STC Mini-Smelter:

The Low-Cost & Environmentally Sound Solution for Small Capacity Battery Recycling Plants

Alberto Bergamaschini – Commercial Director STC Italy

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INTERNATIONAL SECONDARY LEAD AND BATTERY RECYCLING CONFERENCE


Exposure to lead can affect multiple body systems and is particularly harmful to young children and women of child-bearing age..


Lead is distributed to the brain, liver, kidney and bones where it can accumulate over time.


According to World health Organization, Lead exposure was attributed to more than 1.5 million deaths globally primarily due to cardiovascular effects. .


There is no level of exposure to lead that is known
to be without harmful effects.


The harmful impacts on health from
lead exposure are entirely preventable.

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Agenda

- The global context
- STC standardized solution
- Benefits of STC
- SMART approach
- Conclusions

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Global Battery Recycling Context

Lead-acid batteries remain the most widely used rechargeable batteries worldwide.

Their recycling is both an environmental necessity and a profitable industrial activity.

The market is growing, driven by increasing vehicle use, backup power demand, and environmental regulations promoting circular economy practices

Regional Differences

Large-scale recycling plants dominate in China and North America, where high population density and centralized collection enable economies of scale.

In other regions, however, market and logistical conditions demand smaller and more flexible facilities

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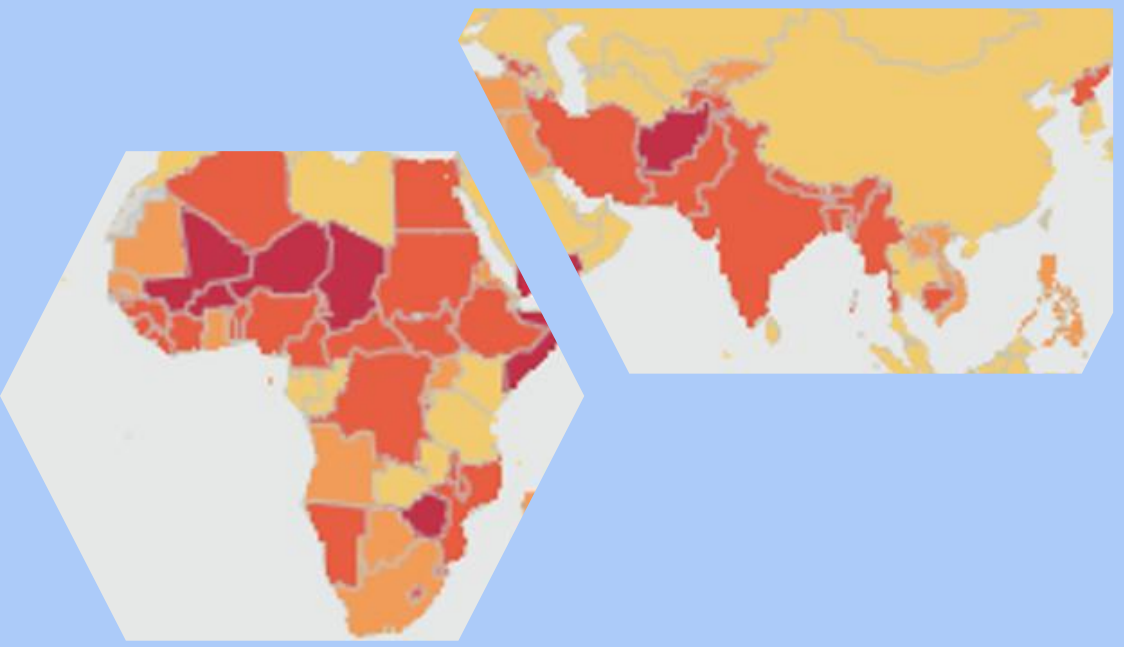
Challenges in Emerging Markets



In many developing or remote markets, battery recycling faces unique constraints:

- Fragmented collection systems
- Strong presence of the informal sector
- Competition among numerous small operators
- Limited access to large and consistent volumes of batteries

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The Investment Barrier

Building a large industrial facility requires substantial capital investment and long payback times.

For regional sized operators, this can be a major obstacle, slowing market development and delaying environmental improvements.

