Session Introduction
The Future of Responsible Lead Production – Challenges Ahead

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Challenges v Improvements

Responsibility – The vast majority of the Secondary Lead industry takes their “responsibility” as a driving operating principle.

It also underpins the work done to address challenges from various sources, and the improvements we undertake to resolve them.

But, as some companies are doing now, it may be time to look at our processes to see where we can look at improving: “borrowing” from other industries

Unfairly, the “responsibility” of recycling ULABs, both good and bad and any place in the world, is placed upon the Secondary producers.

Internally we can control, External is another matter……

Challenges are Nothing New

The Secondary Lead industry has faced many challenges over the past 50 years, and often not realising the value of these improvements:

- Massive improvement in OH&S
- Reduction in blood leads
- Better emission controls
- Desulphurisation
- Production of Calcium and Barium alloys
- Removal of impurities: Nickel, Tellurium, etc.

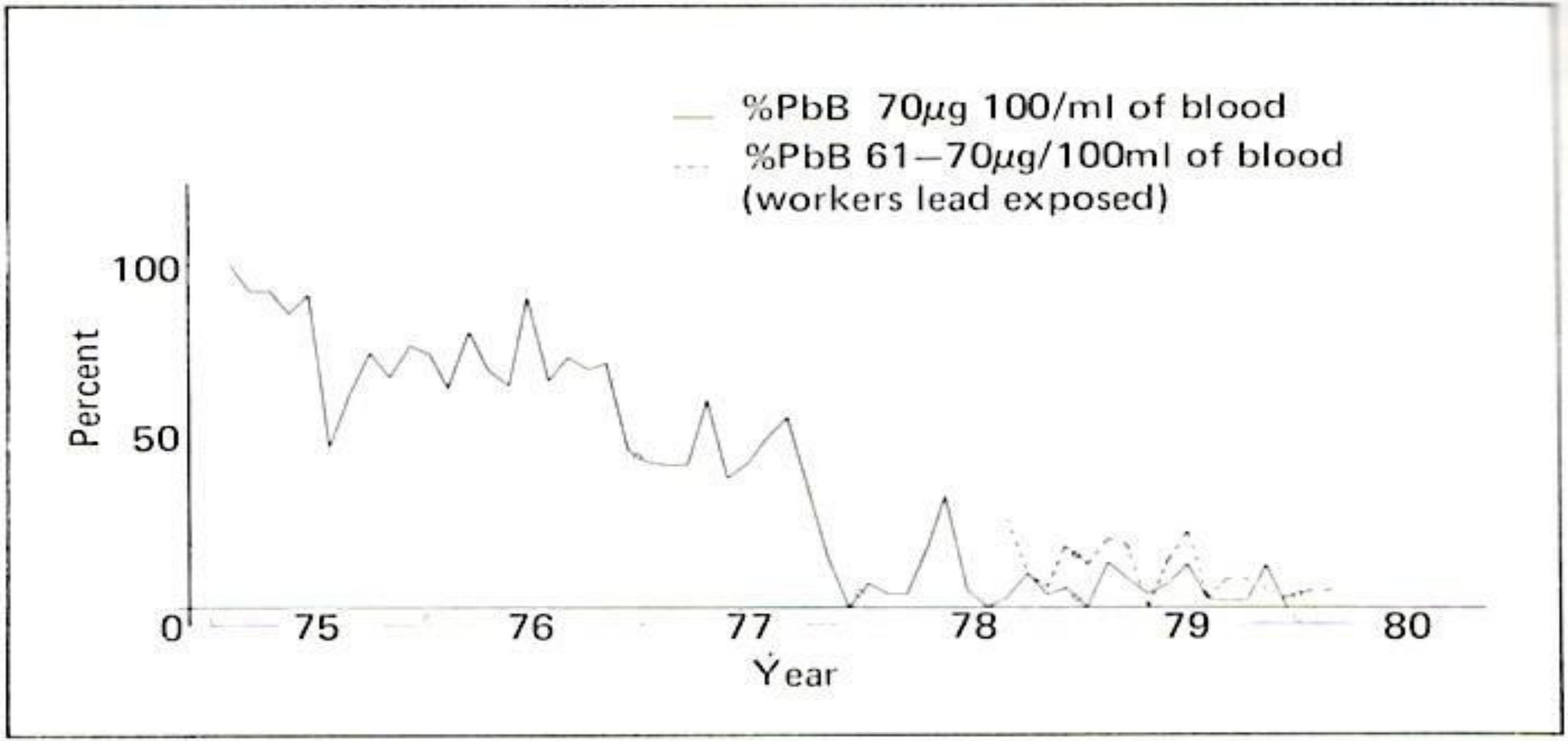


Figure 2. Blood lead levels of workers exposed to lead.

