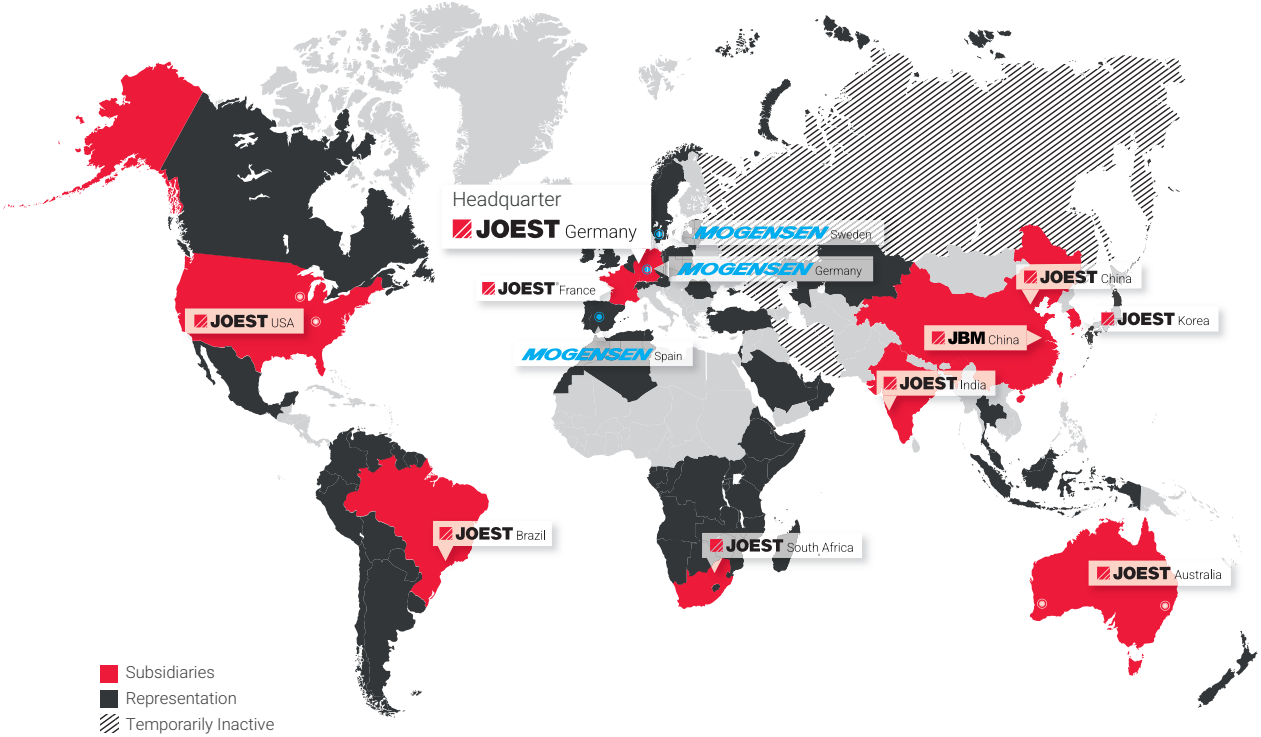
JOEST

YOUR PARTNER FOR **BATTERY RECYCLING**

CONTENTS

JOEST group



Our Members: JOEST MOGENSEN

Our Brands: JVM GOESSLING

WE BUILD SOLUTIONS.

The JOEST group is a globally leading provider of customized solutions in vibration, screening, and separation technology. With over 100 years of company history, we have earned an outstanding reputation for innovation and quality. We develop and manufacture specialized machines and systems that operate efficiently and reliably to meet specific customer requirements. **Our focus is on sustainable and energy-efficient solutions that optimize our customers' production processes.** With a global network of subsidiaries and representatives, we can support our customers worldwide and provide fast service and comprehensive technical assistance. The combination of technical expertise, innovative products, and a strong customer focus makes the JOEST group the optimal partner in all areas.

