Eurometaux

Antwerp 7 November 2018, Eurometaux Workshop on:

***Stimulating Substitution within a Circular Economy Perspective in the metals sector, a conceptual frame*.**

In line with one of the recommendations of ECHA's Substitution Strategy [1], Eurometaux organised a session on *stimulating/encouraging a reflexion on the substitution concept within the metals sector*.

To consider the specific properties of the metals, in particular:

- their natural co-occurrence (meaning that some SVHC metals appear with the production of base metal needed for society)
- their recyclability (i.e. allowing to close the materials loop)
- the fact that recycled materials and those produced from virgin material have the same high-quality properties allowing equal safe use as demonstrated in the ES for the material manufactured from virgin material
- the high potential for exposure control (e.g. alloying often reduces releases)

Eurometaux proposed to frame the workshop within the context of the Circular Economy and closing the loop, hence naming it "Stimulation of Substitution within a Circular Economy perspective in the metals sector: concepts and examples".

In case substitution is selected as (a/the) preferred option, the following framework for the metal and inorganic sectors was proposed to the workshop participants:

Promote Sustainable substitution by assessing in a **stepwise approach** if the replacement of a **Substance of Very High Concern** is **technically and economically feasible** from a **combined perspective** of Chemicals Management, Circular Economy, and other EU-Environmental and Health policy objectives; recognising **Societal Value and Impact.**

Several speakers presented case studies and considerations on how substitution could be thought through, the boundaries of the substitution concept and how to anticipate the risk-controlled management of SVHC metals required for safe economic growth in Europe. A panel composed of representatives from ECHA, Commission, Member States and Civil Society, then reflected on these various cases and approaches and

[1] https://echa.europa.eu/documents/10162/13630/250118_substitution_strategy_en.pdf/bce91d57-9dfc-2a46-4afd-5998dbb88500

provided comments, critiques and/or suggestions building on the ideas that emanated from these presentations and the participants' questions and reactions.

Overall outcome and conclusions:

An RMOa assessment may in given cases indicate Substitution of SVHC metals or metal compounds as a valid Risk Management measure. The workshop aimed at *stimulating/encouraging a reflexion on the substitution concept within the metals sector for such cases.*

By bringing real cases to the table and allowing a discussion on the concepts, the workshop encouraged a ***broader and critical thinking on when substitution could be effective and sustainable***, or when it couldn't and what the boundaries between desirable and regrettable substitution would be.

It is suggested to work along a ***sustainable substitution concept/frame*** that balances hazard, risk control when substitution wouldn't be sustainable, and that would put substitution in balance with Circular Economy (resource economy) and other environmental policy aims.

The debate showed a clear support for such a ***concept for materials that can be recycled safely*** like metals, but further raised the need for: *thinking and considering as early as possible* (during the design phase of products and anticipating the EOL phase), *thinking more widely* (during the RMOa phase) and *considering a broad(er) audience,* when defining best options to progress towards sustainable substitution or alternatively if not feasible or desired, a fully risk-controlled use. Reducing the amount of waste by maximising recycling and reuse is part of this concept if they can be guaranteed.

One main hurdle is that all parties (regulators, industry and society) are too attached to a linear instead of a circular way of thinking, or only consider their own and not the collective benefits. Breaking these barriers by promoting an open and frank debate on the value of sustainable substitution within a broader societal and economic context will be difficult but is clearly a necessity and the way to move forward.

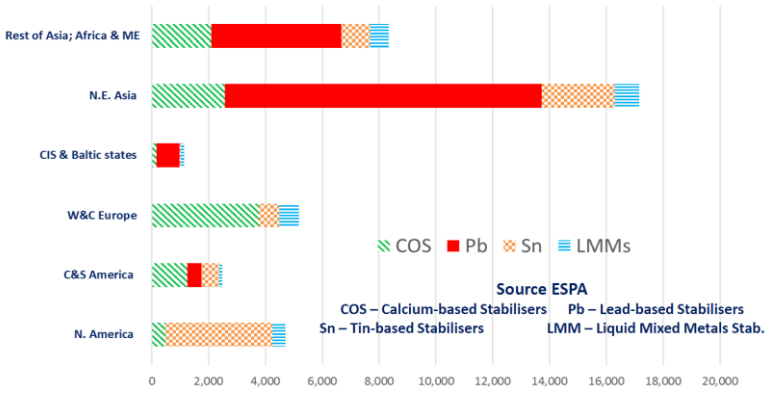
The debate should, in this context, not only focus on or provide choices for risk management options, but also consider the ***relevance and efficiency of alternative tools*** taking into consideration what really matters for RMM, economic instruments and behavioural changes.