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The Opportunity for Compact Plants

In such situation a standardized, integrated small capacity plant offers multiple advantages:

- Lower capital expenditure
- Faster return on investment
- Simpler operation
- Flexibility to adapt to changing volumes and market conditions

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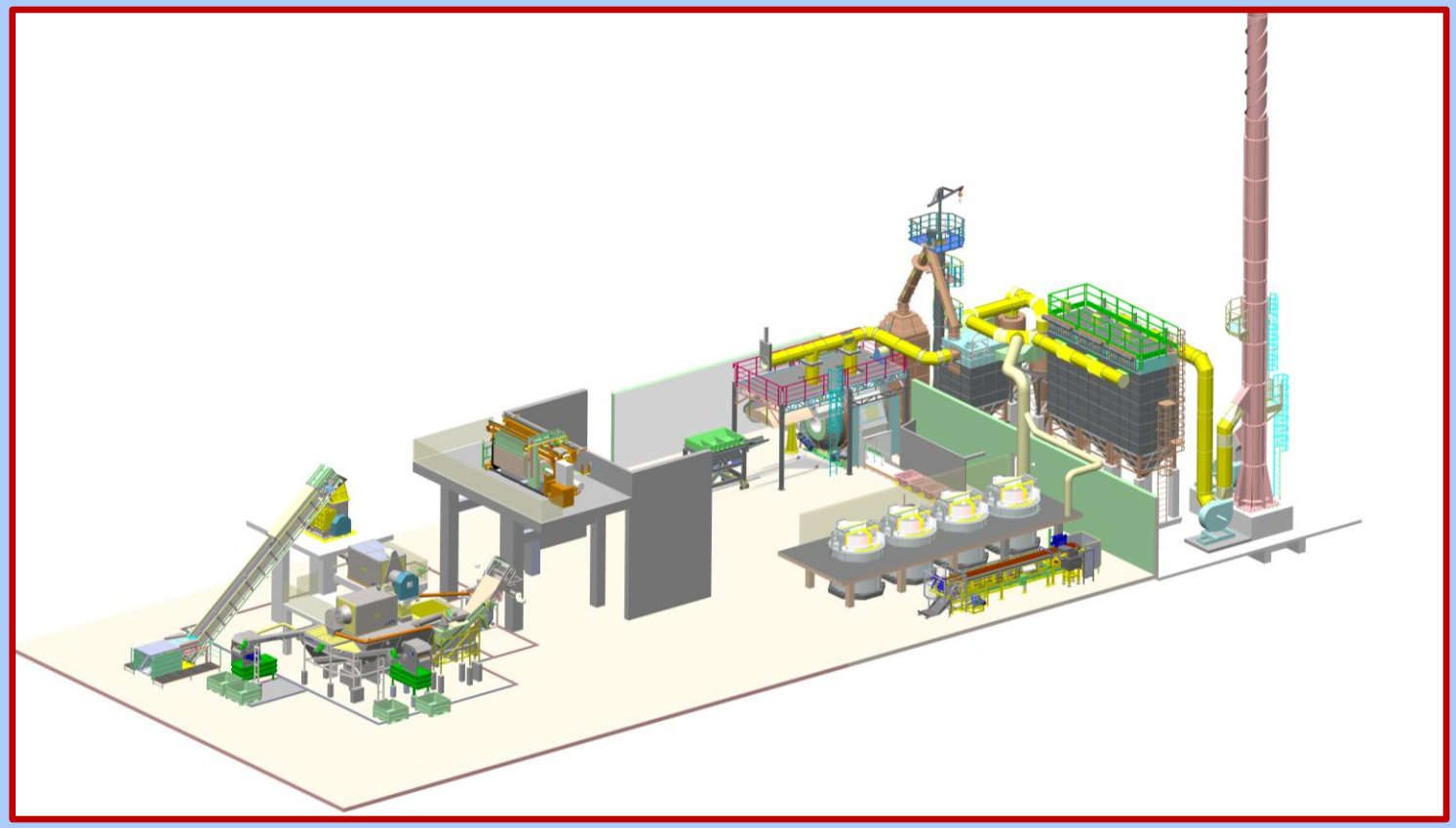
STC's Integrated Concept

STC has developed a fully integrated plant covering the entire process: from battery breaking to refined lead ingots.
All equipment are pre-engineered for quick installation and commissioning, ensuring reliable performance.



