



# LEAD BATTERY RECYCLING FACILITY

Pb  
2025 JUNE  
25-27



International  
Lead Association



# ILA AGENDA

1. Moura Group | Overview
2. PAM - Moura Environmental Program
  - Reverse Logistics – Lead Battery Recycling Process
  - One-to-One program
3. Competitive differentials | Results – Project
  - Moura Unit of Recycling & Metals

# THE BEGINNING

**Founded in 1957,**  
in Brazil, following the  
dream of the couple **Mr.  
Edson Mororó Moura and  
Ms. Conceição Moura**



# MANUFACTURING



# DISTRIBUTION



# TODAY

South America's **biggest battery manufacturing center** and one of the world's most modern facilities, and also one the **largest in the world's lead-acid battery recycling center**



**7 INDUSTRIAL PLANTS**

6 BRAZIL  
1 ARGENTINA



**+7.000**  
EMPLOYEES  
( inc. Distribution )



**10 MILLION**  
BATTERIES PER  
YEAR



**100.000 Tons**  
OF LEAD  
PRODUCTION  
PER YEAR

# MANUFACTURING



**VERTICALLY INTEGRATED  
INDUSTRIAL COMPLEX**  
(>190.000 square meters)



**COMPLETE VALUE CHAIN:** battery plants  
(broad portfolio), unserviceable batteries  
recycling and plastic injection



**TECHNOLOGICAL  
PARTNERSHIPS**





# COMPLETE PORTFOLIO

# OUR FUTURE — KEY FOCUS AREAS

# BESS AND LITHIUM

## AUTOMOTIVE



HEAVY & LIGHT VEHICLES

## BESS



ENERGY STORAGE SYSTEMS

## STATIONARY



TELECOM. SOLAR

AS A SERVICE

## MOTIVE POWER



INDUSTRIAL VEHICLES

SOFT LEAD

TIN ALLOYS

ANTIMONY  
ALLOYS

CALCIUM  
ALLOYS

HOG

COMPLETE LEAD ALLOY

PORTFOLIO

# MANUFACTURING



# DISTRIBUTION



Moura  
One-to-One

# PROGRAM OF REVERSE LOGISTIC

FOR EVERY NEW BATTERY SOLD, ONE SCRAP  
BATTERY IS COLLECTED AND RECYCLED

# DR. ÉDSON'S STRATEGIC VISION

*"Moura's growth depended on our ability to manage the reverse logistics chain — from collection to old/scrap battery recycling — in a reliable and sustainable way"*