The Source of Improvements

The majority of improvements over the past 50 years have been done with “what we have”:

- Refineries didn’t change to make Ca alloy
- Casting machines didn’t change
- Baghouses just improved performance
- Scrubbers just improved performance

But we may need to look outside of our industry and borrow from others…..

So, what Improvements?

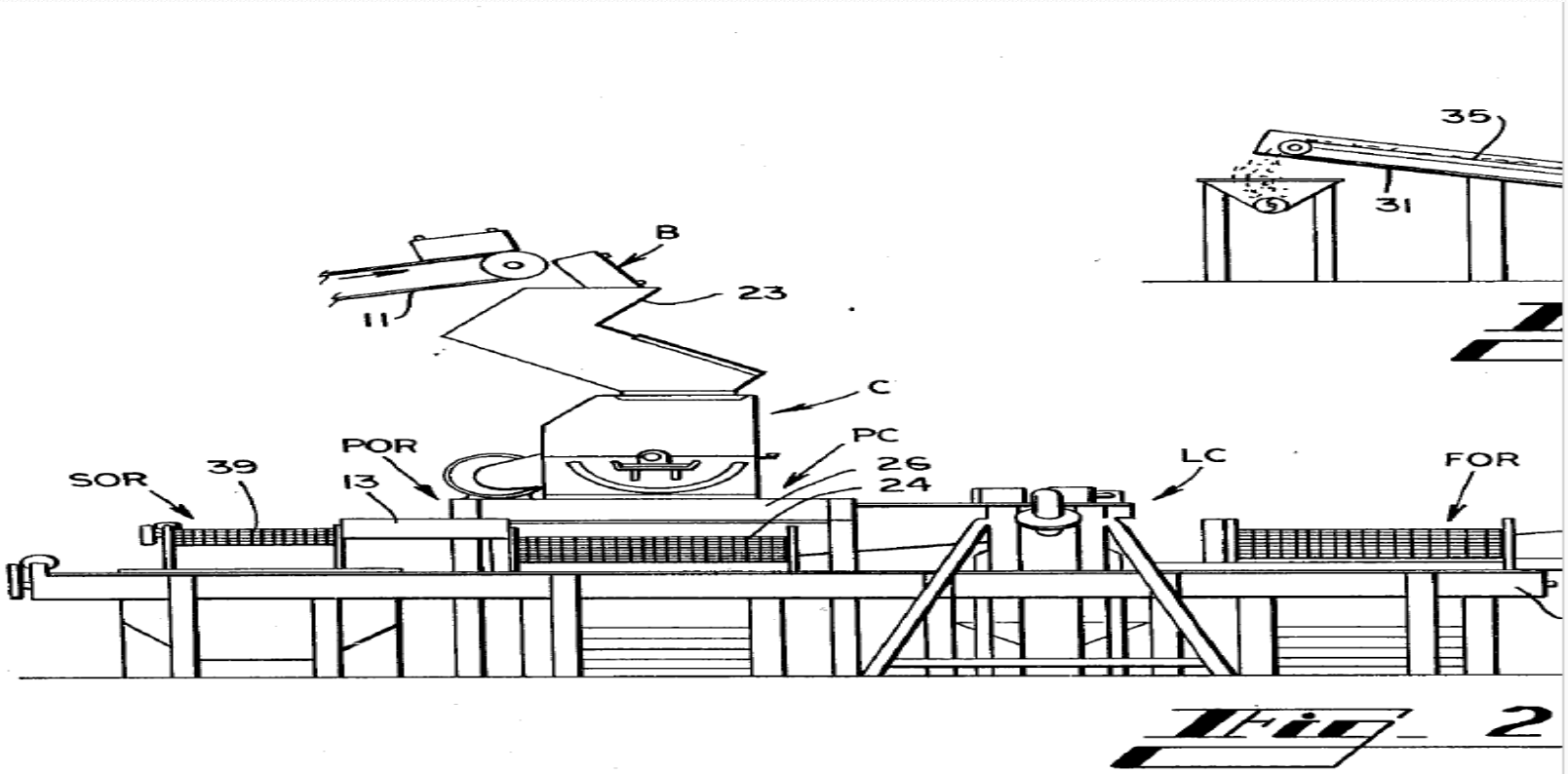
Is it time to challenge what we do?:

- Why do we have to raise the ULAB's so far in the air to break them?
- "Break-to-Molten" in two hours……..
- "BA v Ryanair" > driving the furnace.
- Why do we freeze bullion, then have to remelt it?
- Why do we pump alloys to the casting machine?