Workshop presentations

"Drop-in" alternatives, often hard to find

The use of "drop-in" substitutes is in theory the easiest way forward. However, even if it is technically and economically feasible, as shown in a case on lead stabilizers' in PVC plastics (presented by Geoffrey Tillieux from EUPC), substitution remains a cumbersome challenge, often due to "market and customer" habits driven by small differences in performance or appearance. In practice, it may take up to 5 years before the market has accepted and implemented valid alternatives. Moreover, while substitution may take place within the EU, other continents might (and do) not progress toward substitution, resulting both in the import of articles containing lead stabilizers and the loss of export markets for PVC plastics for EU companies to these other jurisdictions.

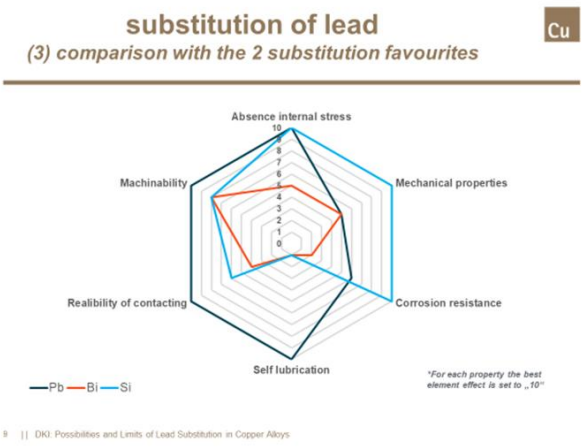
Figure II: how in the world PVC resin (expressed in K tonnes) is stabilised (2015)



Jens Torslov (DHI) presented a case on a cobalt-containing desiccant in paint, highlighting that a long search for a drop-in substitute was not effective despite the clear willingness to find an alternative. Indeed, metal compounds often present so complex interactions and functions -required by the use- that many promising substitutes fail to meet the minimal technical feasibility criteria. Another example referred to companies in search for an alternative catalyst composition for NiO to be used in the steam reforming, cracking and desulphurisation of petroleum streams. Alternatives mostly lacked good technical performance or when one was more effective (e.g. Ruthenium), its availability (volume of Ru produced) was far too limited without the prospect of any significant increase in the future. The sector further assessed if the expected decrease in automotive fuel as a result of the electrification of mobility would reduce the bottleneck on the available substitute; but even under these conditions, the shortage remains very large due to all other outstanding needs for the cracking and desulphurisation of petrochemicals in the future.

Anticipating the potential need for substitution provides time to search for alternatives

Several metal sectors have implemented **voluntary substitution research programmes** even before a metal (compound) was listed on the Candidate List as an SVHC. This attention at an early stage is mainly driven by the recognition of the hazard properties of the material, in combination with commercial reasons and concerns. The copper sector (Klaus Ockenfeld) presented the outcome of a long and intensive research to substitute lead in copper alloys, in which lead has a critical function for the machinability and gliding. The sector presented in a very visual way how they assessed their alternatives, looking at how some of the performances of lead in the alloys can be met by bismuth (Bi) or silicium (Si).



A REACH relevant substitute may be a regrettable substitute from a Circular Economy perspective.

