



ECOLEADTM process: a clean technology to recover Lead and Silver from residues.

E. Pecharromán, C. Álvarez, M. Frades, M.T. Pinedo, G. Díaz, A. Staley, J. Pusateri, E. Johnson

TECNICAS REUNIDAS, Proprietary Technology Development, Horsehead Metal Products and Horsehead Corporation

C/Arapiles nº13, 28015

Madrid, Spain.

Abstract

ECOLEADTM is a process developed by Técnicas Reunidas (TR), as an eco-efficient way to recover lead and silver from a wide range of materials, especially residues from zinc refineries. It is conceived as a simple, clean and proficient process adding value to the overall revenue of base metals production factories. This process can be installed as an annex to existing plants and would be practically independent of the main facilities.

ECOLEADTM is a chloride-based technology, capable of separating lead and silver from other components by selective dissolution of chloro-complexes and precipitation with carbonate. It yields a high-purity concentrate that can be readily fed to secondary smelters, where it will render the lead and silver metal with high efficiency and moderate energy consumption.

After extensive research and pilot demonstration, TR's lead and silver recovery technology has recently been implemented for the first time on an industrial scale at Horsehead's Mooresboro plant in North Carolina. This facility is undergoing start-up and ramping up to produce 5600 t/yr of lead and 14.5 t/yr of silver contained in the final concentrate by 2015. This auxiliary plant treats the residue generated from leaching Waelz oxides within the main zinc refinery.

Given its adaptability to process a wide range of raw materials, Técnicas Reunidas expects new developments for this technology. ECOLEADTM has the potential to become a common additional feature to new or existing metallurgical plants in the following years.

ECOLEAD™ process: a clean technology to recover Lead and Silver from residues.

By E. Pecharromán, C. Álvarez, M. Frades, M.T. Pinedo, G. Díaz, A. Staley, J. Pusateri, E. Johnson

This paper was published in the Proceedings of Pb-Zn 2015 vol. 1, which can be acquired in the following link:

<http://emc.gdmb.de/previous-proceedings/proceedings-of-emc-2015/>







The following presentation for commercial use describes the content of this paper.



**ECOLEAD™ process: a clean technology
to recover Lead and Silver from residues**
Implementation at Mooresboro Project





-  Introduction: ECOLEAD™
-  Technologies by Técnicas Reunidas
-  The Mooresboro Project
-  Process description
-  Implementation
-  Conclusions



Introduction



ECOLEAD™ PROCESS. WHAT FOR?



THE AIM:

Recovery of Lead and Silver from metallurgical residues.



THE DRIVE:

- Global demand of lead expected to grow.
- Lead recycling. May hydrometallurgy use other sources?
- The environmental concern about lead-bearing wastes.
- Plus... THE SILVER!





Introduction: ECOLEAD™ Process



WHERE WOULD IT FIT?

- Attached to metal refineries. Suitable for zinc RLE facilities (but not only).
- It renders a product ready to feed lead smelters, with some advantages:
 - It's a carbonate: lower smelting temperature.
 - High tenor of Pb with low impurities: low slag production.
 - Silver adds a significant value.

THE CHALLENGES

- Complex chemical composition of residues, compared to other typical materials.
- A chemically selective separation is required.
- The need to implement “tailor-made” solutions.



Técnicas Reunidas: Hydrometallurgy Technologies

Process development since 1971 at Technology Center in Madrid.

ZINC PRODUCTION



- **ZINCEX™ technology, developed in the 70's.**
 - **SX & EW to produce SHG Zn.**
- **Modified ZINCEX™ Process (MZP).**
 - **Skorpion mine & refinery.**
 - **Recycle plants.**



Técnicas Reunidas: Hydrometallurgy Technologies

LEAD AND SILVER PRODUCTION

- Several processes up to demo scale:
 - Hot Brine Leaching.
 - From standard or mixed concentrates, secondary materials and residues from zinc and copper industry.
 - Production of carbonates, electrolytic Pb, lead oxides or Pb/Ag cements.
- First industrial implementation:
ECOLEAD™ in Horsehead's Mooresboro project.





