

Replacing Melting Processes with Mechanical Operations for Producing Silver Bars: A Lower Energy and Safer Alternative

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Summary

- 01** Scope of the paper
- 02** Production steps in PM foundry and ESG
- 03** Identification of energy intensive and critical processes
- 04** Potential area of intervention
- 05** Case Study: Remelting 1000oz Silver bars to produce kilobars
- 06** Final considerations and future developments

Scope of the paper

The scope of this paper is to present the results of **an advanced research and development project** aimed to reduce energy intensive melting processes with innovative mechanical production steps.

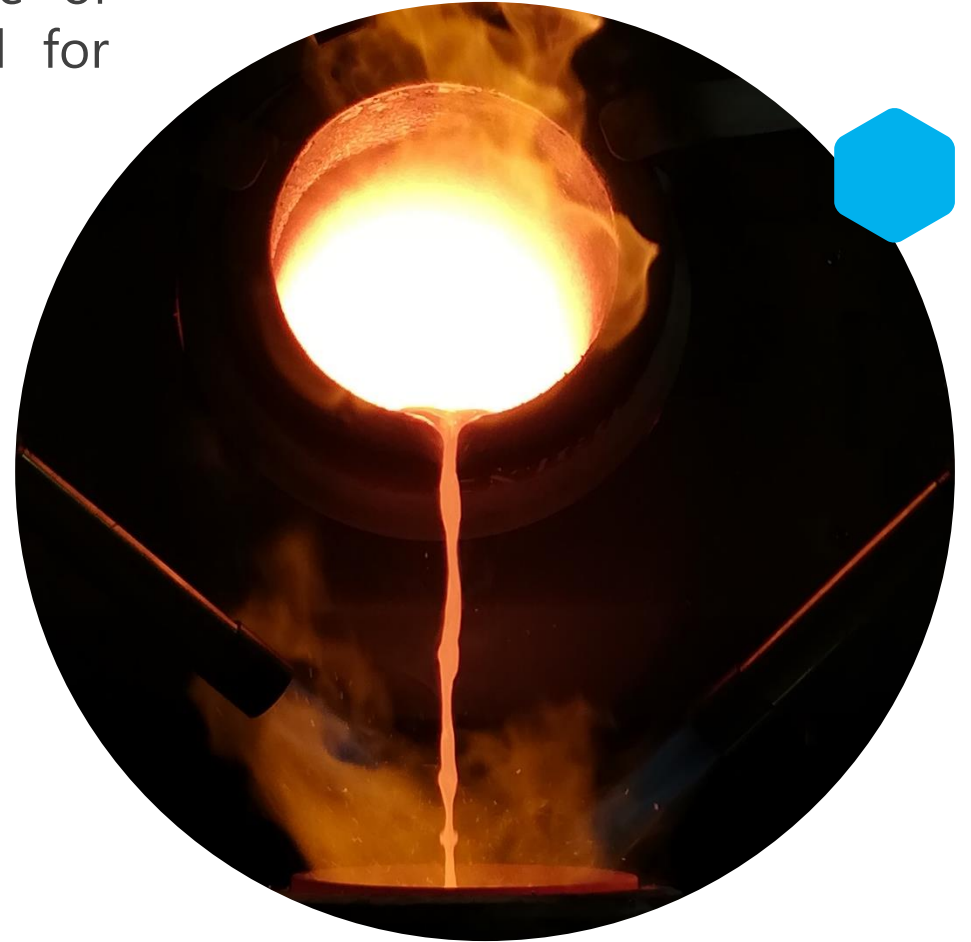
We are presenting in particular a specific study related to the process of re-melting 1000oz good delivery bar to produce silver kilobars.



