Experiences in developing Sector Use Maps

Shaun Presow - BASF
Chair ECMA GES TF
Background - ECMA

ECMA is a sector group of Cefic, comprised of 18 member companies.

These companies are both manufacturers and downstream users of substances in the production of catalysts.

Catalysts are substances or mixtures that speed up a chemical reaction by lowering barriers to activation.

- This means dramatically reduced energy use as pressures and temperatures are lower than would be required without a catalyst.

Typical catalyst manufacture requires the use of multiple substances and manipulation of mixtures.
Catalyst manufacture can be divided into emissions catalysts and process catalysts (only the latter to be discussed here).

Process catalysts are used in the chemical or petrochemical industry to improve efficiency, lower operating temperature or pressure and improve product quality.

Most process catalysts are made up of a combination of metal species, sometimes in combination (common combinations include NiO and NiS, NiO and Al₂O₃, CoO and MoO₃).

In addition, typical catalyst facilities produce multiple types of catalyst, in separate production "runs”.

In many cases the catalysts are considered a mixture of metal oxides (as per ECHA guidance).
- It should be noted some classes of catalyst fall outside of this derogation.
Example – Hydrotreating in refineries

HDS catalysts are used to remove sulfur from gas or petroleum feedstocks

Typically made up of molybdenum sulfide in combination with other metal species, eg nickel or cobalt compounds

Thus, a factory producing this catalyst will be handling molybdenum and nickel based raw materials, modifying these by producing other substances and then producing a product, which may go directly to an end-user or to another firm for activation
Preparing the use maps

- ECMA produced a series of SPERCs in 2012
- The catalyst use scenarios were examined in 2014, and it was agreed that these should be updated with further details
- First step – considering how each metal is used
- Example - Nickel
Manufacture

- One substance is transformed into another substance
- Can take place through a variety of reactions
  - Dissolution (nickel metal in nitric acid to give a solution of nickel nitrate)
  - Precipitation (reaction of nickel nitrate with a base to precipitate nickel hydroxycarbonate)
  - Calcination (reaction of nickel hydroxycarbonate with oxygen under heat to give nickel oxide)
  - Reduction (reaction of nickel oxide under hydrogen atmosphere to give nickel metal)
  - Sulphidation (reaction of nickel metal with hydrogen sulphide gas to give nickel sulphide)
- Often includes intermediates
- Catalyst production can include some or all of these steps
- Ancillary tasks are also included (loading, mixing etc)
Formulation

- Only occurs in very specific cases, where a substance is manipulated without being transformed, and is then provided to another Legal Entity.
- Is often the case for substances that are themselves are inert, but another substance in the mixture undergoes a reaction.
- Activities are similar for manufacture:
  - Forming
  - Calcining (where registered substance does not react)
  - Loading and unloading
  - Mixing
Downstream use

- Use of the substance in a catalyst product
- Quite different contributing activities than manufacture or formulation
- Bulk of the use life is in sealed reactor vessels
- Activities include:
  - Transport and storage
  - Loading and unloading
  - Use in reactor
Contributing activities

A list was created of all expected activities, and these were linked to exposure scenarios:

- Manufacture – where a new substance is manufactured (Ni metal to Ni nitrate)
- Formulation – where a substance is manipulated (e.g., zeolite, coated in nickel nitrate and then calcined to nickel oxide – the zeolite itself does not change)
  - NB in this case, the nickel oxide is considered to be manufactured
- Downstream Use – use of the final substance in a produced catalyst

Each contributing activity was assigned a PROC, duration, PPE, containment, work pattern and potential route of exposure.
Contributing activities

- These could then be bought into complete exposure scenarios, providing the complete use descriptor list for each ES.

Complete list of ES and contributing scenarios available at:
Communication with consortia

- Acceptance from consortia varied wildly
- Sometimes took much longer to introduce than expected
- In some cases we considered producing sector specific exposure scenarios to deal with catalyst specific issues
Next steps

- Begin the process again...

- Update the contributing activities and exposure scenarios using new R12 guidance

- Approach consortia with the changes

- Update dossiers