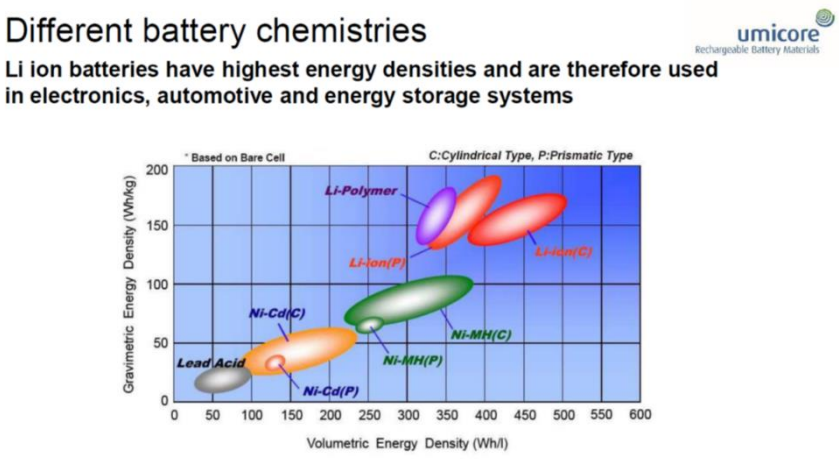
Whilst bismuth seems technically a good replacement for lead and is actively promoted for example in the US for specific uses (drinking water applications), a presentation from the recycling sector (Dirk Goris, Metallo Belgium) indicated that Bi would affect, or even block the potential to recycle the copper alloys thereby causing a regrettable substitution from a Circular Economy perspective. Moreover, a short-term view on the substitution of lead by Bi would overlook the fact that Bi is manufactured from primary lead mining ores in a ratio of 1/50 or even 1/100 and that Bi is a substance that is not recycled at this stage. Substituting lead by bismuth would consequently increase the lead volume present in society, contrary to what is believed or aimed for. This case therefore demonstrates the need for an integrated view, i.e. Chemicals Management and Circular economy to define the best risk management measure.

What can be learnt from the past for the future?

Markets and society are evolving continuously, which is clearly a challenge when there is the will to stay ahead of the needs for a proper management of chemicals and materials. Hugo Waeterschoot (Eurometaux) presented some real case learnings from the past to indicate what risk reduction or substitution measures or tools could be effective for future cases. Market-based environmental policy instruments (like differentiating the tax on lead and lead-free petrol) were probably the most effective risk reduction measures so far. Major changes seem also more effectively driven by technology improvements than by regulatory action as testified by the successive battery technologies. The experience and learnings may help us predict what could be the best risk management or risk control options for the new societal/economic trends such as the electrification of mobility.

Recognition for other EU Environmental policies may affect the use or need for substituting SVHCs

Finally, the case of cobalt compounds' use in the upcoming sustainability-enhancing technologies like in electric vehicle batteries was presented by Wouter Ghyoot, (Umicore). The switch to more environmentally-friendly transport modes will increase the use of cobalt compounds almost exponentially in 1 to 2 decades. The company showed how the sector is continuously searching for lower concentrations of cobalt compounds used in batteries, planning and designing for recycling and preparing for the next generation of mobility (fuel cell based). However, for a period of probably 20-40 years, high volumes of cobalt compounds will be required. The identification of those compounds as SVHC supports the continuous drive for risk-based control by minimising the exposure as much as possible. This case demonstrates how other EU environmental policy objectives may require the increased use of some SVHCs. A risk-control approach including attention for safe recycling and a mindset to remain vigilant for potential alternatives without such properties, is in such a case a "condition-sine-qua-non".



Main headlines from the panel discussion following these presentations

Panel member 1: indicated that other tools than authorisation or restriction can help promote more sustainable substitution within a Circular Economy perspective:

- The *Ecodesign* of new technologies and articles needs more attention: this is a new way of thinking, and should include attention for the recycling step
- *Economic instruments* may help prevent the use of hazardous chemicals and promote closed loops:
    - Taxation, for example, is considered in the proposed EU plastics strategy.
    - Extended Products Responsibility: the EU Commission is working on guidelines. This promising instrument has the potential to provide more power to the recycling industries as has already been demonstrated in sectorial strategies, like for paper whereby modulated fees were a good driver for recycling.
- *Waste perspective*:
    - Economic feasibility is looked at very differently if the material is a waste or a substance.
    - Setting End of Waste criteria may play a role to encourage recycling, thus closing the loop for a chemical. However, this requires action at the member state level with the risk of coordination issues
- *Regulatory instruments*:
    - Restrictions on hazardous substances in articles is an example of very linear thinking: risk reduction action under the form of a restriction is considered when a hazardous substance causes a risk, aiming for a phase-out from the EU market. However, from a Circular Economy perspective this way of thinking ignores the fact that the full loop should be considered. Indeed, the loop can be cut at different places (during manufacturing, at the article level as well as at the end of life level) increasing the efficiency, and not only where it causes a risk.