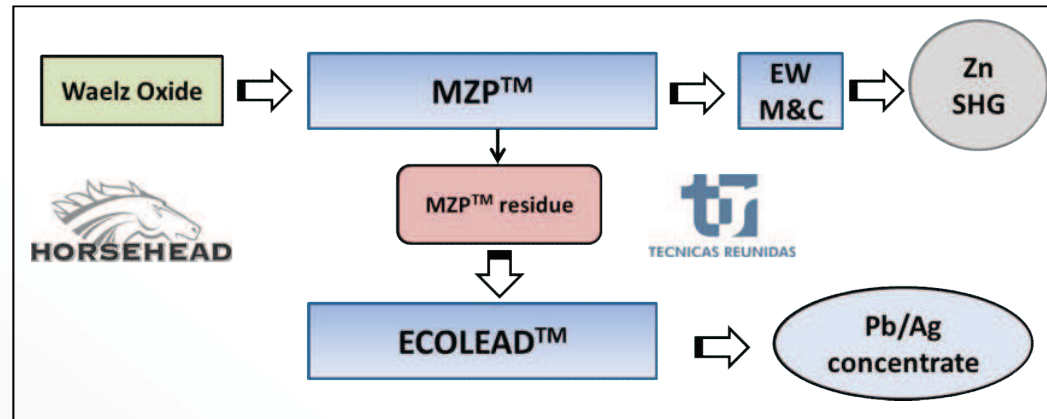
The Mooresboro Zinc Project

- **HORSEHEAD CORPORATION**
 - Leader zinc manufacturer in USA from recycling.
 - Integrated facilities:
 - Four kilns to supply Waelz Oxide (WOX).
 - Electrothermic plant at Monaca (PA), recently idled, replaced by the new Mooresboro (NC) plant.





