A decorative pattern of overlapping triangles in various colors (blue, brown, grey, gold) on the left side of the slide.

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**INNOVATIONS FOR COMPETITIVENESS**  
**THE BASIC INDUSTRIES – A DRIVE FOR GROWTH**  
**Sofia, 31 January 2018**

# Circular Economy

**Tim Kurth**

Executive Director, Aurubis Bulgaria

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Corporate Environmental Manager, Aurubis AG

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### Aurubis Group

A leading worldwide provider of non-ferrous metals, Aurubis processes complex metal concentrates and diverse recycling materials.

Established in 1866 as a stock company, now the Group operates production facilities and sales network in 24 countries on three continents with over 6 400 employees.

Aurubis Group produces more than one million t of marketable copper cathodes annually, precious metals and a range of other products including sulfuric acid and iron silicate.



### Aurubis Bulgaria

Aurubis Bulgaria operates the copper production plant of the Group in Pirdop, Srednogorie region. The company is the **second biggest entity in Bulgaria** in annual turnover with **key contribution to overall export and country's GDP growth**.

Established in 1958, Pirdop copper plant consists of four main production units: Smelter, Refinery, Flotation, Acid plant. More than EUR 600 M has been invested since company's privatization.

With 850 direct employees and **record FY 2016/2017 figures**, Aurubis Bulgaria is the biggest copper producer in South-Eastern Europe.

## Production sites



- » Avellino IT
- » Buffalo US
- » Dolný Kubín SK
- » Emmerich DE
- » Fehrbellin DE
- » Hamburg DE
- » Lünen DE
- » Mortara IT
- » Olen BE
- » Pirdop BG
- » Pori FI
- » Röthenbach DE
- » Smethwick GB
- » Stolberg DE
- » Zutphen NL

» Aurubis has a service and sales network in more than 20 countries (Europe, Asia and North America)



Aurubis has a service and sales network in more than 20 countries (Europe, Asia and North America)