But we may need to look outside of our industry and borrow from others…..

Not much has Changed with Equipment

Copy of figure 2 from MA Patent 4,397,424 of a partial drawing of a conveyor to the hammermill.



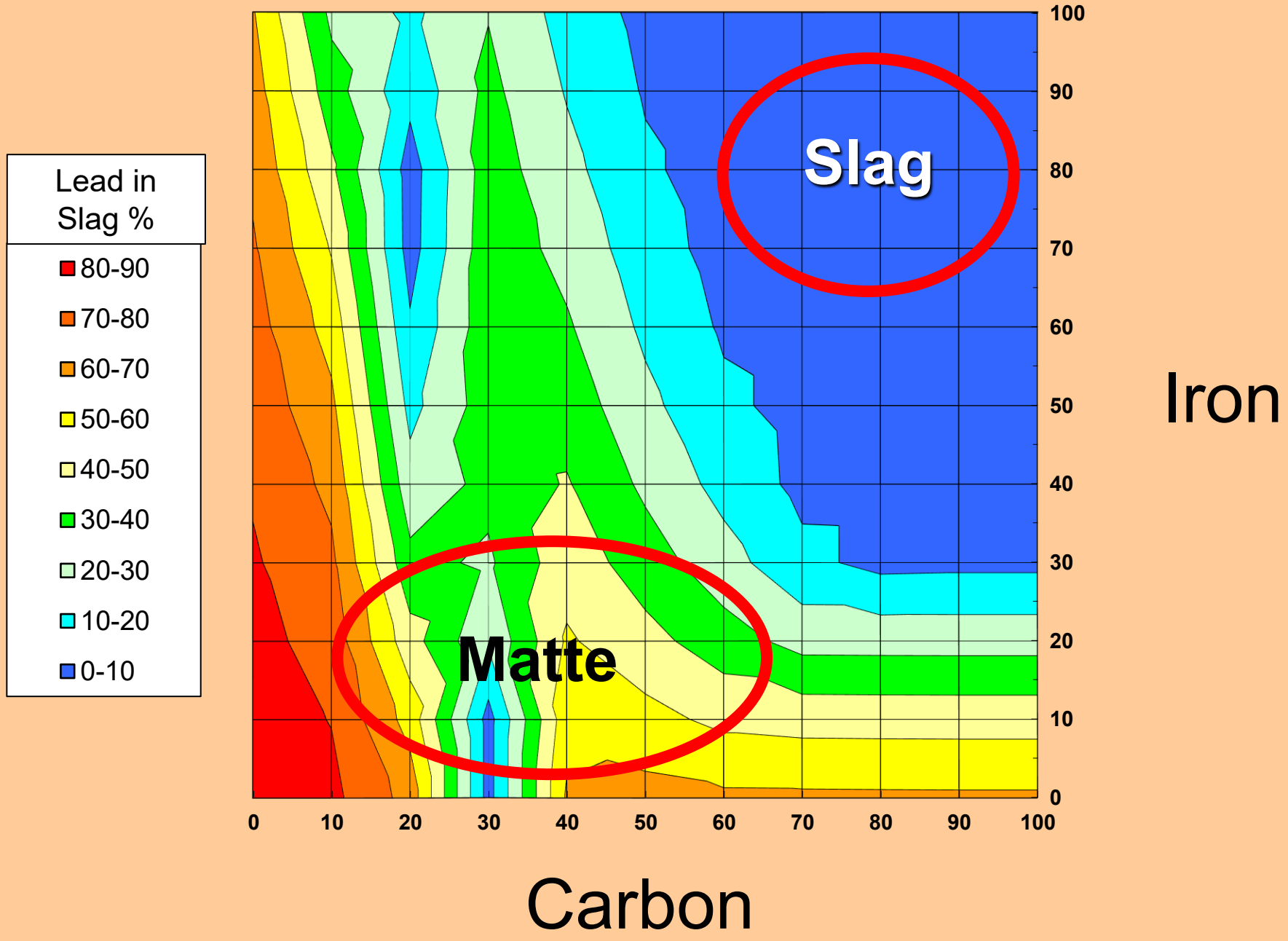

KOMATSU

Lithium Battery Recycling Machine

Yours for only $30,000 to $200,000

