REACH Copper Consortium

Eurometaux Exposure Scenario Workshop
March 26th 2009

Copper experience with process driven scenarios

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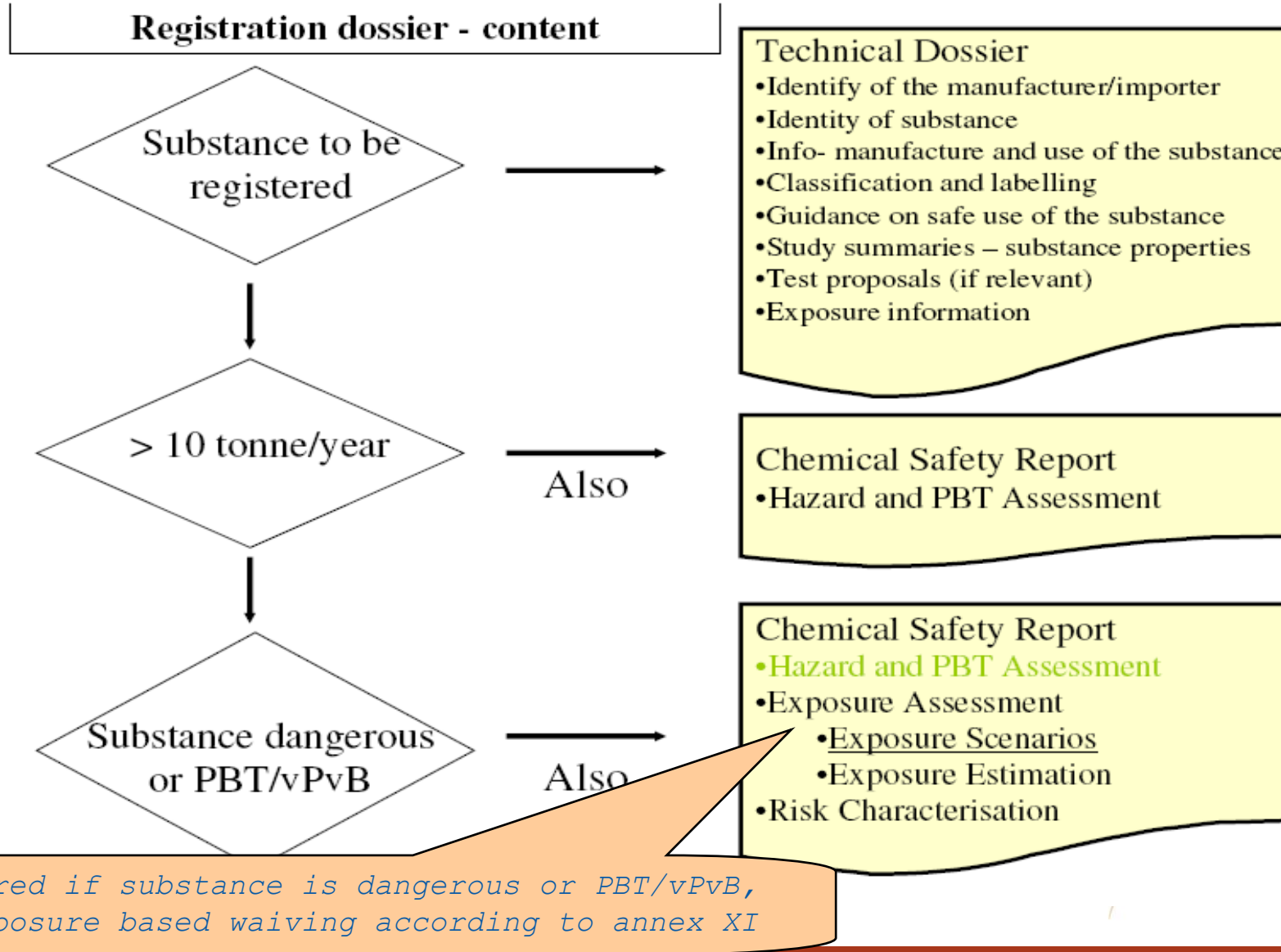
Why Exposure Scenarios for Copper?