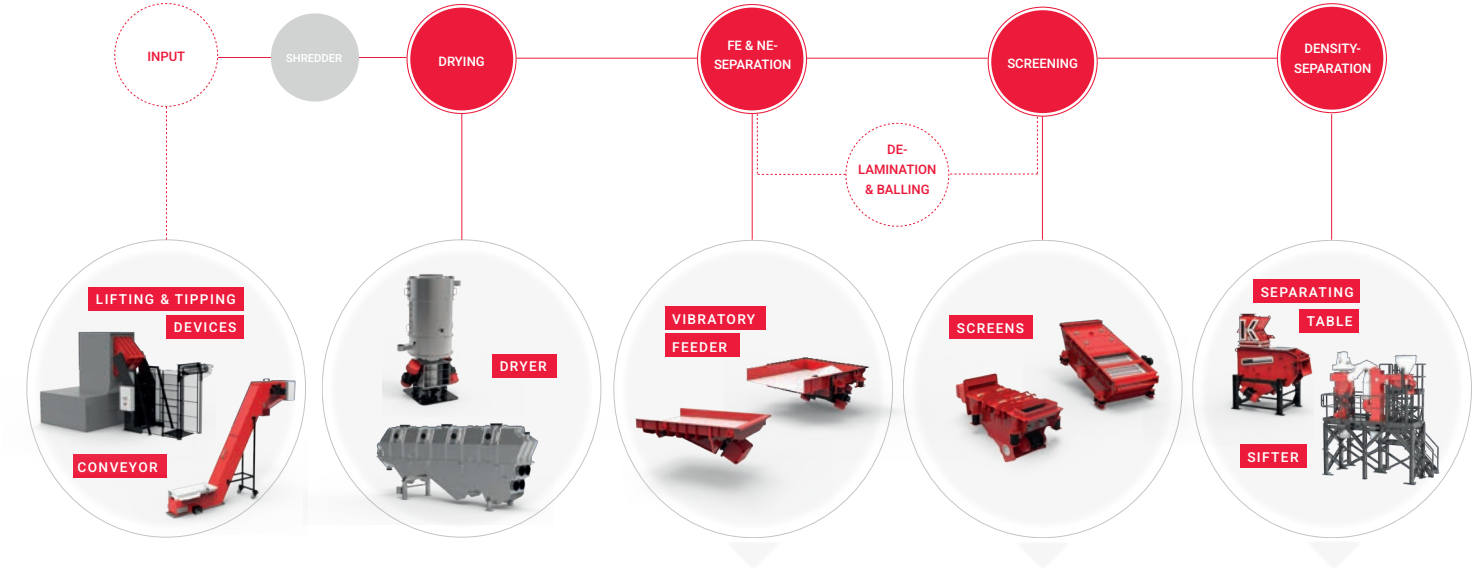
"By coming to us, clients get everything from a single source: From sales and manufacturing to commissioning and after sales service."

Alexander Moormann and Dr. Marcus Wirtz, Managing Partner, JOEST group

SUSTAINABLE BATTERY RECYCLING

Batteries are undoubtedly a driving force for sustainable development, green mobility, clean energy and climate neutrality. As key elements of these visions of the future, they are gaining in importance worldwide. In particular, the increasing demand for batteries for electric vehicles illustrates the strategic relevance of this market. In this transition towards an energy-efficient and environmentally friendly future, **we are facing a key challenge: sustainable battery recycling.** JOEST offers a wide range of products for this purpose, which cover many aspects of the process. From feeding systems for shredders to individual and system solutions for mechanical and thermal processing of lithium-ion batteries – at JOEST you will find tailor-made solutions that ensure maximum efficiency and sustainability.