From Henan Recycle Environmental Protection Equipment Co., Ltd

Lead in Slag – Fe v C Relationship

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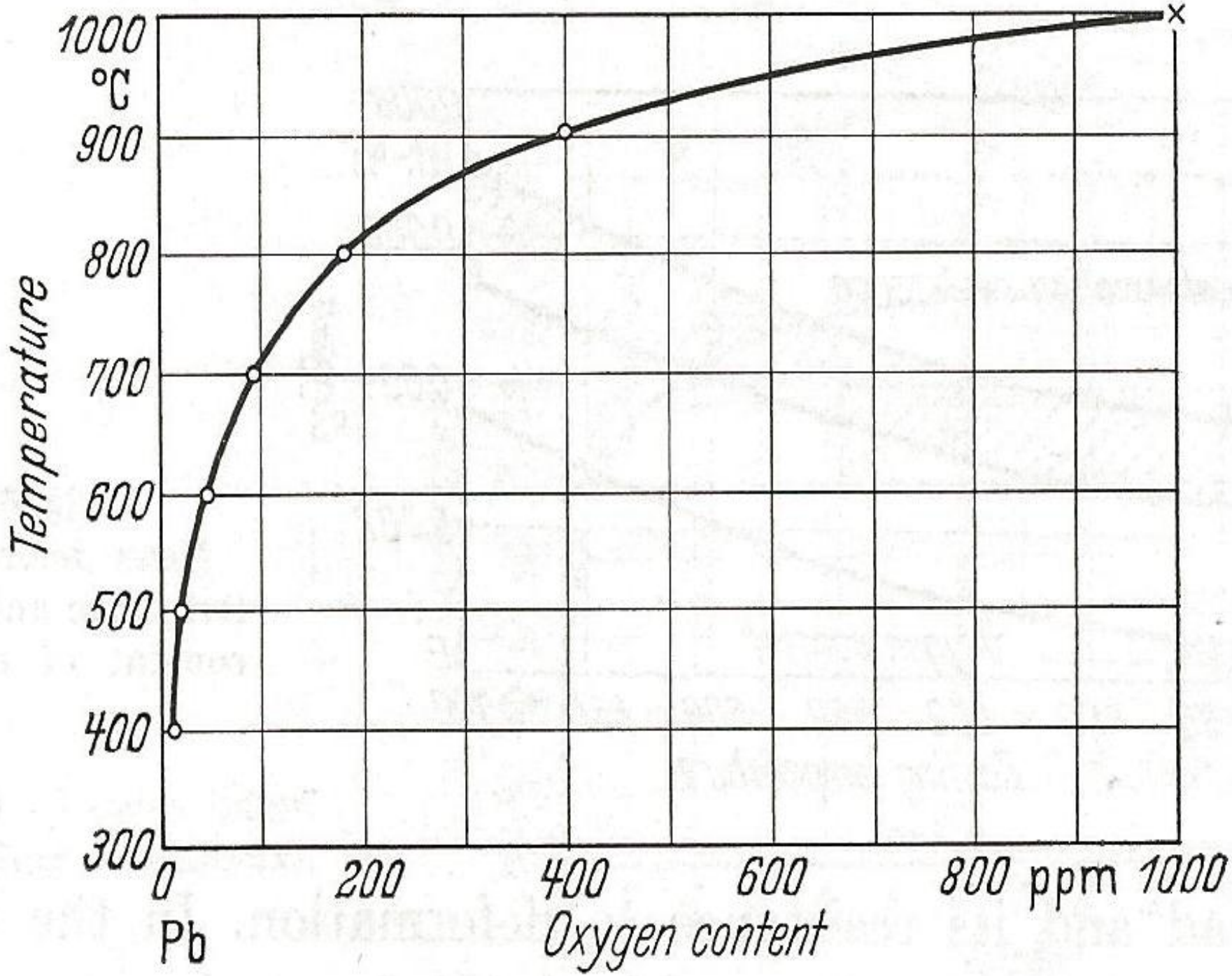
1000
°C
900
800
700
600
500
400
300
Temperature
0
200
400
600
800 ppm 1000
Pb
Oxygen content

Are we up for the Challenge?