Panel member 2:

- There seems to be a trade-off between recycling and chemicals management/non-toxic environment thinking. ECHA is well aware of this and encourages its Committees to consider the recycling step when developing their opinion on the relevance and efficiency of restrictions. The lead stabilizers in PVC are a good example of this, where ECHA and SEAC tried to get the recycling part right by specific derogations.
- The interlink between REACH and Circular Economy requires further thinking on what to do instead of landfilling or disposal, i.e. can we allow a substituted chemical to dilute over time or can we recycle and reuse it effectively and safely?
- While taxes were used as an effective instrument to remove lead from petrol, it was clearly a policy choice to do so and the governments knew they would at least temporarily lose revenue by such measure.
- Price incentives, material leasing (like for automotive batteries), deposit schemes (like for cans) can be powerful instruments if they directly incentivise behavioural changes ('return the can'). We should indeed think through where we could apply economic incentives efficiently
- On the other hand, subsidies at the national level are often not as efficient, as has been demonstrated with the Swedish tax on flame retardants in products. But they may still have a complementary function.
- A crucial aspect in closing the loop is the price difference between secondary and virgin material. Influencing this can create a move towards recycling, thus favouring secondary materials. However,

such an approach needs to be complemented by careful attention for the flow of hazardous materials and their potential impact, which pleads for an integrated view of REACH and Circular Economy.

- If direct substitution is not possible or not desirable from a societal perspective, then how can the safe use of the chemical of high concern be guaranteed throughout the entire supply chain? This is a crucial question for chemicals with growing markets such as those used in automotive batteries. Safe use and minimisation of exposure should be considered and guaranteed over the complete supply chain, including collection and reuse (to consider it within a Circular Economy perspective). This should also include consumer use and a debate on what is a 'safe level' whereby the views of industry and consumers can diverge.

Panel member 3:

- From a Circular Economy perspective, metals are special materials which can be recovered and reused without quality loss. But this also has as consequence that one cannot destroy unwanted metal impurities as would be possible for organics.
- The search for technically and economically feasible "One by One" (drop-in) substitutes remains an objective even if, in reality, this is not so easy, often due to the complex materials/processes metals are involved in.
- However, when doing so, a wider focus than technical and economic feasibility should be considered, ensuring that the materials loop can be closed through recycling and that other, even wider and global aspects (climate contribution, availability, interlink with other metals) are taken into account, as highlighted by the Bi substitution case in copper-alloys
- An integrated view between Chemicals Management and Circular Economy requires to promote sustainable substitution. We need to be more inclusive by considering how to close the loop rather than breaking it, complemented with relevant and efficient risk management measures
- The main question is where such an integrated thinking on sustainable substitution should best take place and how? It is industry's view that this should be considered as early as possible in the process, i.e. for REACH during the RMO discussion in RIME.
- The Circular Economy but also REACH require attention for all types of products (main substances, by-products and impurities). While the market and the regulatory community may focus their attention on main products, this may be a very different story for the (safe) use of valuable by-products like "aggregates (slags)". Nevertheless, the economics of the main product stream is often highly influenced by the use of the by-products due to the high volume of the latter.
- The case of substituting lead by bismuth in copper alloys demonstrated how complex the assessment of a (non-regrettable) alternative could be. While bismuth seems in first instance to be a technically-feasible alternative, it would create a huge problem for the circularity performance of our recycling system and moreover bring more Pb into the market
- A further comment related to the perception of SVHC status. It seems that in the present thinking an SVHC cannot be valuable anymore for society or the economy. The automotive battery case showed that this is not the case, provided there is a risk controlled environment.
- Finally, a plea was made to think further about a better interlink between the Waste and Chemicals regulatory regimes.