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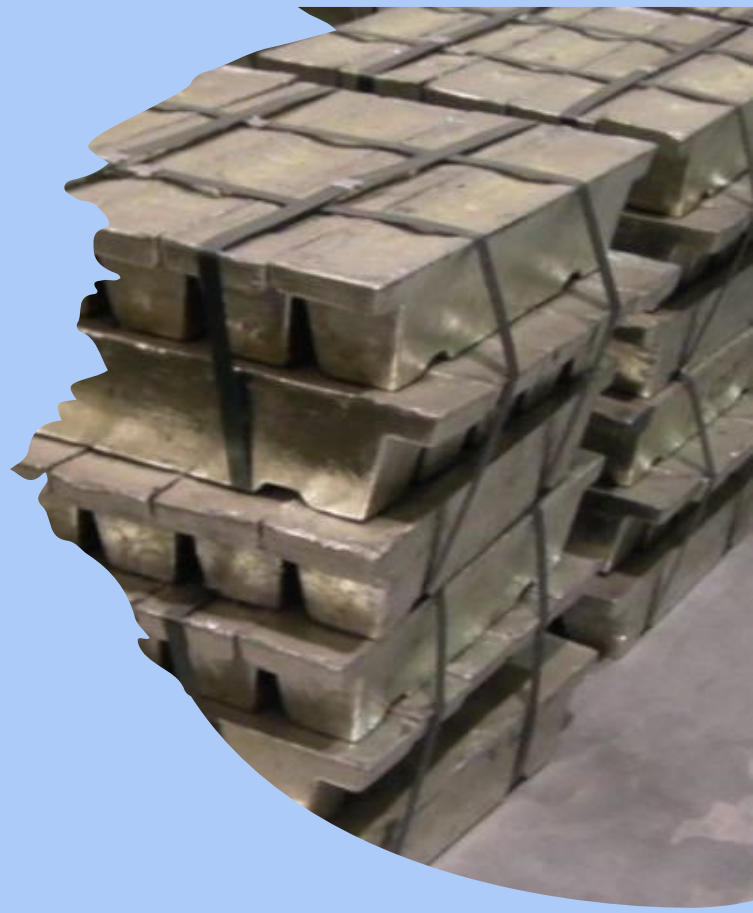
Nominal Capacity and Output

The reference configuration processes
15,000 ton/year of spent batteries,
producing approximately
8,000 ton/year of refined lead ingots.