MECHANICAL PROCESSING OF LITHIUM ION BATTERIES



ADDITIONAL SERVICES

- ✓ Engineering
- ✓ After Sales Service
- ✓ Automation & Monitoring

COPPER
ALUMINUM
FERRUM

COPPER
ALUMINUM
SEPARATOR MATERIAL
–
BLACK MASS

COPPER
ALUMINUM
SEPARATOR MATERIAL

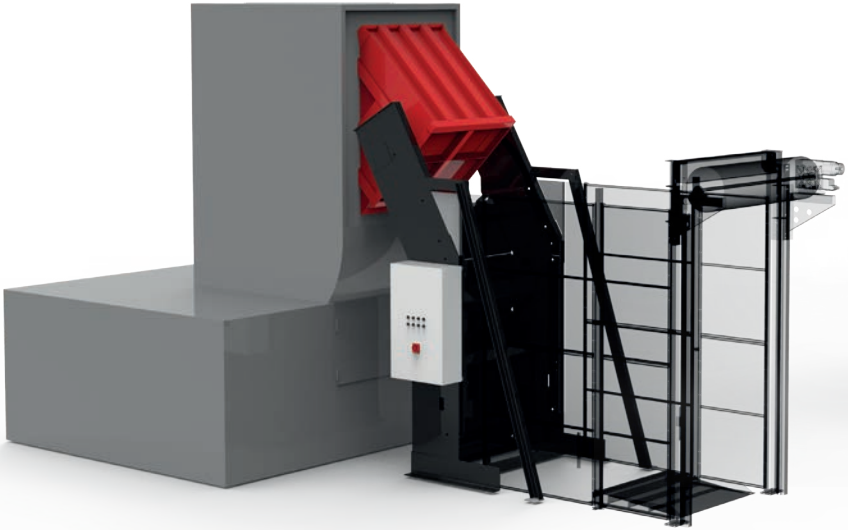
RECYCLING AS END OF LIFECYCLE SOLUTION

Lithium-ion battery recycling plays a central role in many aspects of sustainability. The recovery of metals such as lithium, cobalt, copper and nickel features major energy savings compared to the extraction of primary raw materials. In addition, recycling plays a decisive role in the conservation of resources and environmental protection. For Europe, the recycling of these metals also offers the opportunity to reduce dependencies on third countries.

PROCESS SOLUTIONS

Various approaches to the recycling of lithium-ion batteries have been developed and implemented in industry and science. A distinction is made between hydrometallurgy, pyrometallurgy and direct recycling. Depending on the process, the LIBs are preprocessed thermally and/or mechanically. The variety of battery packs used in the market and the materials found in them require adaptable and robust recycling processes. In order to achieve the required purity of the recovered materials, complex and precise process combinations are necessary.

LIFTING & TIPPING DEVICES



HOPPER DISCHARGE FEEDER

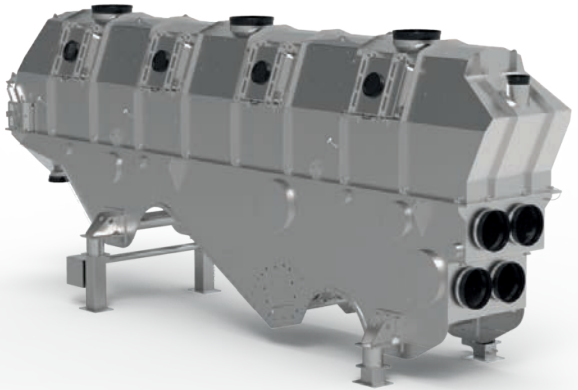
SHREDDING OF THE BATTERY FEEDING SYSTEMS

To separate the materials used, the batteries are first shredded. The aim of this process is to separate the material composites and expose the active materials. Depending on the downstream process, either dry or wet comminution is carried out. Dry comminution often takes place in an inert atmosphere.

BELT CONVEYOR

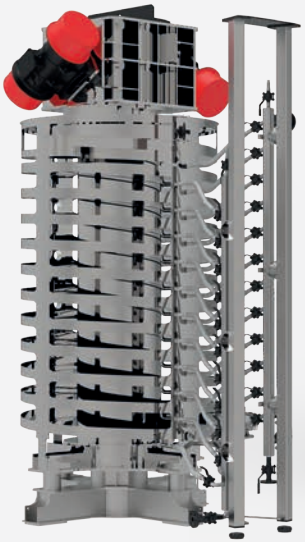
THERMAL PROCESSING TECHNOLOGY

The aim of the drying process is to recover the electrolyte from the broken batteries. The electrolyte is evaporated either in an inert atmosphere, with nitrogen or in a vacuum and then condensed again elsewhere. For optimal drying, this process is often carried out by stirring and/or circulation.



MORE DETAILS

DRYER



FLIP-FLOW SCREEN

OSCILLA CLASSIC

LINEAR MOTION SCREEN

SCREENING TECHNOLOGY

Through screening, the shredded battery material is classified according to its particle size. The aim is on the one hand the separation of the black mass as fines and on the other hand the fractionation of the other materials for a downstream density separation. While the black mass is present as a fine powder, the sieving process retains the battery housing materials, plastics and electrode foils as coarse particles. For a better classification result, the screens are excited by vibrations.

SEPARATING TABLE

SORTING & SIFTING TECHNOLOGY

Due to the different densities of the electrode and separator foils (PP < 1 g/cm3, Al = 2.7 g/cm3, Cu = 8.96 g/cm3), they can be separated by a separation table and/or zig-zag air separator. The size and shape of the feed material have a major influence on the separation result, which is why an impact mill can be used to sphere the material in addition to a pre-classification. By repeating the separation process, the degree of separation or the purity of the fractions can be optimized.