Downstream Uses of Copper

Stage	Comments
Extraction stage - mining activities	Not to be taken into account
Manufacturing stage –industrial ➢Production of Cu cathode	See exposure in VRA Gaps to Extend from EU15 to EU27
Manufacturing & "formulating" stage - industrial: ➢Production of Cu massive forms ➢Production of Cu powder ➢Production of Cu containing material –preparations ➢Production of Cu containing alloys –special preparations ➢Production of Cu containing material –articles	See exposure evaluation in VRA (cf codes on Table 2.5 of it) Potential gaps are identified
Consuming stage –utilization of Cu made articles, etc ➢Application using materials in massive form ➢Application using materials in powder form ➢Applications using "matrix-bended"/ alloyed materials	For each application, maybe sub-divided into •With potential for inhalation •With release to water body This is linked to HH & Env profile of Cu, assuming no (non-professional) use of liquid materials See exposure evaluation in VRA Potential gaps to be identified
End-of-life stage (e.g. product disposal or recycling) ➢End-of-life of products from M&F processes ➢End-of-life of consumer products made from massive Cu material ➢End-of-life of consumer products made from powdered material ➢End-of-life of consumer products made from Cu alloys	Each EoL type to be linked to scenario of recycling, re-use, or disposal VRA includes a disposal scenario (generic scenario across uses) % recycled material may need update

Translation from VRA to REACH – Step 1

Step 1. Use VRA data for REACH ES

Industry sectors covered under the VRA report

- ✓ Smelting and refining
- ✓ Casting billets & plates,
- ✓ Casting wire-rods,
- ✓ Production of semis,
- ✓ Extrusion, rolling and drawing of semis,
- ✓ Casting ingots
- ✓ Sand die-casting and wire drawing and cabling (limited information)

→ Data available - VRA companies = 114 cies (Copper smelters & refiners + some DU)

→ used to develop the first exposure scenario's: by sectors AND by processes approaches

* VRA = Voluntary Risk Assessment
DU = downstream uses

Translation from VRA to REACH: Step 2

2. Data-gaps

2.1 Extension EU-15 to EU 25 (for smelters/refiners and D-U)

→ use same approach/questionnaire as VRA

2.2. Refinement of information from sectors with environmental risks → use same approach/questionnaire as VRA

2.3 Refinement of information from DU sectors not well covered under the RA (eg drawing of cable)

→ use as far as possible process approaches

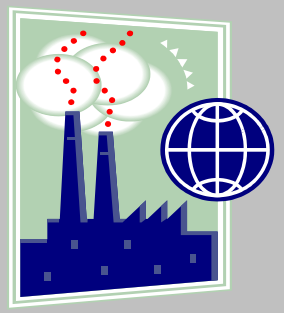
2.4 Analyze additional DU sectors (eg DU of copper powder productions)

Others? → as far as feasible, use approach as above + include knowledge from properties of the metal/ion

european COPPE

Sector-driven Exposure Scenarios

Cu PRODUCTION



1) Raw material handling: Cu concentrate delivery, blending and drying

2) Thermal processes: Smelting, converting, casting

3) Electrolysis

Cu-cathode

4) Cleaning & maintenance

Sector-approach

Process-approac

Process-approac

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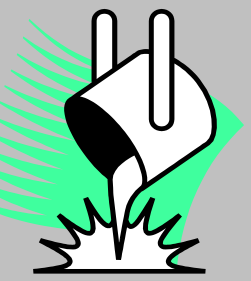
DU - PRODUCTION OF Cu ARTICLES and Cu-ALLOY ARTICLES



1) Raw material handling

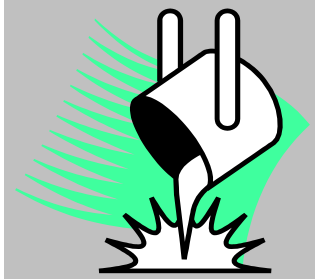
2) Thermal processes: melting and sand casting or die casting

3) Mechanical processes: drawing, rolling, grinding

Cu articles

4) Cleaning & maintenance

DU - PRODUCTION OF Cu POWDERS



Raw material handling: Cu, Zn, Pb

Thermal processes: melting and atomisation

Bagging

Cu-powder

4) Cleaning & maintenance

Sector-approach

Process-approac

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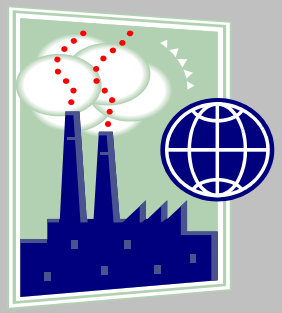

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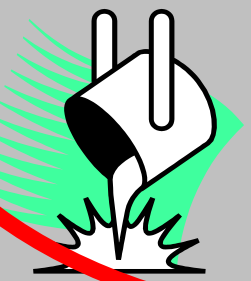