## Hamburg

- » Copper scrap
- » Intermediates
- » E-scrap
- » Others

## Olen

- » Copper scrap

## Fehrbellin

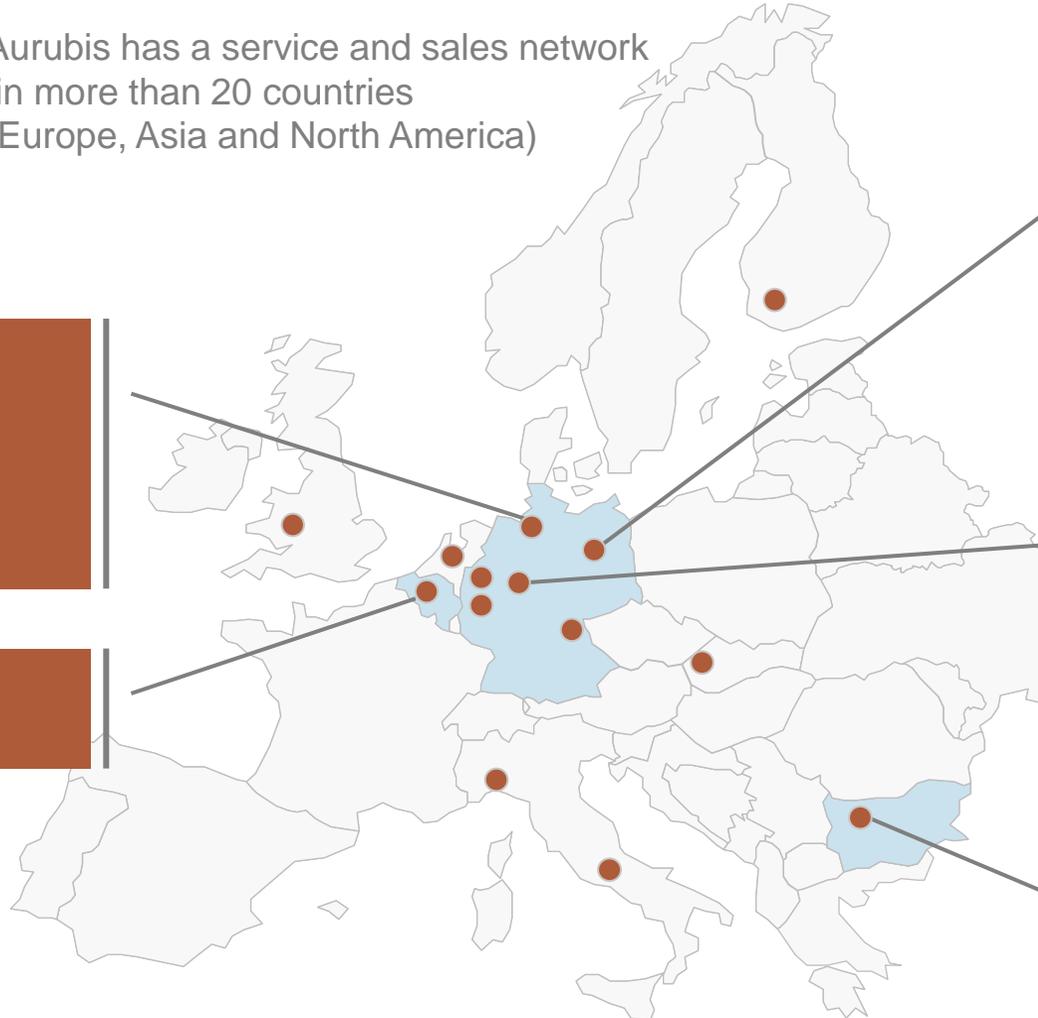
- » Cable scrap

## Lünen

- » Copper scrap
- » Alloy scrap
- » Shredder materials
- » Industrial residues
- » E-scrap
- » Copper-iron material
- » Others

## Pirdop

- » Copper scrap



- » Biggest SEE copper operation and second biggest company in Bulgaria in turnover
- » Leading producer of copper cathodes: 99.9 percent purity
- » London Metal Exchange certified cathodes: class A, brand Pirdop
- » Leading producer of copper anodes and sulfuric acid
- » Over EUR 600 M of direct investment in Bulgaria
- » ISO 9001 Quality management system and ISO14001 Environmental management system
- » Largest user of Bulgarian rails and ports
- » Storage facilities at Burgas ports
- » Four main production units at Pirdop plant