The Mooresboro Zinc Project



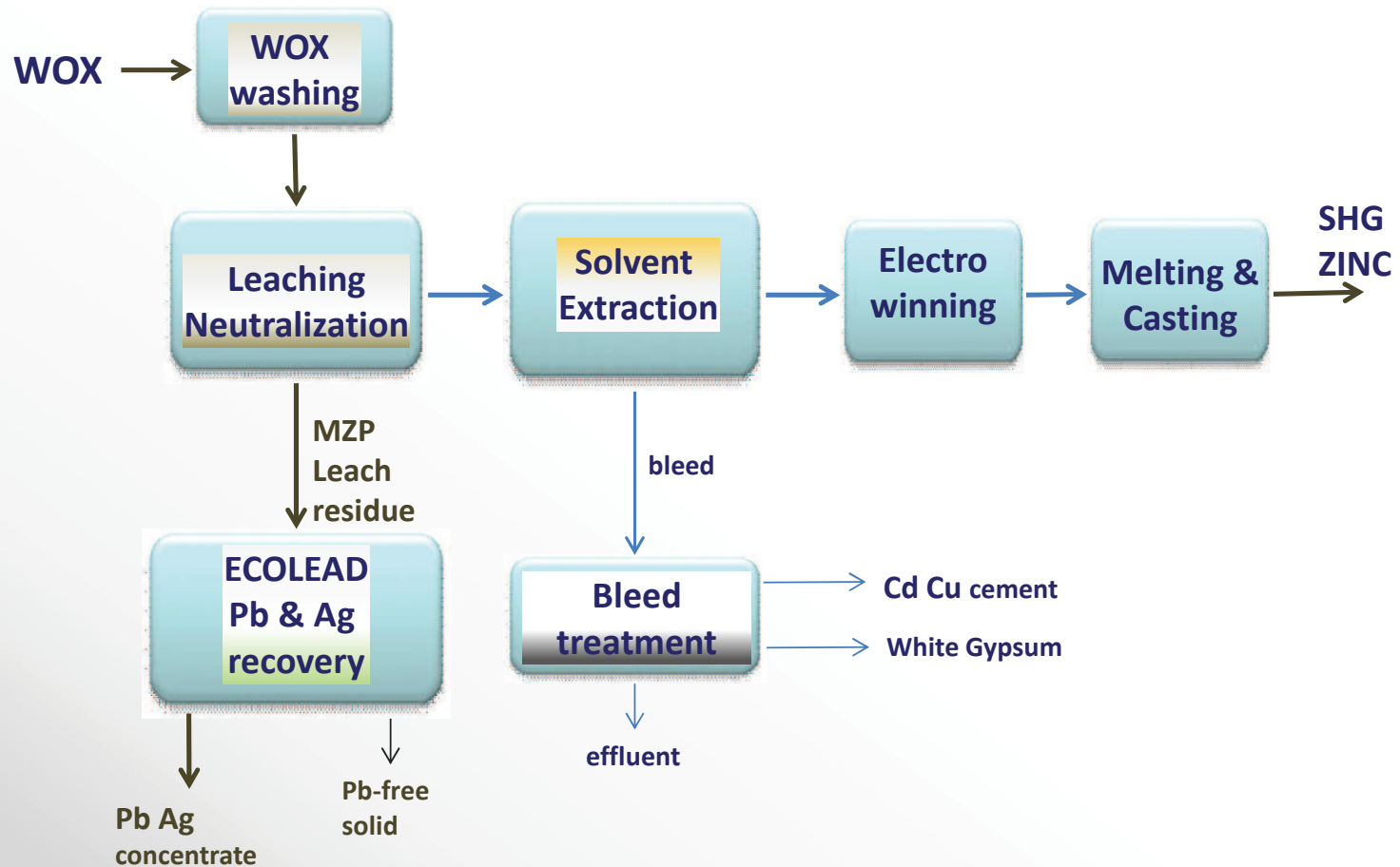
- First in the world to process 100% recycled materials by
- Leaching - Solvent Extraction - Electrowinning - M&C.
- 140,000 t Zn SHG / year nameplate capacity.
- Recovery of other metals contained in WOX:
 - Cu-Cd cement by-product.
 - Pb and Ag by