Panel member 4:

- There are in general limited choices for the substitution of metals or even broadly for inorganics, when it comes to very specific applications that make use of specific chemical-physical processes like catalysts. An important issue we heard today is that many SVHC metals are used in such uses.

- Alternatively, recycling does not affect metals' quality as long as purity issues are respected, meaning that the safe use can be guaranteed as it is for primary based metal production and use.
- It is good to see that societal issues like the Circular Economy and Climate Change are now also discussed and considered by industry, in a constructive way. Let's ensure that chemicals management can also be integrated in that more holistic thinking on how we manufacture, use and recycle metals.
- There are business opportunities by interlinking these issues, which must incentivise industry.
- The safe use of SVHCs by encapsulation, closing the loop of SVHCs and minimising exposure remain points of attention, certainly for growing businesses. But there are good examples of this: lead-acid batteries.
- Economic incentives can indeed work and be efficient: small tax breaks may provide large behavioural changes, like the switch to low-sulphur fuels, or the banning of plastic bags. It is therefore surprising to not see more such economic incentives used by the regulators. This should definitively be explored more.
- It is also surprising to see how much certain chemicals continue to dominate the regulatory agenda, such as lead wondering if this is still in balance with its remaining effects nowadays. In the past, lead was used much more , but society lived with it. What is the difference now? This raises the question if we should not think more about prioritisation, what is already regulated and what isn't, …?
- Another consideration to be taken into account is the dimensions related to the economy's globalisation. Global trade may bring materials back to the EU that were substituted here or that cannot be recycled. It should be further investigated how to handle this?
- Recycling is fine but how resilient are these recycling systems we have developed, especially when the subsidies disappear (e.g. plastic recycling in the UK)? This may be less an issue for metals though given their high intrinsic economic value that is further stimulated by the Circular Economy concept.
- And finally, it is good to see that we are looking towards the future: we need to see priorities and global dimensions that are necessary and efficient ways of dealing with the issues of the interface between REACH and Circular Economy. We need to resolve them in a mutually beneficial way.

Discussion

The first reactions from the panel triggered a lively discussion with the workshop participants as well as between the panel members, on the following questions and issues:

- The transition from a linear to Circular Economy is a huge shift. This means that we need to stop using linear thinking as consumers, as regulators but also as industry. As a consequence, we need to know more about the needs and habits of producers/consumers to arrive at a more circular economy thinking, which is often not understood or studied.
- The EU has ordered a study on waste in the context of Circular Economy. The workshop of today certainly provided insights on how we can recycle certain substances to ensure the transition while considering safety in all its aspects. We clearly need to explore new ways. Differently from the chemicals legislation, the disparity in the handling of waste by national authorities does not help promote a more integrated and circular thinking although we absolutely need to move towards a circular economy.
- The Circular Economy principles are not new. In certain areas, we have already been applying them for a while, but we never called it that. However, up to now this path was only taken when it made

economic sense (like for metals), whilst now we consider its relevance for chemicals and materials management.

- Circular Economy helps consider how we handle materials and chemical substances at the end of their life. However, 80% of the impact of products is determined at the design phase. This should be part of the debate and also be included in education and training, including for companies.
- The lacking communication in the supply chain between suppliers and users is another reason why often substitution does not progress (e.g. the authorisation cases on chromates and CTP). Failing communication at that level also means that it will not improve at the level of recycling. There is therefore something inherent that should be tackled in a strategic and stepwise way: design for use while considering sustainable substitution and ensuring recovery at the end of life of the material. What can authorities and industry collectively do to promote such an even more integrated concept?
- There is a general consensus that regrettable substitution should be avoided. One way of doing so is to look at groups of substances and no more work on a substance by substance basis.
- Despite all critiques, authorisation as promoted by REACH has its value especially given that it can consider trade-offs (continued use vs. risks) which the applicant may raise in his application.
- The interface between chemicals management and waste remains a concern with lots of grey zones. There is a clear need to investigate and understand how chemicals of concern should be looked at in this interface.
- Materials flow analysis can play an important role to promote a better interface between Circular Economy, Waste and REACH. However, it should be extended from a mapping of the main flows to also allow the identification of where the material leaks occur (relevant for the Circular Economy and REACH) and where the main potential emission sources are (relevant for REACH). Such extended materials flows could become an important tool to determine the most relevant RMOa, product design and tools that could achieve the circularity.