MORE DETAILS

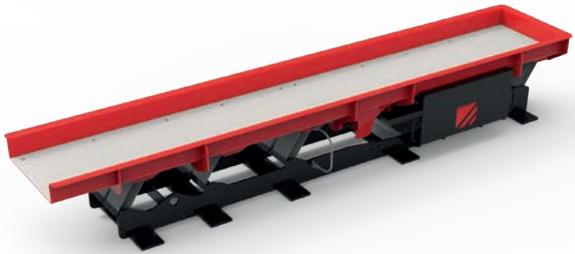
ZIG ZAG AIR SEPARATOR

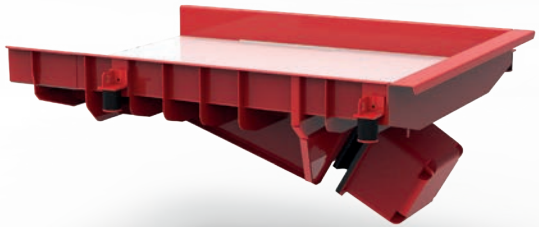
BELT CONVEYOR

MORE DETAILS

CONVEYING TECHNOLOGY

To guarantee a good coordination of the sub-processes, optimal control of the material feed and the interface transfer is necessary. Vibratory conveyor technology can be used to achieve and control targeted dosing of the material flows.





VIBRATION FEEDER

MAGNETIC SEPARATION

The aim of magnetic separation is to remove iron and steel particles as well as other magnetizable materials from the material stream. Magnetic separation can be used to efficiently recover coarse iron particles (e.g. housing parts, screws). This also protects the following machines from wear and tear.

AUTOMATION TECHNOLOGY

CONTROLS & REGULATION

- ✓ PLC by Siemens and Allen-Bradley
- ✓ Intuitive operation thanks to industrial HMI solutions
- ✓ Individual recipe management based on expert knowledge
- ✓ Modern drive technology and regulation procedures
- ✓ High process safety and traceability
- ✓ Control and monitoring of third-party systems

INDUSTRY 4.0

- ✓ Holistic monitoring of machine and plant parameters
- ✓ Remote maintenance and IoT Gateways
- ✓ Dashboard analysis and remote access
- ✓ Integration to higher order controllers or ERP-systems

Our Solutions:

J-WATCH.
Monitoring System

J-SEN *4.0*
Vibration Sensor

MORE DETAILS

AUTOMATION TECHNOLOGY

- ✓ State of the art electronic design with EPLAN P8
- ✓ Switch systems for extreme conditions (e.g. ATEX) or country specific standards (e.g. UL)
- ✓ Verified and validated security technology according to DIN EN ISO 13849-1 & 2
- ✓ Individual software services based on a proven standard
- ✓ Worldwide commissioning and training

MADE TO MEASURE

We offer worldwide commissioning and training with our own personnel that is well familiar with the JOEST product portfolio.

SYSTEM SOLUTIONS

- Holistic approach to processes and logistic
- Reduction of interfaces for clients
- Cross-functional collaboration between different establishments

STANDARDIZATION

- Proven plant concepts for various applications
- Predefined and proven SPS operation
- Matrix of widths and heights for commonly used machines

PRODUCT PORTFOLIO

SCREENING

- Dosing Screen
- Dewatering Screen
- Finger Cascade Screen Topspin
- GRIZZLY
- Coarse Separator
- Circular Motion Screen
- Linear Motion Screen
- Magnetic Drive Screen
- Flip-Flow Screen from the OSCILLA Family
  - OSCILLA Classic
  - OSCILLA Combi
- - OSCILLA Screen Feed
- Linear Flip-Flow Screen
- Finger Rod Screen GRECCO
- Finger Rod Screen Stabrofix
- Finger Rod Screen Stabroflex
- MSizer

CONVEYING & FEEDING

- Hopper Discharge Feeder
- Hopper Discharge System ExtroVib
- Hopper Discharge Device
- Small Dosing Feeder
- Vibrating Trough Type Feeder
- Vibrating Tube Type Feeder
- Flex-Feed
- Spiral Conveyor
- Resonance Conveyor
  - One-Mass-System
  - Mass compensated
  - Two-Mass-System

DOSING

- Small Screens
- Dosing Trough Type Feeder
- Dosing Tube Type Feeder
- Dosing Stations

DRYING, COOLING/HEATING & TEMPERING WITH

- Fluidized Bed Systems
- Vibration Feeder
- Spiral Elevators
- Dosing Feeder

SIFTING, SORTING & SEPARATING

- Zig-Zag Air Separator
- Cone Classifier
- Separation Table
- Air Vibe
- J-Flow Air Separator

MORE DETAILS

A member of the JOEST group

JÖST GmbH + Co. KG, Germany
Gewerbestraße 28 - 32, 48249 Dülmen

Fon: +49 2590 98-0
Fax: +49 2590 98-101

info@joest.com
www.joest.com