# 84

Distribution Centers

# One-to-One program



# For Every New Battery sold



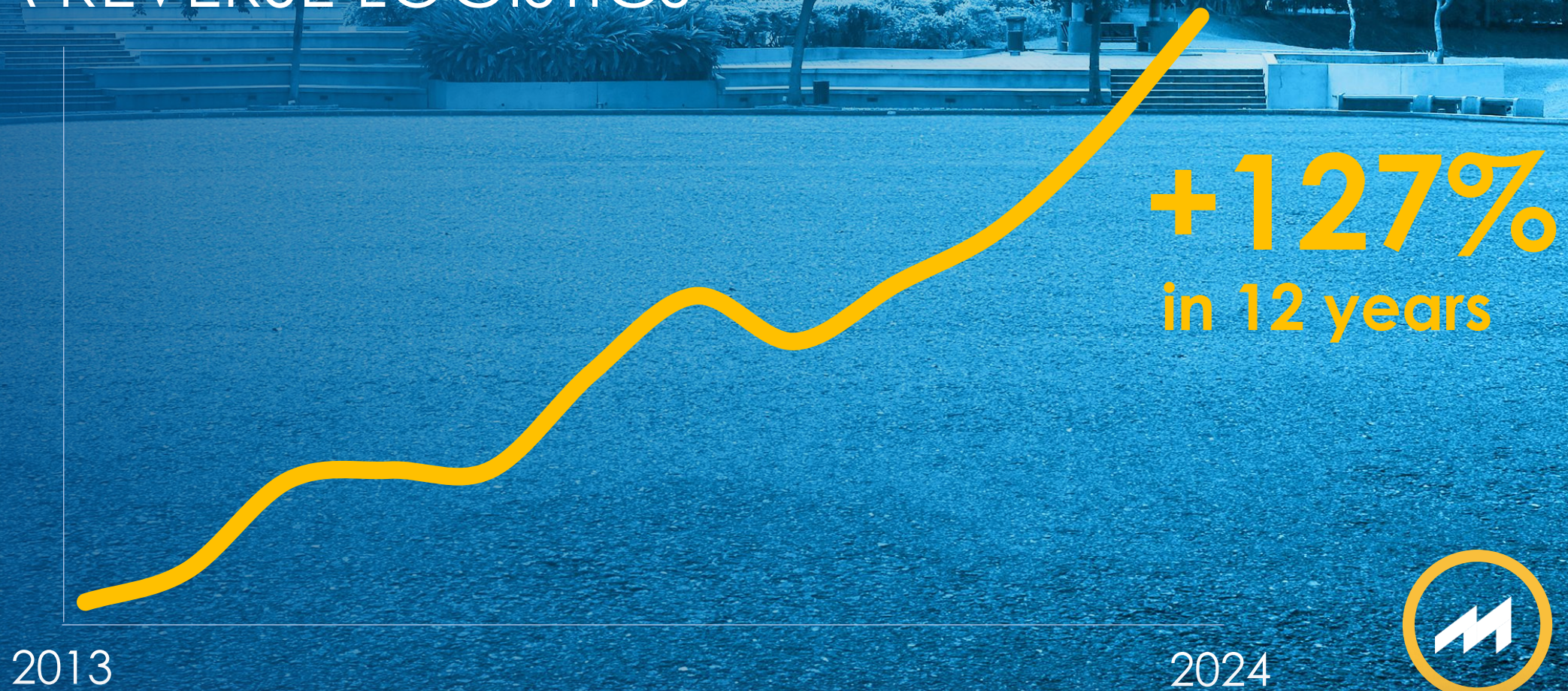
one  
scrap  
battery is  
collected  
and returned for  
recycling