Typical production steps in PM Foundries

A precious metal foundry performs a wide range of production steps, both for internal processes and for finished products, such as:

1. Feedstock melting and homogenizing
2. Casting of anodes for electrolysis
3. Casting of grains/flakes for Aqua Regia dissolution
4. Melting bars, sponge to cast grains
5. Remelting scraps, defective products and GD bars
6. Pyrometallurgical processes such as Chlorination
7. Vacuum distillation processes
8. Casting finished bars

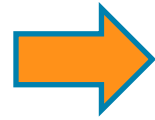


ESG and Precious Metals Foundries

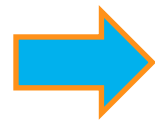
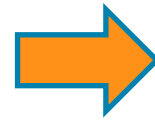
- The activities of precious metal foundries are **energy intensive** and may pose a **health & safety risk** for operators.
- ESG principles should be implemented as much as possible also in this environment.
- Melting and re-melting are necessary for the daily activities of a refinery, but **some intermediate processes may be removed or replaced** with alternative solutions.

In this paper we will analyze the case of **re-melting 1000oz silver bars to cast smaller bars**, as a consequence to market demand of such products.

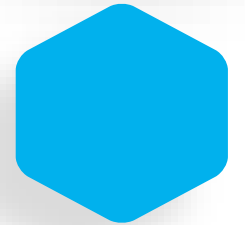
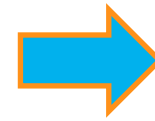
Case Study: from 1000oz GD Bars to small bars - Process comparison



