The *global trend* of *metal recycling* from *used products*

Keynote lecture presented at the Symposium
“*Current Situation of the Metal Recycling in the World*”
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Outline

1. Primary production vs. metal recycling.
2. Used products from consumers & industry.
3. From *used products* to metal.
5. Limits to Recycling.
7. Conclusions and Outlook.
I. Primary products vs. recycling

Ore reserves:
• Are limited and *depleted* by mining.
• Increase rapidly in case *metal prices* rise.
• *Primary production* shifts from developed to mining areas.

Metal inventories still rise rapidly.
Recycling grows close to the ‘urban mines’, yet only rests *competitive* with difficulty.

2. Metals in consumer waste

Mainly from:
• *Packaging (cans mainly).*
• *White goods.*
• *Brown goods (WEEE).*
• *Cars.*
• *Demolition.*

Collection, sorting, grouping... are well organised.
Sources are complex and evolve with time in amount and composition!
3. From scrap to metal

The metal trade collects, sorts and groups *scrap*, according to the *supply* and the potential *outlets*. These vary both with time & location.

Secondary metals may be grouped according to their *compatibility*.

*Impurities* may be undesirable and decrease the value of scrap, e.g. Cu or Sn in steel.
Ladder of Lansink

Lansink prioritised WASTE MANAGEMENT options:

- Prevention, reduction.
- Reuse.
- Materials recycling.
- Energetic recycling.
- Safe landfill.

This hierarchy fails taking economic factors into account!

Ladder of Lansink

- Lansink failed to tell who would pay for respecting this hierarchy, which is often in conflict with economic factors!
- Responsible Waste Management is a necessity.
- Mandatory recycling is not so easy to implement and often leads to huge economic losses!
4. Reasons for Recycling

Metals are scarce and hence valuable.
Recycling supplements primary production.
Scarcity has been counteracted by substitution - strategic reserves (USA) – export embargo’s.
Offer vs. demand command price evolution.
High prices increase both recycling and ore reserves.
Dispersion of toxic elements must be avoided.
Legislative constraints, concept of Lansink’s ladder.

5. Limits to recycling

Dissipation, wear, erosion, corrosion... all reduce the amount of inventories available for eventual recycling.
Ores are concentrated in deposits. Metal usage is spread all over. Decreasing the Entropy requires work.
Economic & Technical limits: the cost and technical difficulties of gathering and separating scrap.
Environmental aspects. Recycling generates pollution!
6. Worldwide differences

- **Competition for raw materials** is worldwide.
- Recycling is **highly diversified** and spread irregularly over various countries.
- Manual labour is no longer available and competitive in advanced countries.
- Recycling has significant environmental and safety aspects.
- Sometimes it resort under the disposal of hazardous waste, in other cases it refers to **high-value materials**.

7. Conclusions

After the colonial era metallurgical industry in the E.U. has shifted from **ores** towards **secondary materials** as a feed.

This is supported by still **rising inventories of metals**.

The conversion of ores to metals, followed by a wide range of metal uses is potentially a source of **dissipation, pollution** and hence **hazards**.

There is a case to be made for **less dissipation** and for more collection and recycling.