen-inerted atmosphere**. The product is then conveyed to an evaporator to isolate the electrolyte, while an air treatment system ensures conformity of dust and incondensable rejects.

The dry product is sieved to **recover the blackmass**, while aluminum, copper, other metals and plastics are separated using densimetric tables. The collected blackmass is then ready for hydrometallurgical treatment to chemically recover the metals to an elemental level.

Our pilot battery recycling unit at MTB Recycling site, France (38) ©MTB

REDUCED ENVIRONMENTAL **IMPACT**

Based on an assessment by WeLoop, the recycling impact of the MTB process is **reduced by around 20%** compared with the average process in Europe.

OUR DEMONSTRATOR

INSIDE THE PILOT UNIT : **3 KEY STEPS**

1 SHREDDING

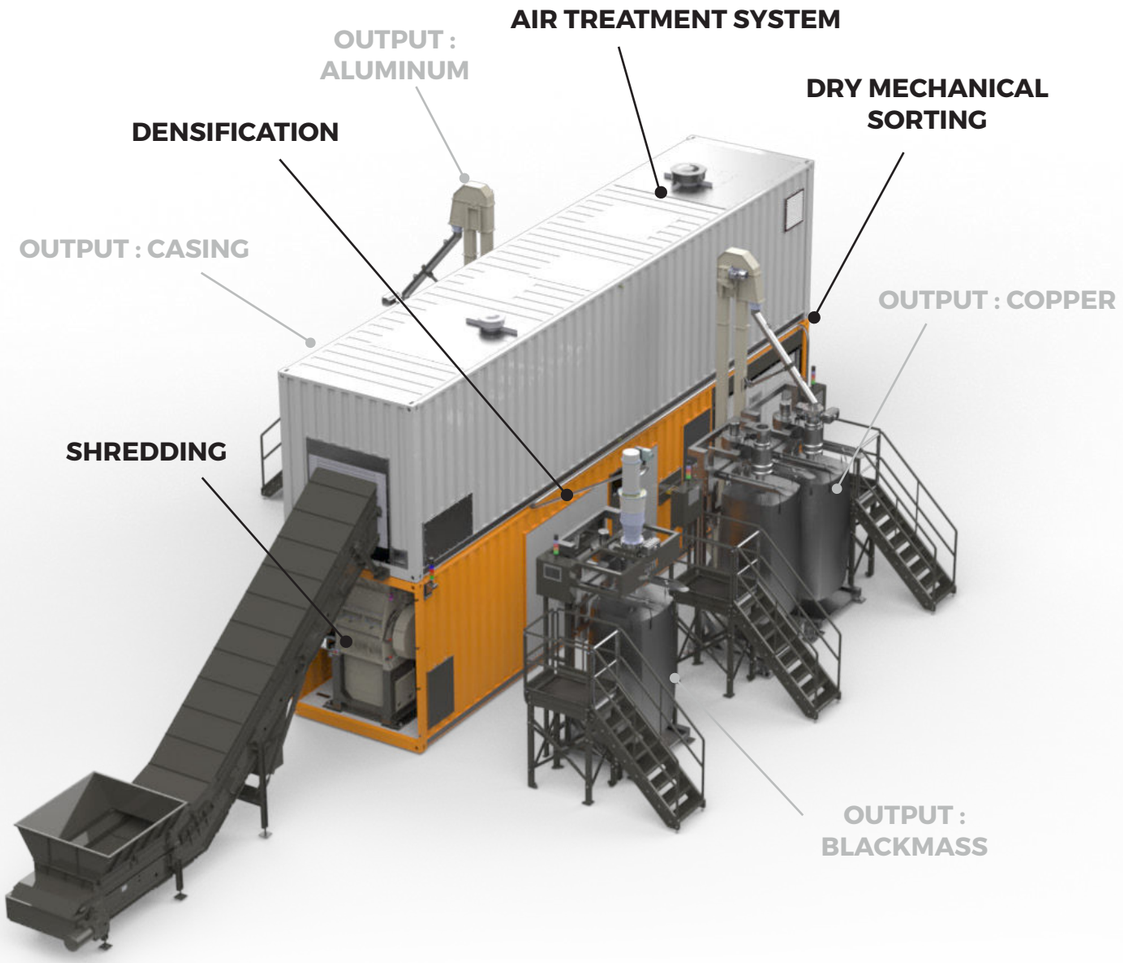
2 EXTRACTION

3 SORTING

INNOVATION AND EXPERTISE

We develop and **design customized equipment** to carry out tests and perfect our shredding techniques, particularly for new chemistries. One example is the **micro-shredder** used in R&D projects.

FOCUS ON **THE SEPARATION UNIT:** DRYCELL BOX



Vincent and Antoine at the heart of the Zero Waste Battery pilot unit ©MTB

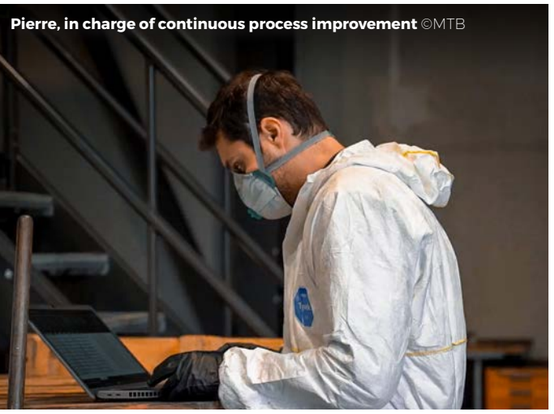
DRYCELL BOX, IS ALSO A STAND-ALONE RECYCLING SYSTEM FOR BATTERY SCRAP WITHOUT ELECTROLYTE

- **Quick** installation and commissioning
- **POWERBOX** centralised control unit
- **High-quality** output products
- **Optimum elimination of fine particles** (HEPA H14 filters)

DrycellBOX ©MTB

SAFETY FIRST

We are committed to **ensuring the safety and reliability** of our processes. Here are the measures we have put in place to guarantee the safe and efficient management of battery recycling:



Pierre, in charge of continuous process improvement ©MTB

Vincent, battery project manager ©MTB

EMISSIONS CONTROL

We constantly control atmospheric emissions to limit risks and ensure a safe and clean working environment.