ZINCEX™
SOLVENT
EXTRACTION





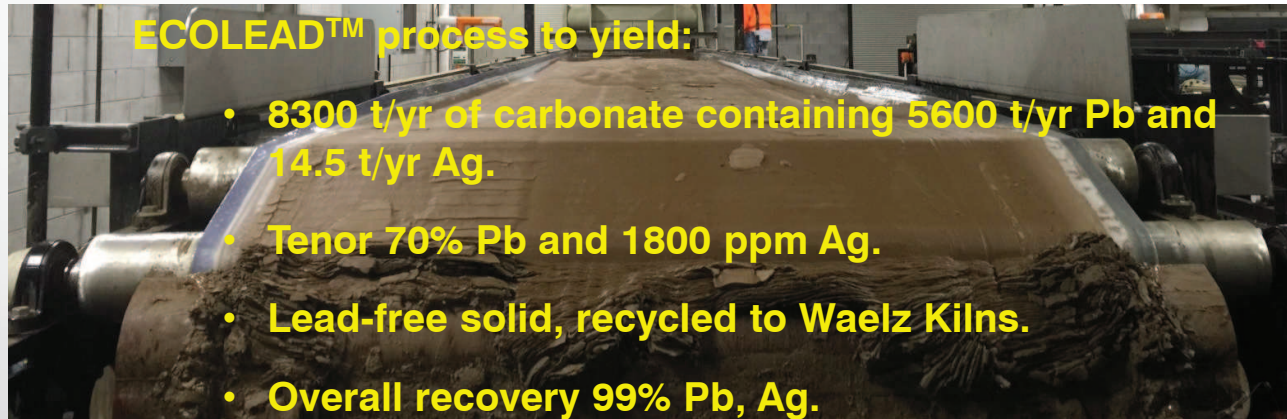
The Mooresboro Process. Overall





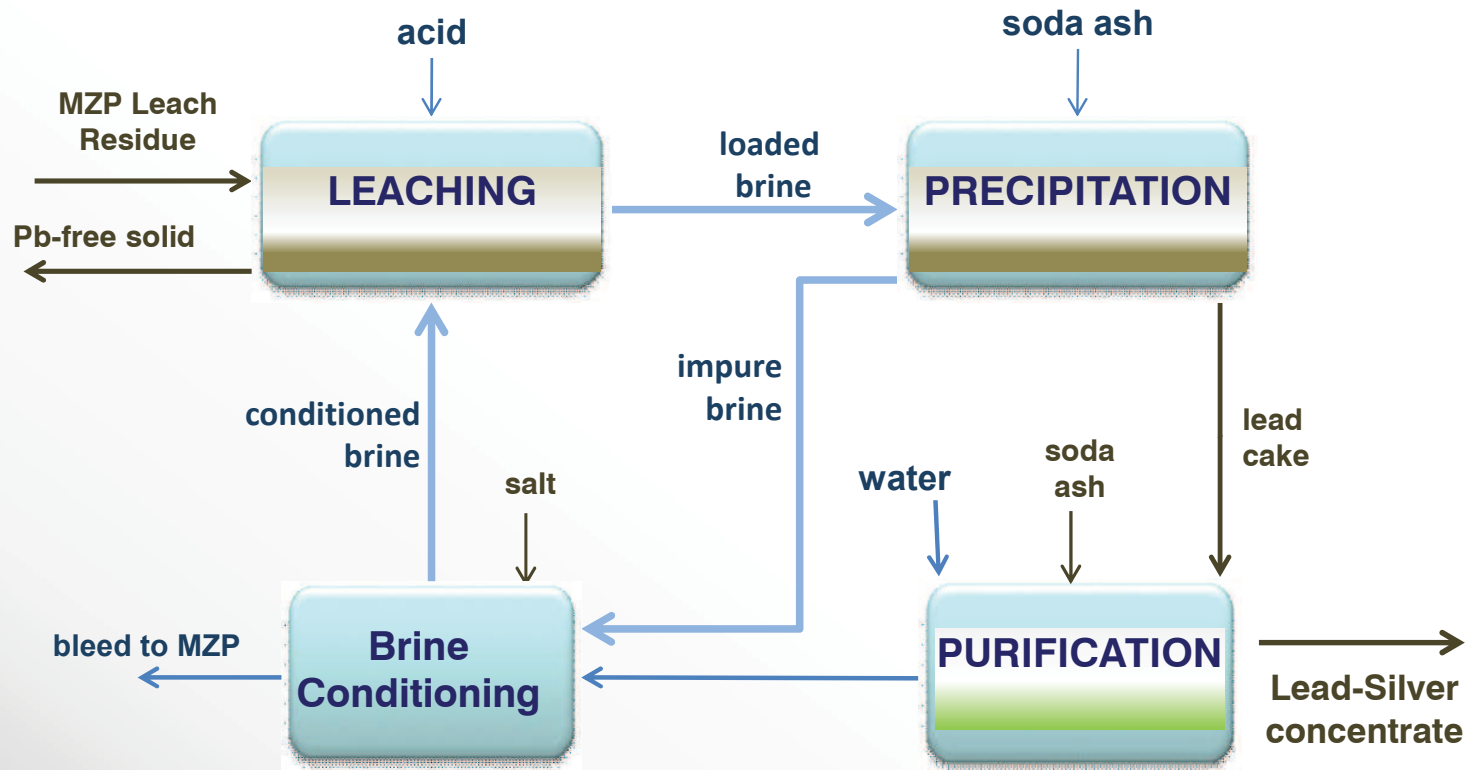
Mooresboro process: Recovery of Lead and Silver

