

TECHNICAL WORKSHOP

“INTEGRATING COMMON PROBLEMS FOR SHARED SOLUTIONS”

Project Area #6 - INEGI LEAD-FREE COPPER-ZINC ALLOYS

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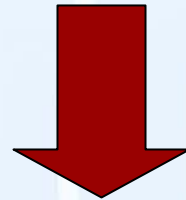
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OUTLINE

- 1. PURPOSE OF THE STUDY**
- 2. JUSTIFICATION AND RELEVANCE IN TERMS OF POLLUTION PREVENTION**
- 3. EXPERIMENTAL WORK**
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- 5. FINANTIAL OPPORTUNITIES**

1. PURPOSE OF THE STUDY

Study new copper-zinc alloys for the foundry (low pressure and tilt casting) and forging industry.



Replace/reduce the 2-3% lead by other materials (Bi, Se, etc.) that are environmental friendly, but that can ensure:

- Casting properties
- Forging and machining characteristics
- High quality products

2. JUSTIFICATION AND RELEVANCE IN TERMS OF POLLUTION PREVENTION

- **Lead is a dangerous heavy metal** that can cause severe problems to the environment and human health, namely in contact with drinking water.
- Ingots and forging rods suppliers still have their main brasses products containing copper, zinc and lead.
- **Lead** gives good foundry properties and plastic behaviour during casting or extrusion and imparts the intense machining grinding and polishing, necessary for the final products appearance and functionality, but these processes smears the lead across the surface, **leaving it vulnerable to leaching**.

2. JUSTIFICATION AND RELEVANCE IN TERMS OF POLLUTION PREVENTION

- International organizations have been establishing very low lead values in drinking water:
 - 15 ppb at the tap, in USA
 - <10 ppb in lead flushed from the tap, in Canada
- New low-lead or lead-free alloys are required for plumbing fittings to meet the reduced toxicity levels.

2. JUSTIFICATION AND RELEVANCE IN TERMS OF POLLUTION PREVENTION

- Other elements, like Bismuth or Indium, are potential lead substitutes to promote similar characteristics to the copper-zinc alloys:
 - Machinability (ease, chip ejection, speed and cost)
 - Fluidity
 - Cracking resistance
 - Ease of plating and soldering
 - Pressure tightnes

3. EXPERIMENTAL WORK

- Diagnosis of the forging and casting Portuguese industrial sectors, considering house hardware and taps manufacturing companies and ingot industrial manufacturers.
- Inquire to identify the manufacturers needs and strategic position relative to the lead problem.
- Bibliographic review about the currently used casting and forging copper alloys and their technological properties.
- Compilation about the needs and the strategic positions of the forging and casting sector in Portugal and eventually in Spain, Germany and other countries, relatively to this problem.

3. EXPERIMENTAL WORK

- Extension of the partnership, in case of necessity, in order to cover all the areas, from the remelting to the final components.
- Laboratory tests to check the technical implications of the new alloy system:
 - Metallurgical
 - Embrittlement
 - Machinability
 - Physical and foundry properties
- Study the workplace hazards and their effects on the human health and the environmental implications of foundry emissions, wastes and recyclability of these alloys.

3. EXPERIMENTAL WORK

- Laboratory tests to identify the big differences in the feeding and solidification phenomena between the old and the new alloys.
- Machinability tests of some benchmark components to identify the differences and establish the final new machining solutions.
- Industrial tests of tilt pouring and, in a later phase, the low pressure die-casting.
- Industrial tests of forging and machining
- Conclusions and dissemination of the results, economical evaluation and demonstrations for the forging and casting sectors and ingot manufacturers.

3. EXPERIMENTAL WORK

INEGI have a considerable experience in the foundry field, using copper alloys

Human and Laboratory facilities

- Human
 - 5 PhD researchers in the metallurgical field.
 - Several engineers and lab and foundry technicians
- Equipment:
 - Emission spectroscopy
 - Induction and heat treatment furnaces
 - Die casting
 - Machining
 - Metallographic analysis
 - Mechanical tests

4. DEMONSTRATION AND TESTING ACTIVITIES

1. Change the production methodology
2. First phase in the taps manufacturing lines, which are the ones with more direct contact with drinking water
3. Second phase in house hardware.

5. FINANTIAL OPPORTUNITIES

1. IDEIA PROGRAMM