WATER MANAGEMENT

The building has its own water retention basin, to ensure that there is no impact on the environment.

These measures demonstrate our commitment to providing a battery recycling service that is both safe and environmentally friendly.

SECURE STORAGE

Our storage facilities are designed for maximum safety, minimizing any potential risk. Batteries are stored in trays on racks connected to an automatic detection and flooding system.

INERT SHREDDING

Our shredding process takes place under inert conditions, minimizing the risk of incidents linked to material reactivity. Inert atmosphere is ensured by instrumentation conforming to ATEX standards and SIL 2 safety level (temperature, pressure, oxygen sensors, spark detector, etc.).

EMERGENCY FLOODING SYSTEM

If a fire is detected, our shredder can be flooded immediately. Sensors measure static and thermovelocimetric temperature, and the presence of smoke. In case of anomaly, electrovalves activate the water network fed by a booster to flood the cases concerned.

Jacques, production operator on the Zero Waste Battery pilot unit ©MTB

CUSTOMER SUPPORT

INSTALLATION - MTB SERVICE

Our specialized technicians are experts in the installation and repair of our equipment, ensuring rapid and efficient service anywhere in the world.

CUSTOMER SERVICE

We are at your side to advise, troubleshoot and supply spare parts at short notice.

TRAINING & COACHING

Our experts will train you prior to commissioning the machines, providing you with the keys to success.

PLATEFORM MYMTB

Our application enables you to achieve greater efficiency by giving real-time production data, tracking history and much more.

ECO-DESIGN SUPPORT

Our team of experts supports industrial companies in their circular economy initiatives (recyclability studies, eco-design recommendations, etc.).

Visit our website

www.mtb.fr

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