- Zinc-processing residue contains typically:
 - 5% to 14% Pb as insoluble lead sulfate (PbSO_4)
 - 400 ppm Ag
 - Iron oxides
 - Zinc, cadmium, copper and other metals
 - Gypsum



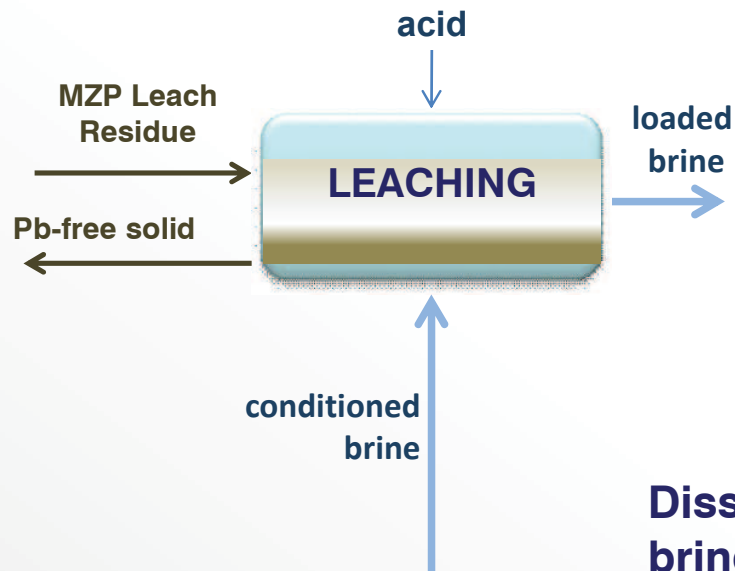


Ecolead Process. Overview.





Ecolead Process. Lead & Silver Leaching



Dissolution of Pb and Ag in the loaded brine.

High efficiency and selectivity.

Concentrated brine.

Atmospheric pressure. Heating.

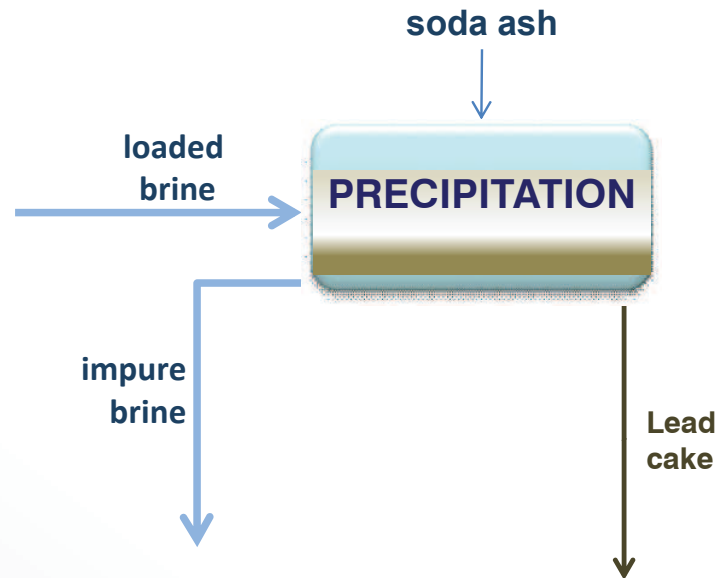
Mild acid medium, adjusted by HCl.



Ecolead Process. Lead & Silver Precipitation

Soda ash added to render solid carbonates.

Control of pH / dose.



After precipitation in brine, the lead cake contains some chloride but no sulfate.