**Smelter**



**Refinery**



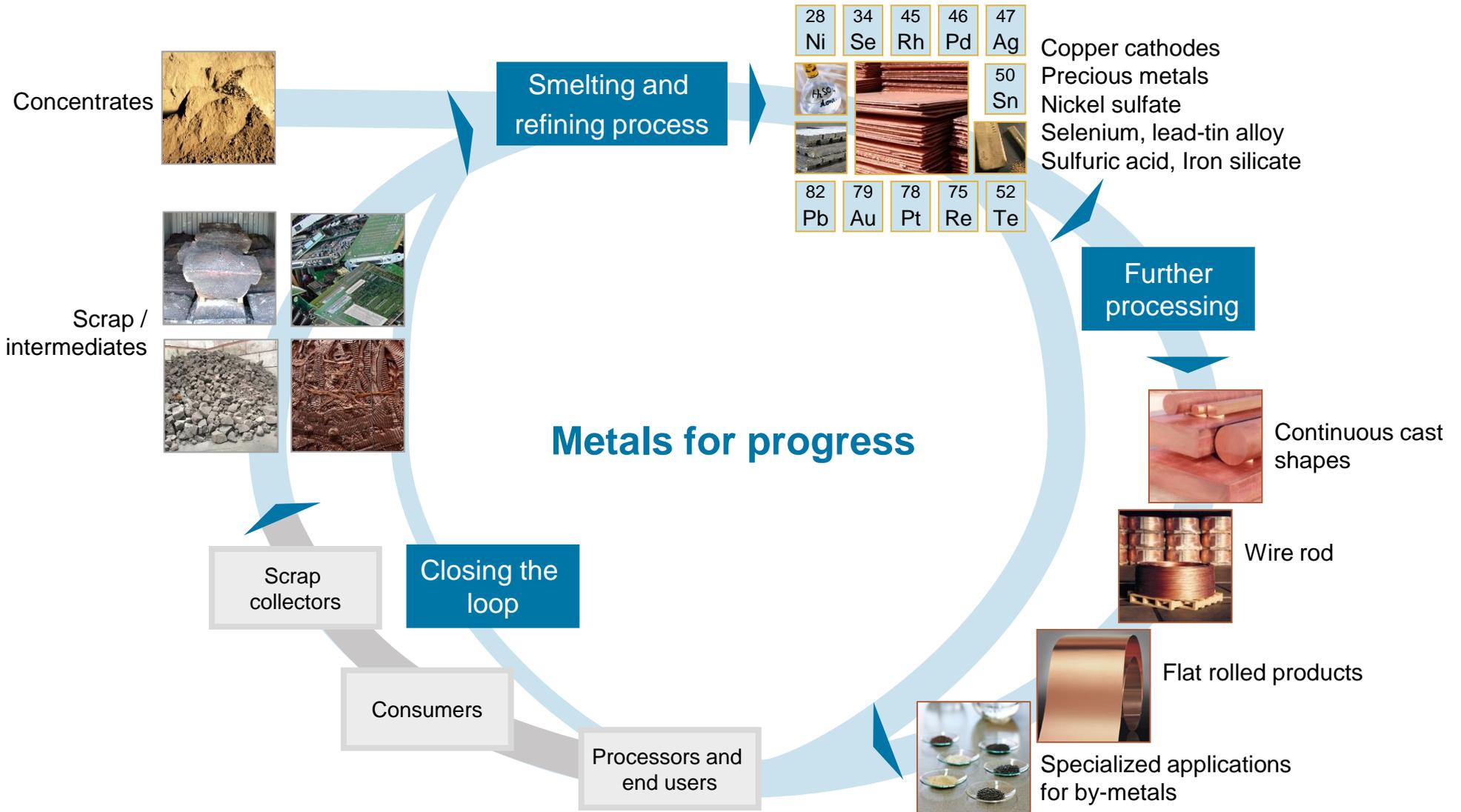
**Acid plant**



**Flotation plant**

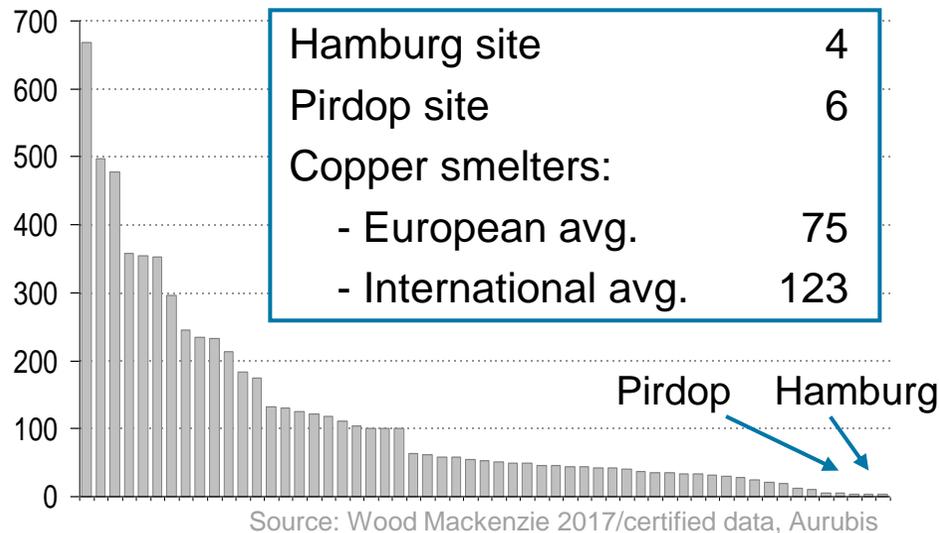


# Aurubis' strengths include productivity, efficiency, environmental protection and processing expertise



## Primary copper

SO<sub>2</sub> emissions of copper smelters  
(in kg SO<sub>2</sub> per t of copper)



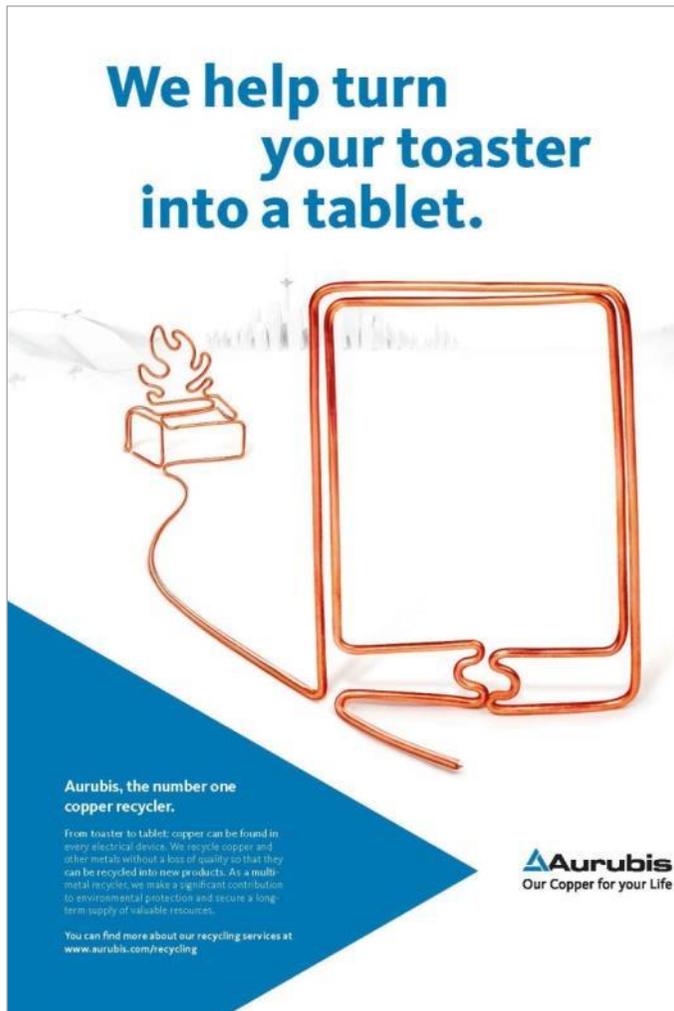
- » Outstanding success in environmental and climate protection
- » One of the most environmentally friendly copper producers in the world today

## Recycling



Kayser Recycling System (KRS)

- » Innovative recycling solutions with state-of-the-art recycling technologies
- » High metal recovery rates while observing stringent environmental standards with its multi-metal recycling process



**We help turn  
your toaster  
into a tablet.**

Aurubis, the number one copper recycler.

From toaster to tablet: copper can be found in every electrical device. We recycle copper and other metals without a loss of quality so that they can be recycled into new products. As a multi-metal recycler, we make a significant contribution to environmental protection and secure a long-term supply of valuable resources.