# HISTORY

## MOURA REVERSE LOGISTICS

Volume of  
unservicable  
batteries



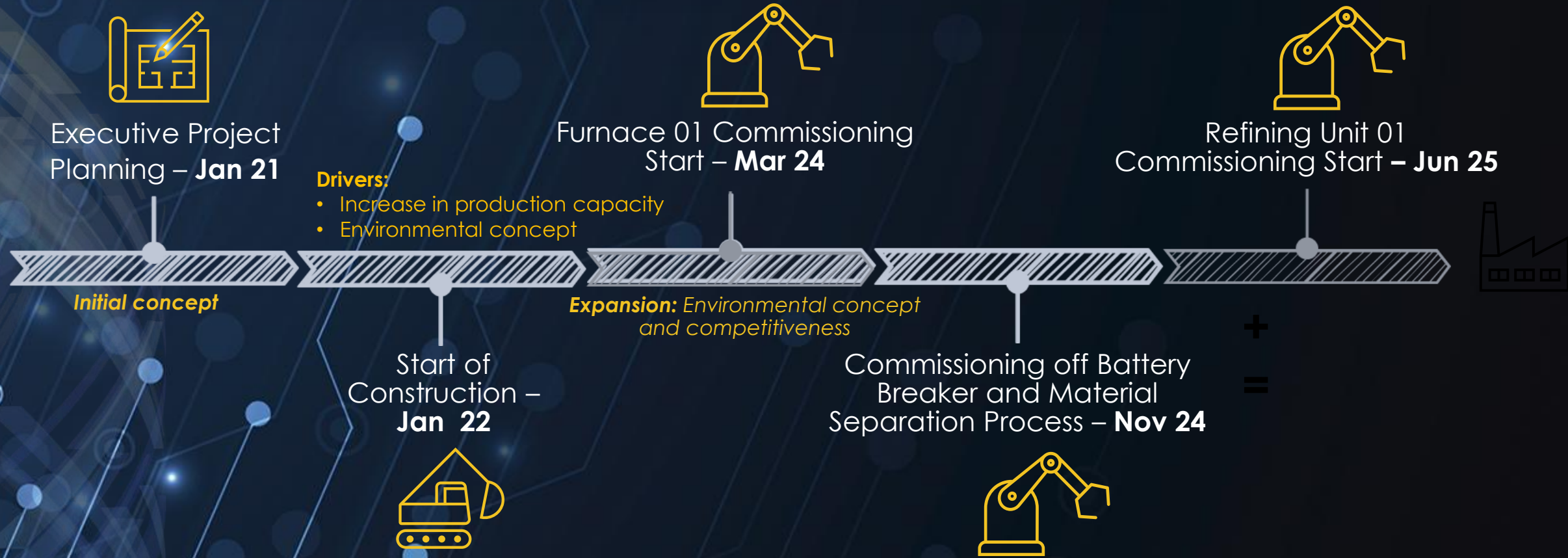
# PLANT FULL OPERATION - 2025

LEAD BATTERY  
RECYCLING FACILITY





# TIME LINE OF THE PROJECT



# Battery Components Separation Technology/Concept → Improve the Recycling Yield



# Global News highlights Metals

## CRITICAL METALS

中华人民共和国商务部  
MINISTRY OF COMMERCE OF THE PEOPLE'S REPUBLIC OF CHINA

Departamento de Segurança Industrial e Control

Casa | Dinâmica de trabalho | Política Legal | Índice de inventário

Links Relacionados: | Quem somos

Perguntas e respostas inteligentes

Fonte: Direcção de Segurança e Controlo | Tipo: Original  
2024-08-15 16:00

**Anúncio n.º 33 de 2024 do Ministério do Comércio e da Administração Geral das Alfândegas sobre a implementação das exportações de antimónio e outros**

EL ECONOMISTA

ÚLTIMAS NOTICIAS | BISTROFOME | TENDENCIAS | ELECCIONES JUDICIALES | ALIANZA EDUCATIVA | MERCADOS | INDICES | DIVISAS

Prohibición china de exportaciones de minerales críticos disparará el precio del antimonio a máximos

Los precios del antimonio podrían alcanzar niveles récord, ya que los consumidores buscan suministros alternativos tras una nueva prohibición de exportación de China, y mientras las crecientes tensiones comerciales cambian la dinámica en torno a los mercados de materiales críticos.

Anuncio fechado pela CRITEO

Denunciar este anúncio

Ad choices

Fonte: <https://www.eleconomista.com.mx/>

Antimony: A Market Under Severe Stress

Production

Report on antimony is the first of six reports on critical minerals, which we will publish in Due to their use in clean energy technologies semiconductors, critical minerals have gained prominence in government policy agendas and in

An Industry Dominated by China

The leading global producer of antimony in 2023 was China. It produced 36% of the world's mined antimony, followed by Russia, accounting for 28%, and Tajikistan, producing 19%. The midstream production of antimony products is also dominated

FC Ambrian estimates that China produces 85% of global mined antimony domestic and imported

Figure 1 shows the breakdown of ore processing.

Processing of Antimony Ore 2023

China's Domestic Ore 43%

FC Ambrian estimates

Global production of mined antimony is only 110 kt. However, production has declined since 2011, when output was 150 kt. The supply of antimony ore and

FINANCIAL TIMES

COMPANIES TECH MARKETS CLIMATE OPINION LEX WORK & CAREERS LIFE & ARTS HTSI

Opinion Markets Insight

**The niche minerals now surging in price as defence spending booms**

Antimony, \$ per tonne

60k

50k

qualquer item da lista de controle, exportadores devem solicitar licenças, processo pouco transparente que permite que Pequim domine a situação