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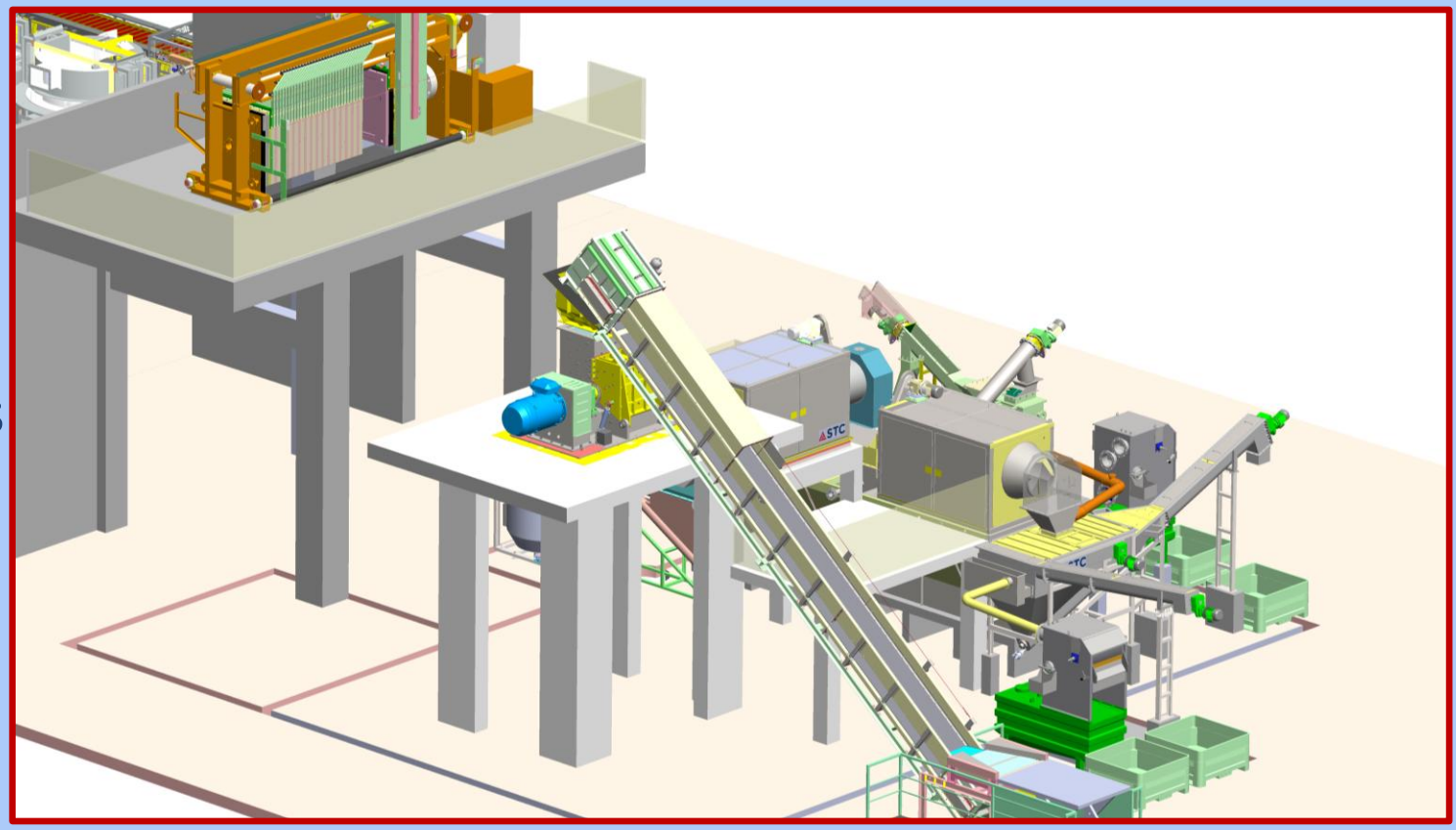
Standardized Configuration

The plant layout follows a standardized design ensuring:

1) Proven & optimized process flow
2) Simplified procurement and logistics
3) Predictable installation timelines
4) Reliable performances
5) Compliance with BAT & Industry std.



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Process Overview

Battery Breaker & separation

Lead Smelting

Lead Refining & Ingot Casting

Air Pollution Control

Electrolyte neutralization

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Battery Breaking & Separation

The BB&SU allow recovery of:

- Metallic Lead (grids, poles, posts)
- Lead Paste with low humidity
- Polypropylene
- Heavy Plastics (PE separators, ABS)
- Diluted Electrolyte

Lead Smelting

Lead Smelting consists of:

- Rotary Furnace
- Process fumes extraction
- Sanitary hoods
- Burner (oxy/air Fuel)
- Charging system (vibrating feeder or spoons)

Lead Refinery & Ingot Casting

Lead Refining is composed of:

- Refining kettles with burners
- Lead pumps
- Lead agitators
- Oxygen lancing
- Automatic casting line
- Semiautomatic stacking
- Water cooling system