In what we have control over, Yes absolutely!

We have demonstrated continuous improvements and developments over the years, enabling us to rise to the challenges presented.

However, the external factors, to which we are often tied, are often harder to understand and help.

External – Another Matter

The simplicity of smelting and recycling lead has its positives and negatives. The positives we know and control are the ones we can manage; it's the negatives (the informal sector) that cause the most problems.

We need to be able to explain the "whole story" to those working in and helping the informal and other sectors, as understanding how and why it operates is essential for achieving a better outcome.

In the majority of cases, formal Secondary smelters have no control or input; however, those companies and agencies that do, working as a team, can help solve many of the problems.

External – Another Matter

But there are issues that do hamper the work of many inside and outside of the industry:

- The word “Waste”
- The uneducated educated
- Working together – asking the experts!

“Waste” – A word reserved for Lead in the Metals world?

For a resource that supplies >65% of world supply, it is too commonly referred to as “waste”. Double the amount of battery paste is consumed per year compared to Pb Concs, but we don’t call it waste.

- Aluminium cans are not referred to as waste
- Steel for EAF’s is not referred to as waste
- Li batteries are generally referred to as Used, Spent or Scrap, rarely waste.

Perception is everything!

Lead-Acid Battery – An Urban Mineral Resource

A lot is written about the ULAB and recycling, but effectively it is a valuable “Urban Mineral” product, a key part of a “Circular Economy”. In mining/mineral terms, once the product has been dismantled it is;

- High lead metallic fraction > 95%
- A compound of lead sulphate/dioxide with Pb > 70%
- Very little payables (i.e. Silver)
- Minor organic contamination
- Recoverable plastic payable

The Nonsense Out in the Public Domain

"The lead containing parts of lead acid battery such as lead grids, lead oxide and other parts are washed and then melt down in furnace. The molten lead is then shed into ingot molds. The impurity generally known as trash rises on the top of stable-molten lead in the ingot moulds after few minutes. The impurities are removed and the moulds are left to cool. After cooling the lead recovered is then sold to battery manufacturers, where they are reused to produce lead grids and other lead containing parts of new battery."

Department of Chemistry, Faculty of Engineering & Technology, Manav Rachna International Institute of Research and Studies, Faridabad, Haryana, India

The Nonsense Out in the Public Domain

"The utilization of lead acid batteries is growing day by day in Greece due to the increase in number of vehicles but only 80–85% of used lead acid batteries are collected and recycled. Whereas in China only 25% of used lead acid batteries are being recycled [56]."

This work has been cited 26 times in papers and journals across the world so far.

Table 6

Economic balance sheet for treatment of 100 kg of lead cupel waste.

Consumed reagents	Amount	Price (US$/kg or l)	Total (US$)
Urea	400 kg	5.00	- 2000.00
Acetic acid	91.76 l	6.48	- 594.60
Sodium sulfate	106.2 kg	16.30	- 1731.06
Product			
Lead sulfate	44.4 kg	1142.00	+50,704.80
Balance (US$)			**+46,379.14**

The value used for Lead Sulphate is US$1,142,000 per tonne!!!!!

Table 6 - Revised

Economic balance sheet for treatment of 100 kg of lead cupel waste.

Consumed reagents	Amount	Price (US$/kg or l)	Total (US$)
Urea	400 kg	0.90	- 360.00
Acetic acid	91.76 l	0.90	- 82.58
Sodium sulfate	106.2 kg	0.20	- 21.24
Product			
Lead sulfate	44.4 kg	2.20	+97.68
Balance (US$)			**-366.14**

Working Together – Tapping the Knowledge

"Illegal operators make less pollution, because they smelt at a lower temperature than a legal smelter, so less fume comes out…."