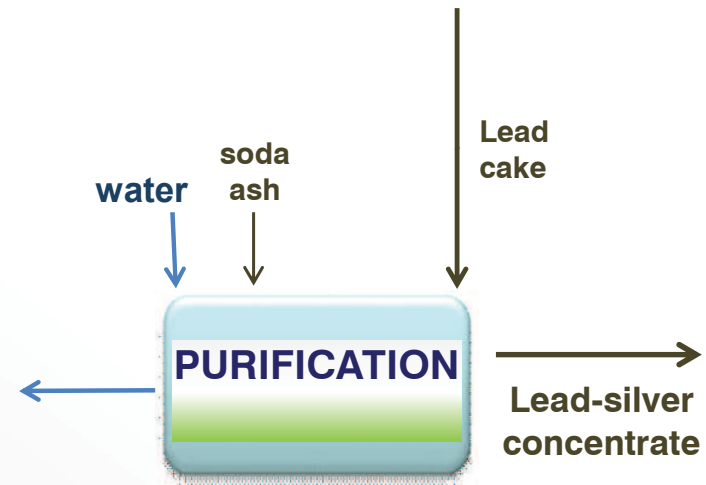


Ecolead Process. Purification.

**Chloride removal by physical wash and chemical reaction.
Minimizing water consumption.**

Final product:

- **70%wt Pb. 1500-2000 ppm Ag.**
- **Less than 0.2% Cl**



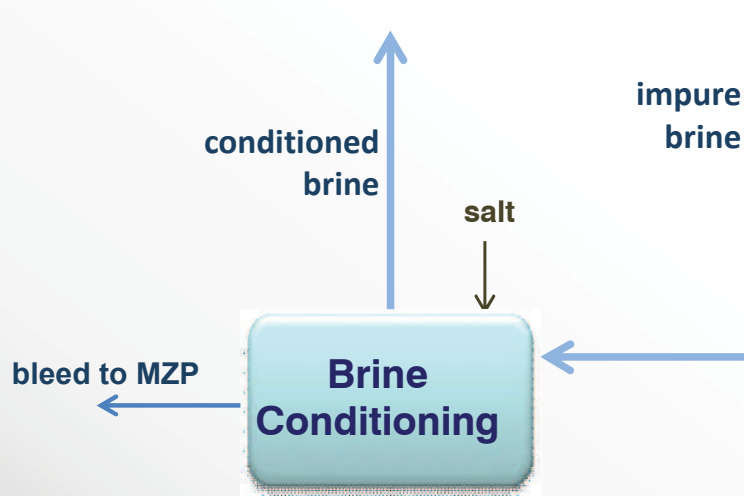


Ecolead Process. Brine Conditioning

Removes sulfate from brine.

Evacuates excess water.

Adjusts concentration of brine.



Nanofiltration:

- **Permeate = conditioned brine**
(low sulfate brine)
- **Reject = bleed to MZP**
(concentrated sulfate brine)



Implementation in Mooresboro Project

Location of Lead and Silver recovery facilities





Implementation in Mooresboro Project

STATUS:

- **Currently**
 - **Ramping-up:**
 - Load of Pb in brine.
 - Circulating flowrate.
- **Objectives:**
 - Maximize quality.
 - Minimize reagent/utilities consumption and bleed.
 - Production target.





Conclusions

ECOLEAD™ technology: first time implemented at Horsehead Moorsboro plant.

Production 5600 t/yr Pb and 14.5 t/yr Ag. Expected grade 70% Pb and 1800 ppm Ag.

The product is a clean carbonate, optimal feed material for smelters in favourable economic conditions.

This technology valorises a leaching residue from a zinc plant, that otherwise would be a hazardous residue.

A major milestone in the maturity of Técnicas Reunidas technologies for lead-silver processing.

ECOLEAD™ has the potential to become an alternative for Pb and Ag recovery in existing or new plants.



Acknowledgements

Thanks to:

Mr. Anthony Staley. (General manager)

Mr. John Pusateri. (Technology director)

Mr. Eric Johnson. (Process engineer – Pb & Ag Unit)





PROPRIETARY TECHNOLOGY DEVELOPMENT DIVISION



Thank you for your attention