Melting and grains casting



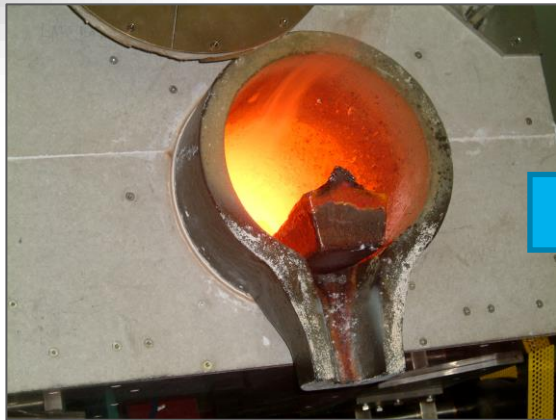
Mechanical processing



Case Study: from 1000oz GD Bars to small bars



Bar loading



Melting and pouring



Grains



Melting and grains casting



Small bars



Compact or flameless



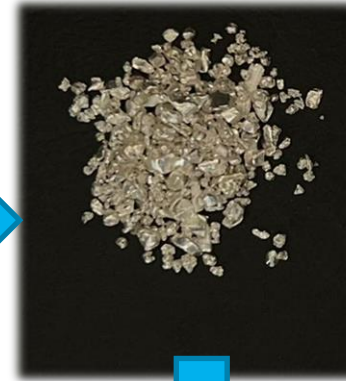
Drying and sieving

Case Study: from 1000oz GD Bars to small bars

Mechanical Processes



DENSITY BOOSTER®



ULTRA BITE®



COMPACT or FLAMELESS®



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PRECIOUS METALS INGENUITY

Case Study: from 1000oz GD Bars to small bars

Mechanical Processes

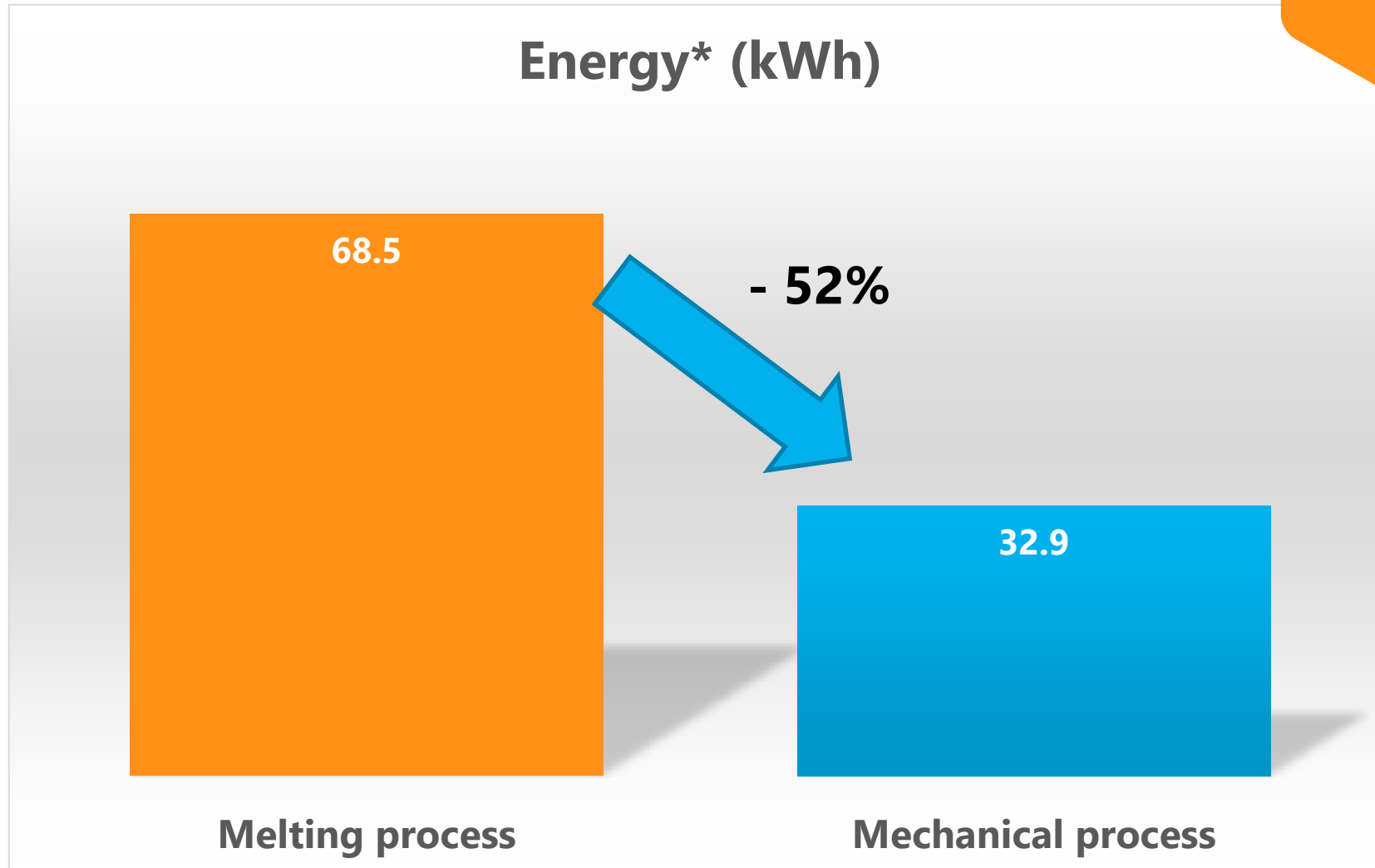


*Mechanical
Grains*



Shavings

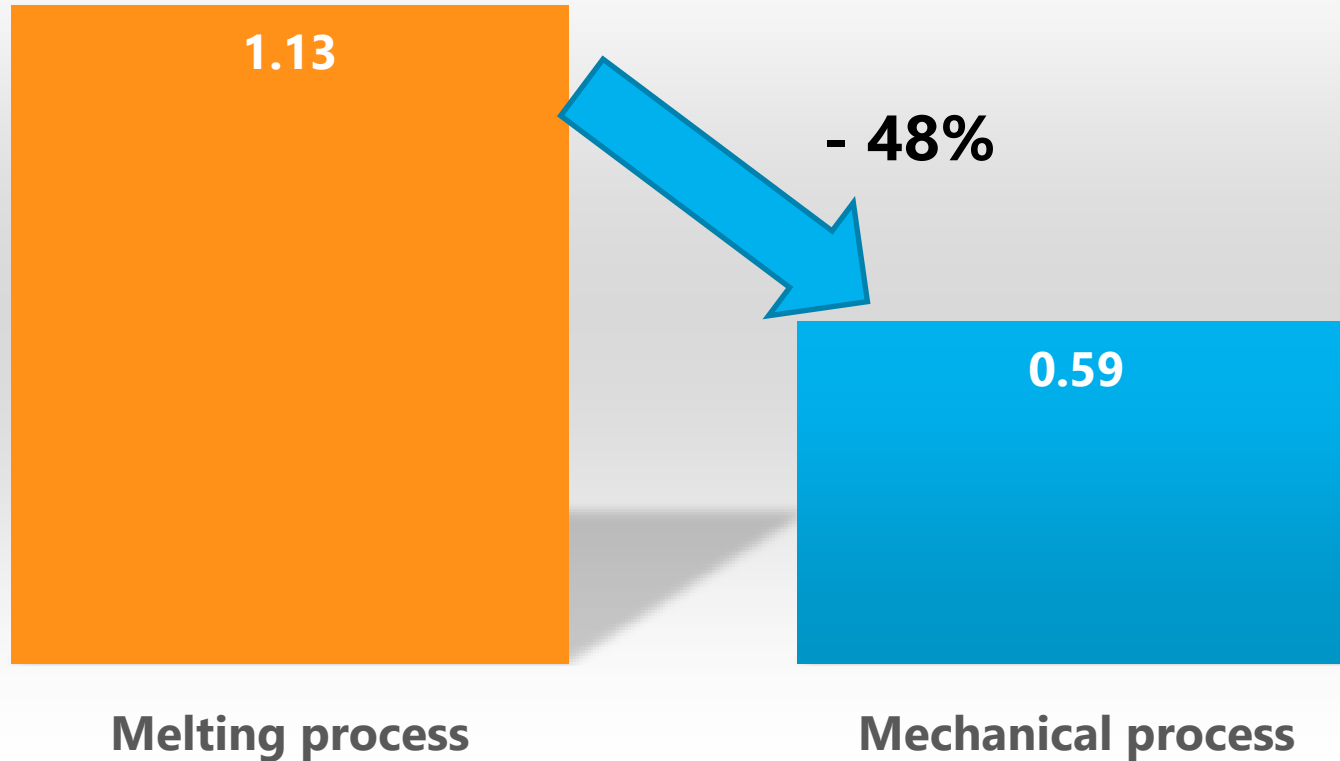
Data comparison



* Data based on a productivity of 60 kg of silver/hour.

Data comparison

Running cost* (Eur/kg)



* Data based on a productivity of 60 kg of silver/hour.

Cost includes energy, utilities and consumables.

Labor cost has not been considered as the comparison is done with two automated systems



Conclusions

The novel process has the potential to **reduce the energy consumption by more than 50%** compared to an equivalent melting process.

Running cost is also reduced significantly, especially in relation to energy and other utilities costs.

Quality of the produced small bars is in line with LBMA standard.

Safety and wellbeing of the workers is increased as there are no open flames and poured molten metal.

In particular **loading of 1000oz into a hot crucible is avoided.**

Future Developments

The same process, with some different technological solution can be applied to:

1. Mechanical process of scraps from production
2. Mechanical processing of dorè bars to feed chemical dissolution or other refining processes
3. Mechanical processing of gold cathodes
4. Increase density to silver crystals to produce directly small bars.



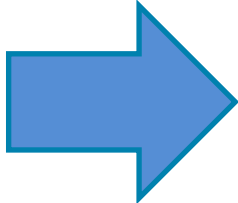
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New Logo



Questions & Answers



A graphic with a dark grey background. On the left, there is a large blue shape that looks like a speech bubble or a stylized arrow pointing right. In the center, there is an orange rounded hexagon containing the text "Thank You" in white. The text is split into two lines: "Thank" on the top line and "You" on the bottom line.

**Thank
You**