You can find more about our recycling services at [www.aurubis.com/recycling](http://www.aurubis.com/recycling)



**Aurubis**  
Our Copper for your Life

- » It returns copper, precious metals and other elements back to the economic cycle
- » Copper and most other metals can be recycled an unlimited number of times without losses
- » Copper and other metals produced from secondary sources have exactly the same quality as primary material
- » Preserves natural resources
- » Saves energy
- » Continuous investments and adaptations to changing recycling materials are required
- » High EHS requirements must be implemented on a continuously ambitious level
- » International competitiveness

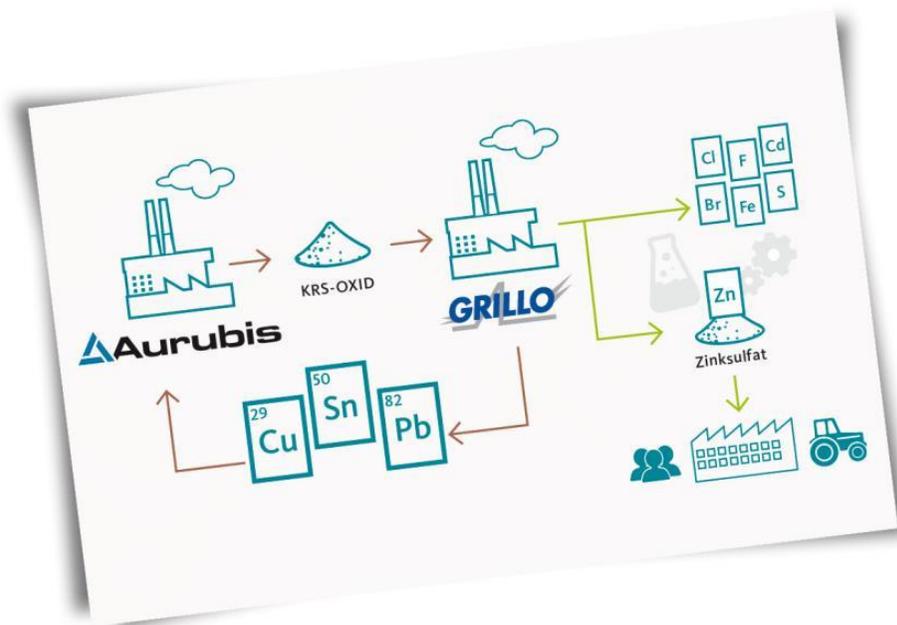
The Aurubis solution: primary and secondary copper production complement one another and ensure the highest flexibility



**Aurubis and Telekom:**  
**Aurubis subsidiary CABLO extracts high-purity copper granules from cable scrap**

- » Aurubis receives cable scrap with a copper content of about 50 % and processes it in a professional and environmentally sound manner
- » After separating the copper core from the plastic fraction, the material is processed into high-purity copper granules
- » The copper granules are re-processed at Aurubis into copper products such as continuous cast rod, which is necessary for electric lines, among other things – the copper cycle comes full circle
- » Using injection molding technology, the plastics are used to produce products with a high surface quality that hold their shape well, e.g. bases for traffic signs

## Closing the loop beyond – an example of a mutual relationship between Aurubis AG and Grillo Werke AG



- » Aurubis Lünen's Kayser Recycling System (KRS) produces KRS oxide, a complex, zinc-bearing (approx. 50 % Zn) residue
- » Grillo Werke AG takes KRS oxide as a raw material to process environmentally friendly zinc sulfate (fiber, feed and fertilizer industries)
- » Additional elements are chemically separated. Considered from e-scrap recycling – **bromine from flame retardants returns to the economic cycle**
- » A resulting residue with copper, tin and lead is again taken back into Aurubis facilities

Aurubis and Grillo: Cooperation on the highest standard for implementation of a transparent, consistent value chain cycle



- » Application of secondary aggregates ( final iron silicate slags) as construction materials contribute to conservation of natural mineral resources (natural aggregates), saving of energy and CO<sub>2</sub> emissions, and reduction of environmental burdens of landfilling.