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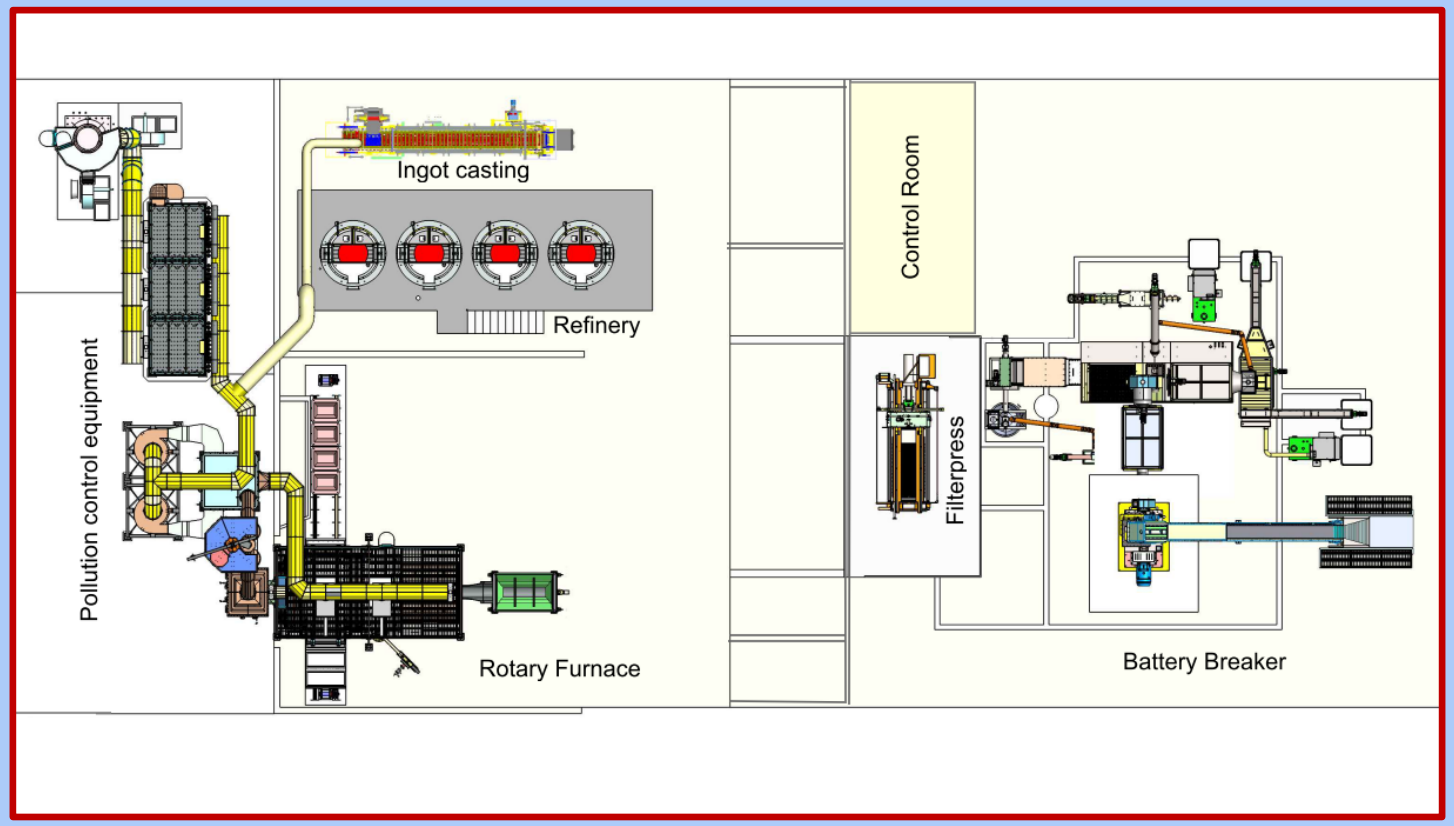
Environment Protection

Environmental compliance is assured by:

- Wet scrubber for BB&SU
- Baghouse for Charge Preparation, RF process fumes, refinery fumes, general ventilation
- Post scrubber is available in case of strict limitation on SO_2 emission
- Electrolyte neutralization

Example Layout

The standardized plant layout ensures low investment costs by replicating a proven engineering solution across multiple projects.
This approach allows fast deployment and cost efficiency, while still offering flexibility to adapt to specific site constraints when required.