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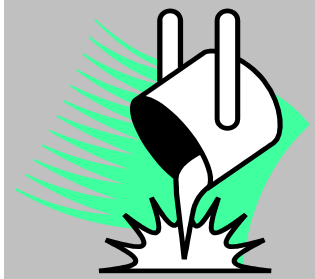


Raw material handling: Cu, Zn, Pb

Thermal processes: melting and atomisation

Bagging

Cu-powder

4) Cleaning & maintenance

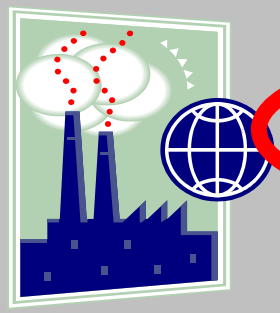
E.g.- Production of semis/melting & casting

1.	Title • Production and further processing of semi-finished copper products (e.g. wire, tube sheet): melting and casting • SU 15: manufacture of fabricated metal products, except machinery and equipment • PC 7: base metals and alloys • PROC 22: potentially closed processing operations at elevated temperature AND/O • PROC 23: open processing and transfer operations at elevated temperature
2.	Processes and activities covered by the exposure scenario Following processes and activities are involved in the production and further processir of semis: • raw material handling: performed with a conveyer belt and a crane, involves manua sorting and handling of scrap. • melting and casting of shapes: melting of refined copper cathodes or high purity scr in a melting furnace; molten metal is transferred to casts; operation is supervised ar operated highly automatically. Routine operation for workers: furnace loading, furna operation and supervision, process control, inspection. • mechanical finishing of cast parts: e.g. extrusion, drawing, rolling, cutting • maintenance: furnace cleaning and maintenance of dust extraction systems.

Process-driven Exposure Scenarios (Generic ES)

Cu PRODUCTION

1) Raw material handling: Cu concentrate delivery, blending and drying



2) Thermal processes: Smelting, converting, casting

3) Electrolysis

Cu-cathode

4) Cleaning & maintenance

Sector-approach

Process-approac

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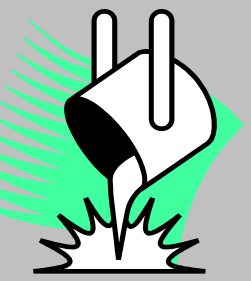
DU - PRODUCTION OF Cu ARTICLES and Cu-ALLOY ARTICLES

1) Raw material handling

2) Thermal processes: melting and sand casting or die casting



3) Mechanical processes: drawing, rolling, grinding

Cu articles

4) Cleaning & maintenance

DU - PRODUCTION OF Cu POWDERS

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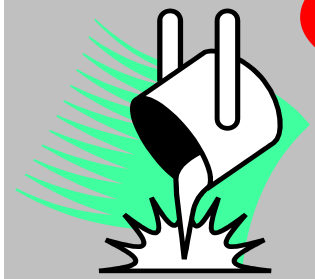

Thermal processes: melting and atomisation

Bagging

Cu-powder

4) Cleaning & maintenance

Copper Generic ES development

GES	Cu Phys-chem form Ind Process	Mineral	Liquid hot	Liquid cold	Vapour	Massive	Powder
1	Raw Material handling	x	x	x	x	x	x
2	Smelting	x	x	x	x	x	x
3	Electrolysis			x		x	
4	Melting		x		x	x	x
5	Mechanical processing			x		x	
6	Maintenance/cleaning	x	x	x	x	x	x
7	Bagging/storing	x	x	x	x	x	x
	Use						
	Industrial DU fabrication		x		x	x	x
	Professional uses					x	x
	General public					x	
	Recycling						

Flexible system: in the preparation of eSDS, one can “shop” in the relevant Generic exposure scenarios

E.g. – Melting & Casting of Copper in the supply chain

1.	Title • Melting and casting of copper in the supply ch • - for the production of copper powders • - for the production of copper and copper al • - for the production of sand and die castings • - for the production of copper wire rod • - further processing of copper • SU 15: manufacture of fabricated metal products, except machinery and equipment • PC 7: base metals and alloys • PROC 22: potentially closed processing operations at elevated temperature AND/OR • PROC 23: open processing and transfer operations at elevated temperature
2.	Processes and activities covered by the exposure scenario Following processes are involved: Melting and casting of shapes: melting of refined copper cathodes or high purity scrap in a melting furnace; molten metal is transferred to casts; operation is supervised and operated highly automatically. Routine operation for workers: furnace loading, furnace operation and supervision, process control, inspection. • Further processing of copper: melting followed by mechanical processing (e.g. extrusion, drawing, rolling) to form semis and/or items destined for a specific application (e.g. tubes, sheets) • Production of copper powders: produced mainly by water or air atomisation and by oxide reduction of molten metal; copper, usually high purity scrap, is melted in a melting furnace; the molten metal is poured in a thin stream and atomized by a jet of water.