- » Safe use of final slags during whole life cycle is demonstrated through REACH



- In order to ensure material efficiency and reduction of environmental burden, Aurubis looks and evaluates the impact of copper products on environment throughout their whole life cycle in an integrated way:
  - fact based decision making and basis to identify improvement potentials
  - assess the entire supply chain for environmental hotspots
  - benefits of using recycled materials as input to copper products, and the recyclability of copper at their end-of-life stage
  - product design for easier recycling , improved material efficiency, reduction residual waste and overall lifecycle impact

# Benefits of the development of Copper Organizational Environmental Footprint



- » Information on performance through the life cycle is an important aspect to be taken into account in the environmental management system and indicators
- » The Environmental Footprint develops a binding method to measure and communicate the life cycle environmental performance of organizations on a harmonized basis
- » OEF is focused on identification of opportunities for improvement
- » Demonstrate the positive aspects of copper metallurgy and multi-metal recycling
- » Communication of EF results can strengthen existing reporting



# Hazard driven framework for chemicals management creates burden to metals recycling

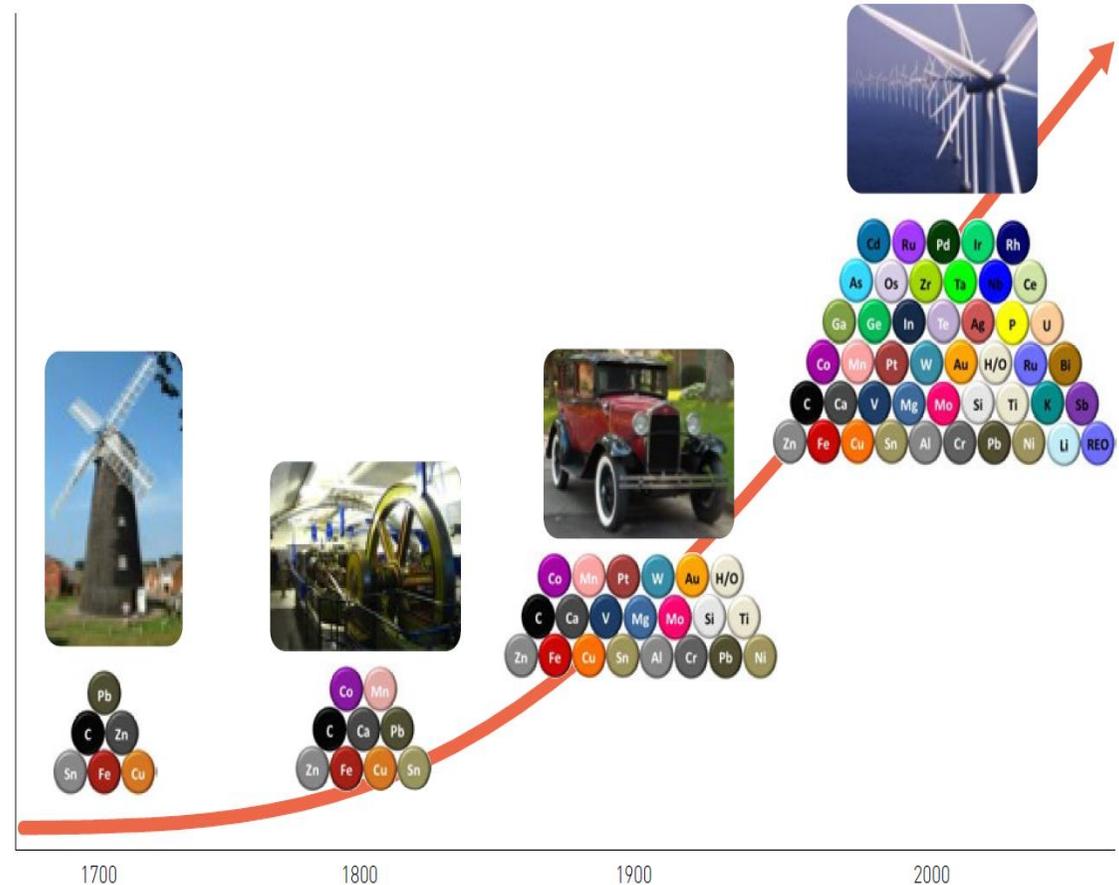
## Facts

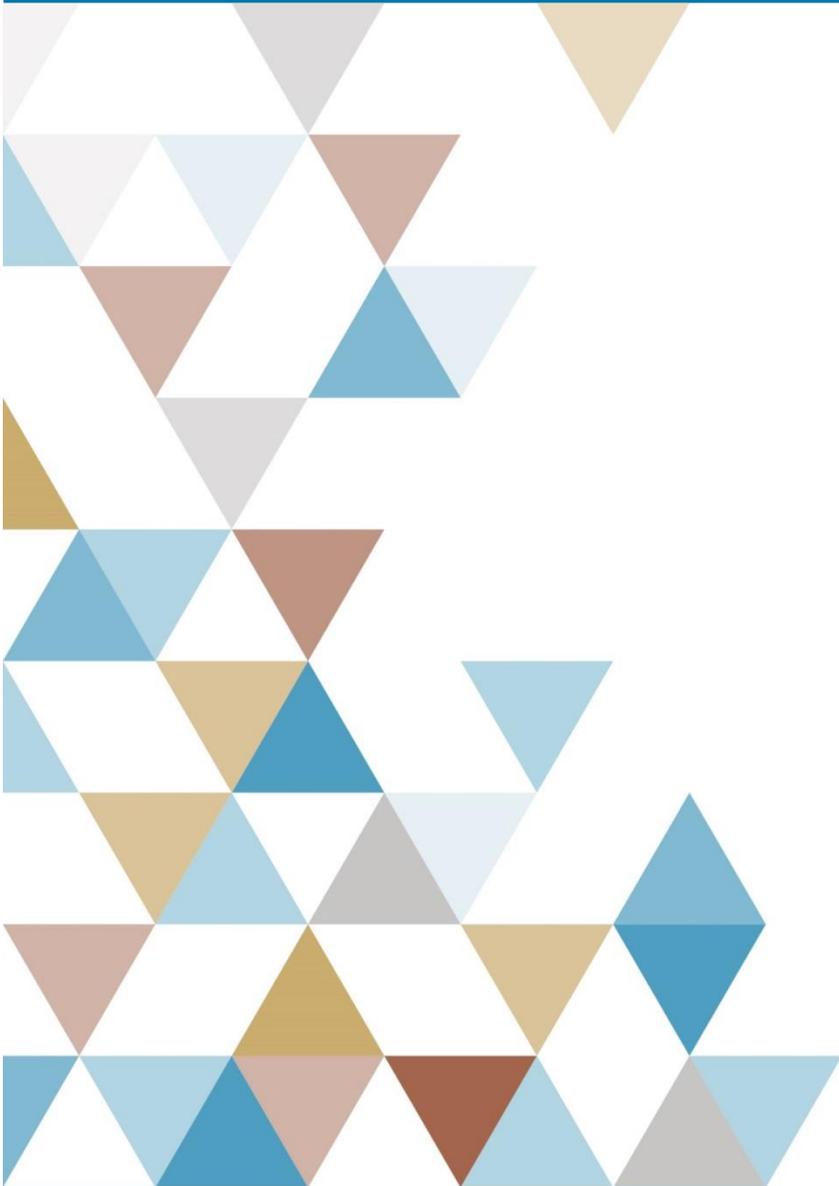
- » Complexity of modern recycling materials is increasing. Miniaturisation results in less metal weight
- » Recycling of complex materials is a challenge

## Objectives

- » **Risk control** .Develop and implement a **value-based industrial network**.
- » **Multi-metal recycling has a key role**

Metal/Element Use Intensity in Products



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