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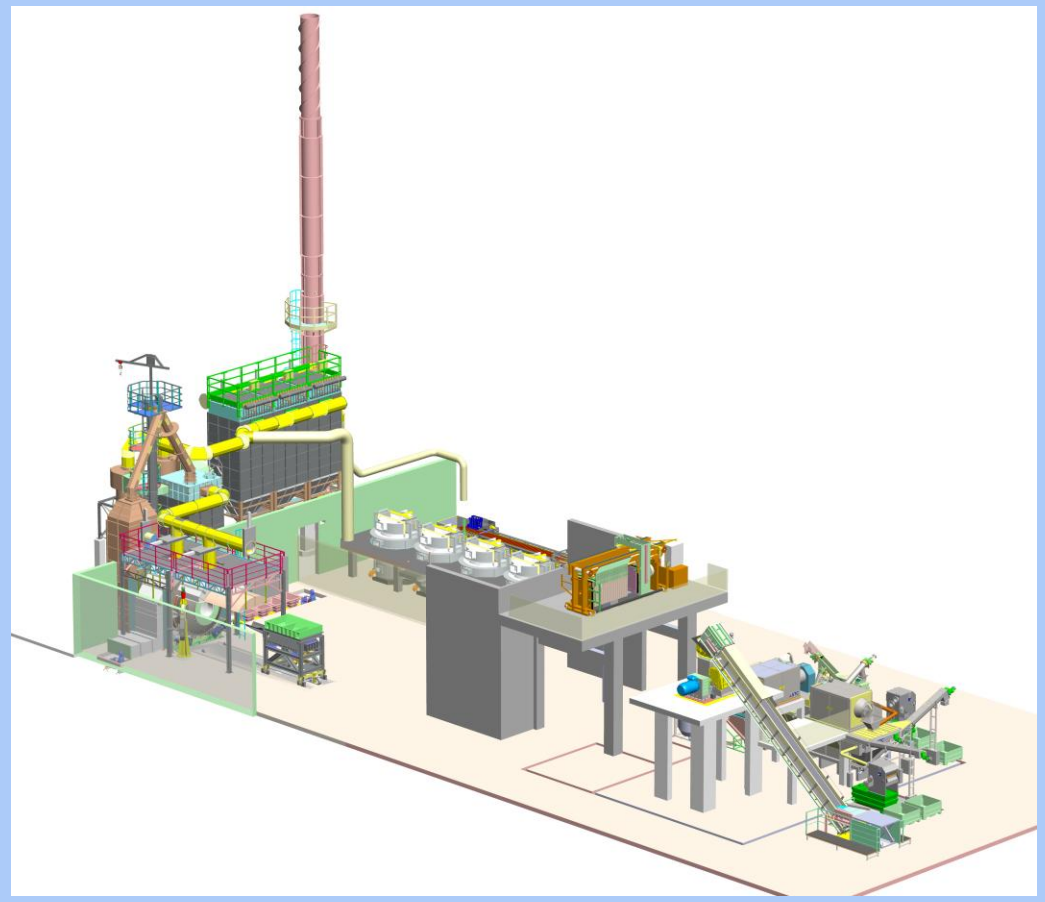
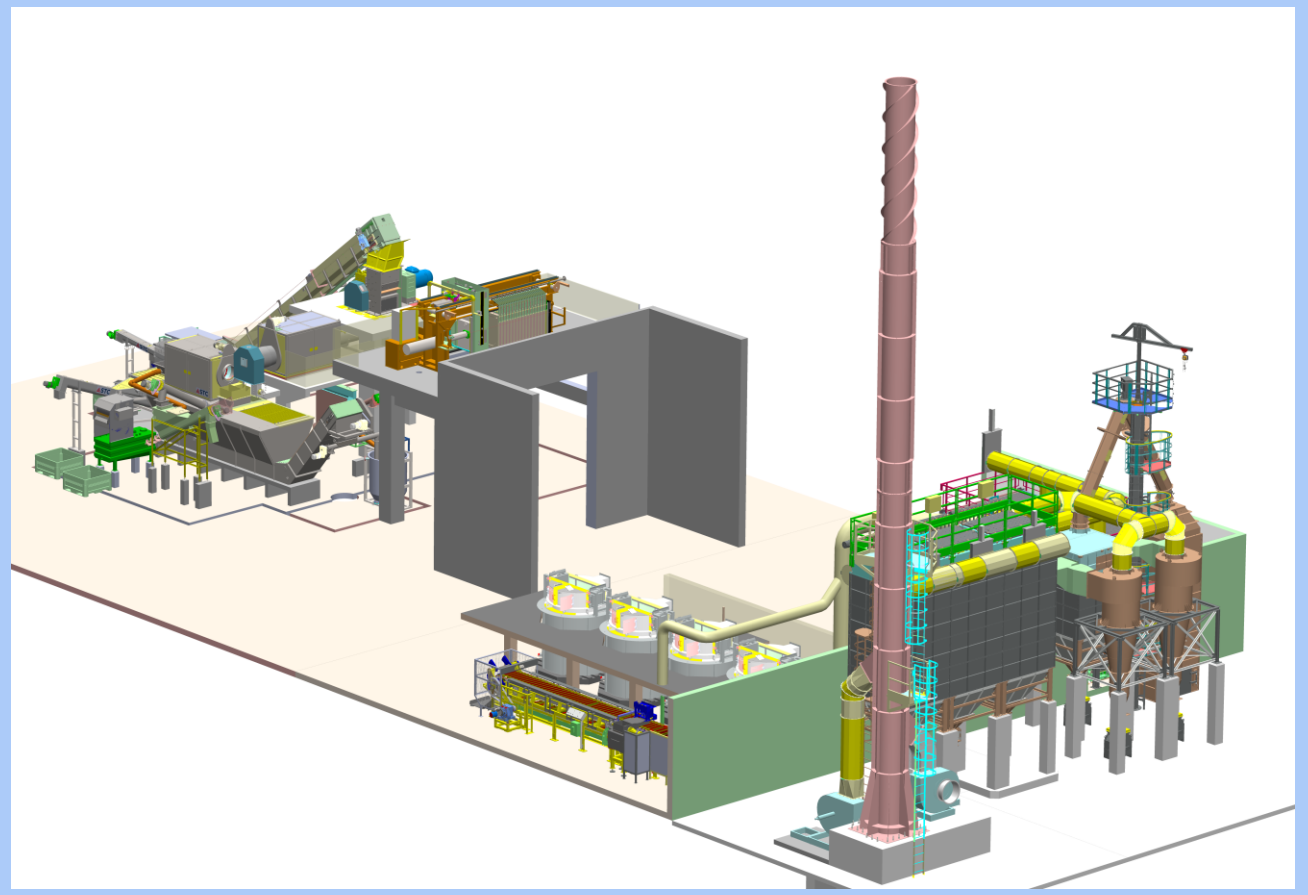
Example 3D model