The plenary debate triggered the following further questions for the panel:

1) Today we heard a new term/concept “sustainable substitution” which many considered as valid. But how can we make it work? What are your recommendations?
   - Promote policies/instruments that would change the habits of industry and consumers and would increase the support base for such a change. Pick success stories out to influence people in changing their habits by using a diversity of instruments, as there are limits to what can be achieved with technology or regulation only.
   - Concerning sustainable substitution time also plays an important role. Recognising this time dimension would further encourage substitution as demonstrated in the lead-stabilizers in PVC-plastics case. The regulatory system may also consider preliminary measures to test the response or address an urgent need for intervention, before moving to permanent measures aimed at achieving a long-lasting solution.
   - Informed substitution: better knowledge on alternatives including on hazard, closing the loop, talking to the supply chain and getting to know where the obstacles are for substitution, what does society need or not…what can be the solution? This certainly includes considering where behaviour can be changed and “putting money” on that by considering what choices are taken by companies, consumers, and thus enable us to influence them.
   - Many have not yet fully understood that Circular Economy goes much beyond the hazard/risk paradigm. Implementing a more Circular Economy while safeguarding the use of necessary chemicals requires working together in a more efficient manner. Addressing technological challenges in product

design and recycling is work for the business environment, whereas addressing risks of workers/environment requires the intervention of authorities.

2. Today, the REACH scheme ensures the regulatory risk management of chemicals with tools like authorisation, restriction, harmonised classification and labelling, OEL settings… Informed decision-making on risk management needs and choices was identified as a critically important step but where is the tool to decide this and when is the moment to take the decision on the best risk management instrument?
   - The earlier the better and taking into consideration a wide variety of arguments and information! Currently decisions are, for reasons of convenience, often made on a hazard basis and often result in ineffective measures. All parties should be involved (regulators, industry and society) in order to decide on the best option, where all pieces of the puzzle are assembled transparently
   - We should be allowed to look back and check what was efficient and what was not. This was partly done during the fitness check and now the Better Regulation programme of the EU should hopefully allow to progress with this because addresses “breaking down silo thinking”.
   - We should prioritise what really deserves Risk Management at the EU level considering the overall benefits for society and the economy. Cadmium in artist paints pigments was an interesting case in this respect. It demonstrated a lack of attention for priority identification resulting in a “framed debate”. All parties have “habits” when it come to the identifying of priorities for risk management (politicians, society, industry). All actors need to come out of their trenches and have a collective and frank debate on what makes real sense.
   - Eco-innovation during the product design phase is critical especially when a hazardous chemical needs to be used and cannot be substituted. The example of the automotive batteries is such a one. Consider a design for a Risk Controlled manufacturing and use, end of life and recycling while paying attention to the larger societal value of technology (e.g. electric cars) and maintaining pressure for substitution seems to be a good recipe.
   - There seems to be an overrated debate about selecting the best RMMs as different groups believe “their own instruments are the best” so it may be difficult to strike a balance between effectiveness and political acceptability.
   - Promoting the sustainability dimension in substitution requires a holistic view from the design, to the use and waste phase and closing the loop whereby many aspects are considered. Contrary to this need for a holistic debate, the RMOa as presently applied, forces the debate where there is no time to have such an integrated discussion on the best sustainable option.
   - There is an important difference when promoting substitution between incentives and innovation. The last one may be more sustainable and less costly for society.
   - Ex-post assessments, may be an option for learning from passed experiences and also to compare (potential) regulatory measures in an objective way, especially when there is a choice between a restriction or an authorisation. Cobalt salts were on their way to authorisation (Annex XIV) and now a restriction has been tabled. Some attendees questioned if we have considered what would have been the effect of an Annex XIV listing compared to a restriction?

The meeting ended with a summary of conclusions as are listed at the start of the document (page 2).

Thanks to all speakers, panel members and participants!!!