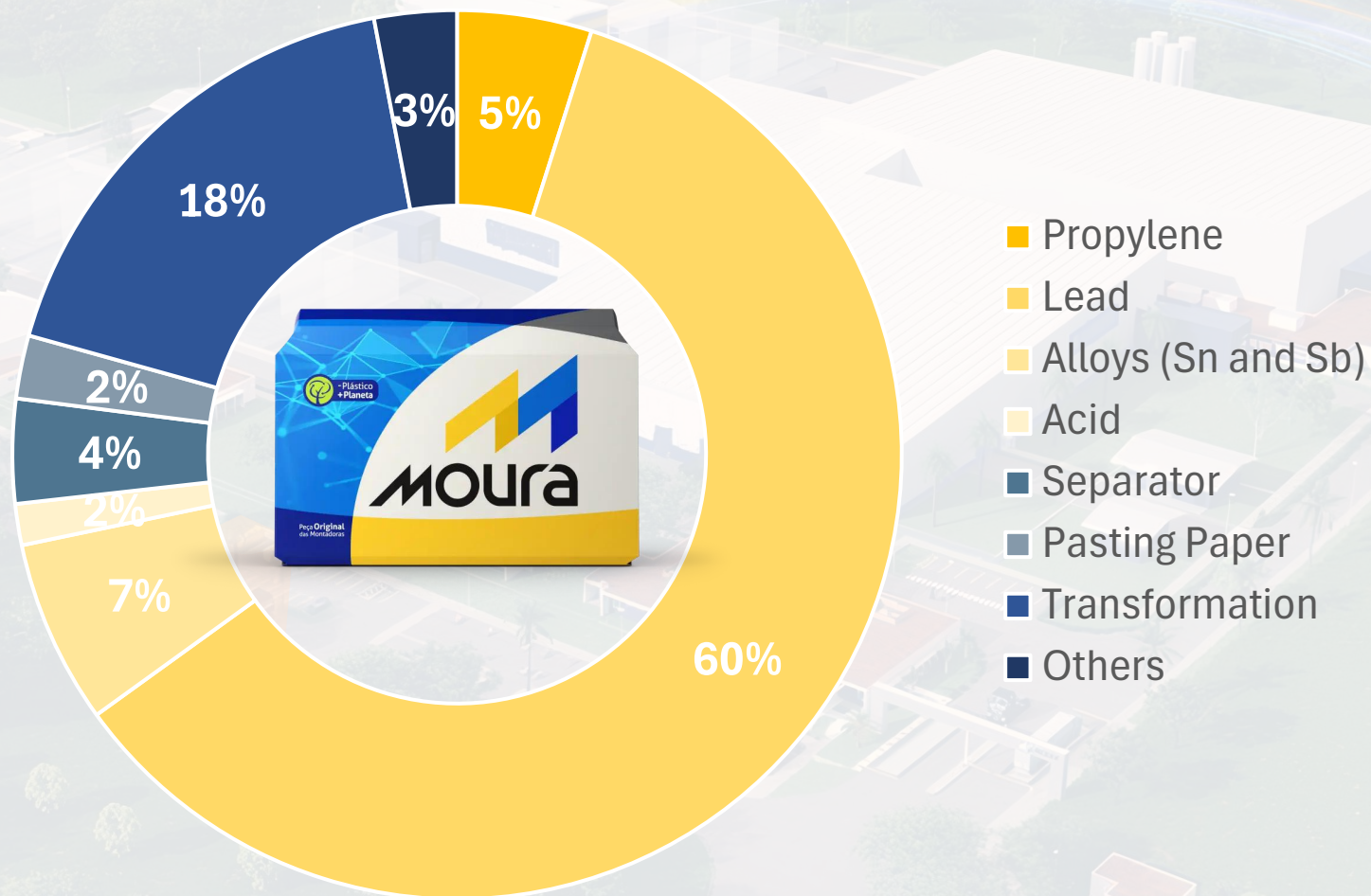
25 às 18:04 | Atualizado 20/04/25 às 18:04

na reduzem envio de

# Metallurgical Cost Contribution to Battery Manufacturing

Metals + Polypropylene + Acid

**+ 73%** of Contribution



# Initial Results

## COMPETITIVE KPIs

### Material Separation:



Battery Breaker Machine



**Lead Paste**

Average Yield = 46%  
Moisture content  $\leq 10\%$



**Fine Metal**

Average Yield = 10,7%  
Lead paste content  $\leq 5\%$   
Plastic content  $\leq 3\%$



**Coarse Metal**

Average Yield = 10,2%  
Lead paste content  $\leq 1,5\%$   
Plastic content  $\leq 1\%$



**Separator**

Average Yield = 3,6%



**Polypropylene**

Average Yield = 6,2%  
Lead paste content  
 $\leq 800$  ppm



**Filtered Electrolyte**

Total solid content  
 $\leq 100$  ppm

# Initial Results

COMPETITIVE KPIs

## Polypropylene:



Recycled Polypropylene

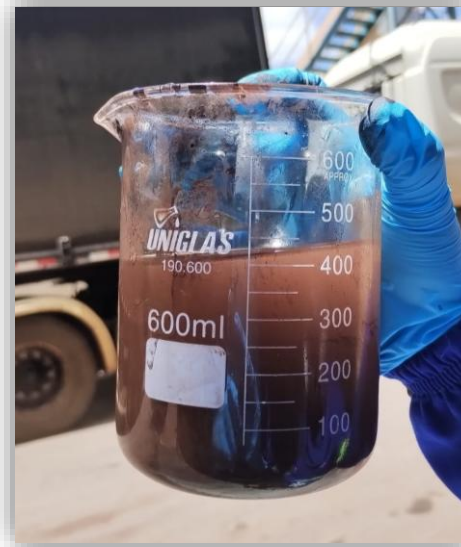
**PP recovery: +12.2%**  
(comparing with MA41 Old Plant)