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Benefits

Operational

Key operational advantages include:

- Short installation and start-up time
- Low maintenance requirements
- Minimal needs for operator training
- High process reliability

Economical

Our integrated solution offers:

- Significantly reduced CAPEX
- Lower operational risks
- Fast ROI
- Better alignment with market fluctuations

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Smart Engineering for Smarter Clients

STC recently launched a new Global Strategy:

Engineering & process design by STC
Local fabrication by the Clients.

Be S.M.A.R.T.
Sustainable – Sustainable projects, with a focus on environmental impact.
Modular – Modular solutions, flexible and adaptable to local contexts.
Agile – Agile approach, for fast execution and adaptation to client needs.
Reliable – Engineering reliability, guaranteed by Italian expertise.
Tailored – Custom solutions, designed to meet specific client requirements.

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S.M.A.R.T Approach

This strategy preserves the excellence of our proprietary process know-how while allowing our Clients to:

- Reduce overall investment costs, avoiding high international transport expenses;
- Stimulate local economy by involving national contractors and suppliers;
- Speed up implementation thanks to quicker availability of manpower and materials;
- Ensure faster access to spare parts and local technical support, minimizing downtime (while STC remains ready to provide immediate assistance and remote support);
- Increase engagement and ownership of the project on the Client's side.

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Conclusions

STC's integrated battery recycling plant offers the best combination of environmental performance, profitability, and scalability. It is a proven solution designed for a cleaner environment and sustainable business growth.

Ideal for:

- Emerging economies with fragmented recycling sectors
- Remote locations with limited infrastructures
- Countries in transiction from informal to formal recycling models

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ThankYou – Q & A

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Let's improve the battery recycling industry together

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