"Illegal operators only recover 50% of the lead"

"Furnace dust is a waste and dumped"

Stevenson Theorem

Assumption x Assumption = Fact

Above C

Gold
Silver
Copper
Nickel
Lead
Zinc
Bismuth
Tin

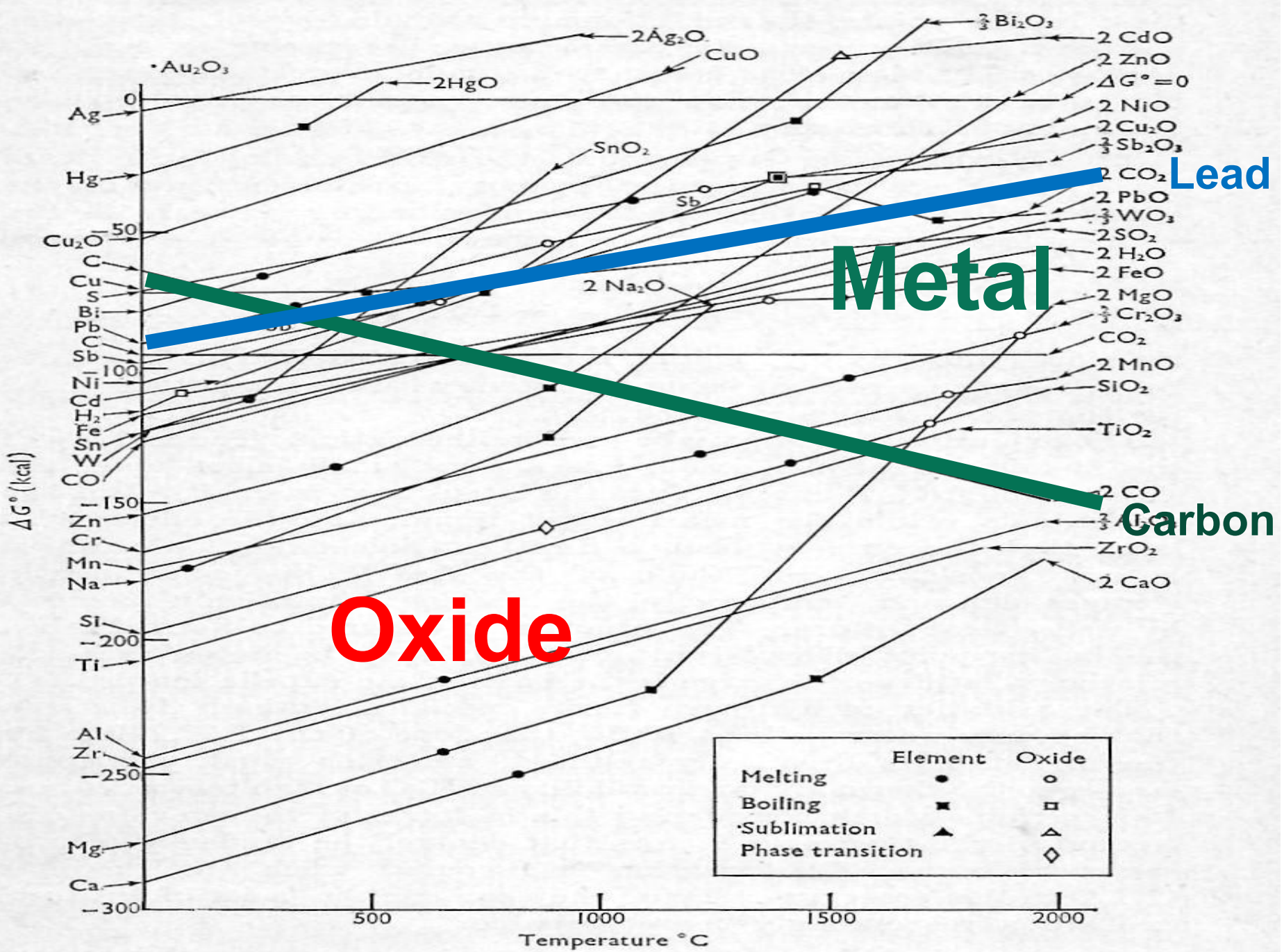

FIG. 2. $\Delta G^\circ, T$ diagram for oxide formation

Below C

Calcium
Aluminium
Magnesium
Titanium
Zirconium
Silicon
Sodium
Chromium


TOYOTA
INCOE
INCOE
CHALLENGER
INCOE
INCOE

Summary

We all share a responsibility in the safe handling and treatment of used lead products.

The industry has faced challenges before and will again, but it may be the point at which we create a new benchmark for operations, exploring new ways of operating. Looking at how we can improve our plants and their performance in all aspects, from OH&S right through to product quality.

But it should be the responsibility of all to convey the correct message.