- ❖ Capacity of 30 tons/hour of scrap batteries;
- ❖ Lead paste content:  $\leq 800$  ppm;
- ❖ Material purity (PP content):  $\geq 97\%$ .

# Initial Results

## COMPETITIVE KPIs

### Sulfuric acid :



Unit 04 - Recycled Sulfuric acid



Unit 14 -Recycled Sulfuric acid

- ❖ Significant improvement in turbidity levels and the amount of solids present in the electrolyte (compared to the previous plant);
- ❖ Total solids  $\leq 100$  ppm.

# Initial Results

COMPETITIVE KPIs

## Metals Separation and Recovery (Sn and Sb):



Coarse metal



- ❖ 15% of the Scrap Battery content;
- ❖ Use directly in Refining Kettle;
- ❖ Source of Sb (Battery posts/poles, strap);
- ❖ Sb increased the value: \$8.000 to \$48.000 USD/mt.

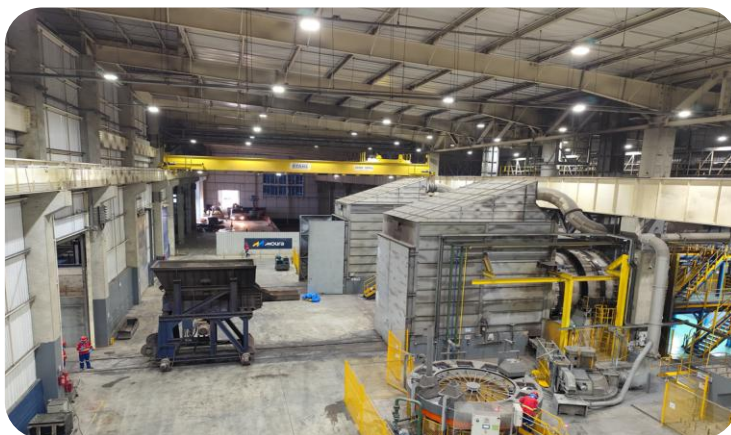
Coarse Metal Process

**+ 12.5% of  
Sb recovery**

# Initial Results

COMPETITIVE KPIs

## Rotary Furnace Production:



Production

Production 3.700 t/month  
with 2 furnace of 13m<sup>3</sup>



Bullion Lead

Average Yield 62%  
Pb Productivity 1,850 m<sup>3</sup>/t



Slag

Average Yield 27%  
Pb Content in Slag 8%



Coarse metal

Average Yield 98%

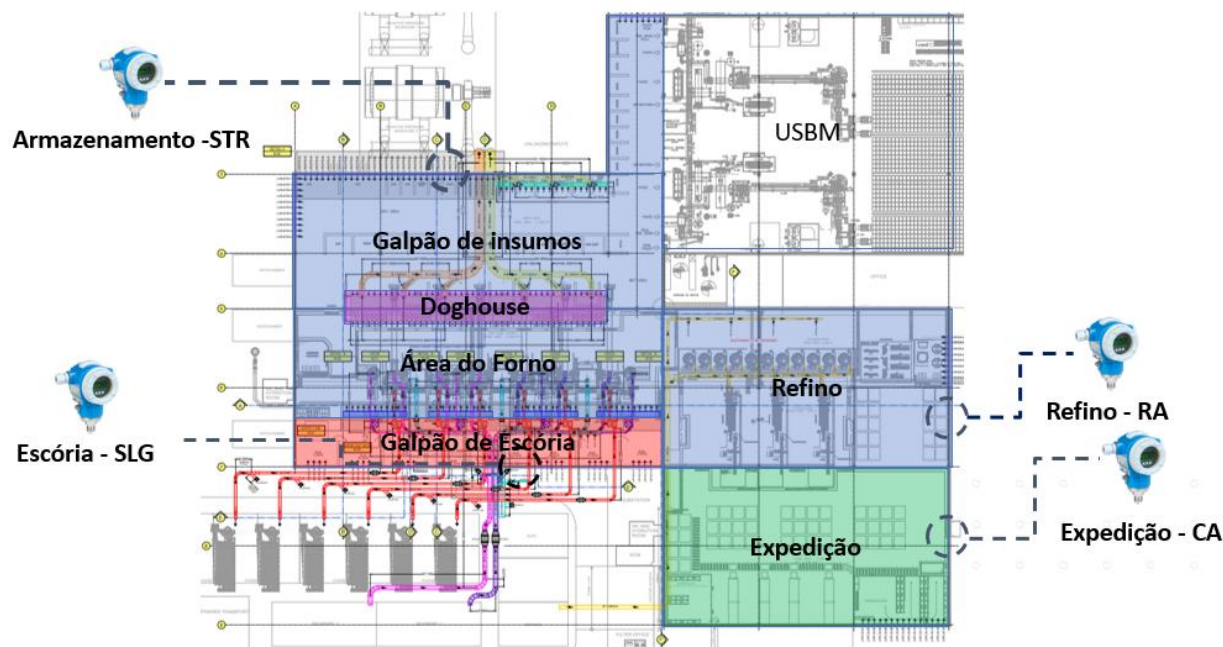
Rotary Furnace  
**+ 31% of  
increment**  
of production capacity.

- ❖ Coarse metal directly in the Refining Kettle;
- ❖ Rotary Furnace #02 with NG + O<sub>2</sub>;
- ❖ Lead Paste Humidity, Metals Separation, Furnace charge controlled.

# Initial Results

## ENVIRONMENTAL KPIs

### Progress of Negative Pressure commissioning:



#### Highlights:

**Completely enclosed plant**

AIR Exchange Design:

**up to 17 ACH**

Pressure Differential:

**~0.20 to 0.46**

(EPA - regulation): 0.18

# Initial Results

ENVIRONMENTAL KPIs

Health & Environment:

**+94%** of  
operation with  
 $PbS < 20\mu g/dl$



# Pilot Plant

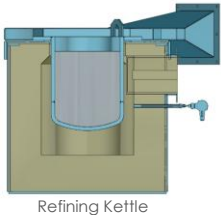
## COMPETITIVE KPIs

### Developing - Process, New Technologies and People - for The Recycling Technology of the Future:

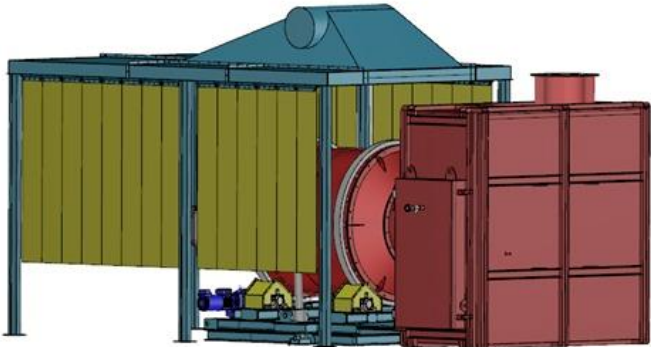
#### Strategic Driver:

- ❖ Possibility to test different formulations
- ❖ Development of new suppliers (Raw material and input testing)
- ❖ Visitable area for benchmarking and future partnerships;
- ❖ Prototyping of equipment/processes to replicate at industrial scale;
- ❖ Research and identification of positive and negative aspects of the overall process.

| EQUIPMENT                            | CAPACITY        | MANUFACTURER           |
|--------------------------------------|-----------------|------------------------|
| Rotary Furnace                       | 13 m3           | Moura Design           |
| <b>Rotary Furnace   Pilot Plant</b>  | <b>0,15 m3</b>  | <b>BJ - Industries</b> |
| Refining Kettle                      | 100 ton         | BJ - Industries        |
| <b>Refining Kettle   Pilot Plant</b> | <b>0,45 ton</b> | <b>BJ - Industries</b> |



Refining Kettle



Rotary Furnace



Site

moura.com



LinkedIn

@grupo-moura



Instagram

@bateriasmoura



YouTube

@bateriasmouratv



moura

Pb

2025 JUNE 25-27



International  
Lead Association

Our Energy, Our People!