→ identification of uses via REACH codes does not work Text description decisive for compliance/recognizion? → NO, **Operational Conditions** & **Risk Management measures** are driving for compliance check!

od description
he process is
cial

E.g. – Melting & Casting of Copper in the supply chain (2)

5.

Other relevant operational conditions

- Mechanical finishing of cast parts: usually continuous or semi-continuous process (depends on the plant and the application): billets and wire rod - continuous casting by cutting the cooled copper wit saw; ingots - cast discretely in moulds; finishing by sawing, blasting or manually with power tools ca be carried out, either automated or manually.
- Molten metal is transferred to casts. This can be automated or performed manually (tapping); i.e. breaching the sand or ceramic material holding the molten metal, this flows out through a permanen channel by a worker using a long pole.
- Production of copper powder: exposure from furnace operations during the production of copper powder are clearly higher than furnace operation in melting and casting and further processing: mu closer operator contact is required for small scale melting for atomization (increasing exposure leve during channel heating and pouring).

to get from all

6.1

Risk management measures related to human health (workers or consumers)

Risk management measures related to human health (workers or consumers)

- melting and casting, automated: LEV (80% efficiency) required
- melting and casting, manual: LEV (?? % efficiency), gloves, protective clothing and RPE (full face mask type P1) required
- mechanical finishing of cast parts, automated: LEV (70% e iency) required
- mechanical finishing of cast parts, manual: LEV (90% efficien loves, protective clothing and RI (full face mask type P1) required
- production of copper powder: RPE (full face mask type P32)

How to set the boundaries? What is compulsory, what not? → two scenarii: fully automated, semi or full manual handling of material?

E.g. – Melting & Casting of Copper in the supply chain (3)

8. Exposure estimation and reference to its source

- ….

WORKER – inhalation – long term

- Measured occupational inhalation exposure

- production of billets, sand and die casting, wirerod:

external dose, typical exposure: 0.12 (0.03-0.24) mg/m³ (internal dose: 0.007 (0.002-0.012) mg/kg bw/

external dose, RWC: 0.6 (range 0.23-1.24) mg/m³ (internal dose: 0.021 (0.012-0.027) mg/kg bw/d).

considerable variability due to the range of operating practices!

- further processing of semis, routine operations:

external dose, typical exposure 0.03 mg/m³;

external dose, RWC 0.2 mg/m³ (range: 0.001-0.78)

Which are the values to be selected? Worst case, Typical?
→ various scenarii (see next slide)

- further processing of semis, all operations

external dose, typical exposure: 0.04 (0.03-0.1) mg/m³ (internal dose: 0.003 (0.002-0.006) mg/kg bw/d

external dose, RWC: 0.3 (0.2 – 2.45) mg/m³ (internal dose: 0.014 (0.011-0.049) mg/kg bw/d).

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9. Guidance to DU to evaluate whether he works inside the boundaries set by ES

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Environmental exposure:

- If DU's OCs/RMMs are within the boundaries set above (Amoun… <100000 tonnes/y, release factor to air: <16.5 g/ton, release factor to water: <0.1 g/ton, …on factor: >10, number of emissio… days: >150 d/y, presence of STP with removal efficiency … >80%), the DU complies with the ES.
- If not, following tiered approach should be followed:……..

How to refer to calculation tools such as BLM, etc?

Proposed solution to set boundaries

- Consider Worst Case (WC) scenario:
  - Sections 3-7: Combination of all/most worst-case OCs & RMMs
  - Section 9 covers DU guidance for any (less stringent) deviation for one or more OC or RMM
  - →WC exposure demonstrating “safe use”
- Consider WC/Typical scenario:
  - If WC do not demonstrate “safe use”
  - Sections 3-7 : combination of OCs & RMMs (one or more less stringent than above)
  - → Typical exposure demonstrating “safe use”
- Consider Typical scenario (with BAT)?:
  - RMM has set in BAT (Best Available Techniques, from Upstream)
  - → Typical BAT exposure?