“The cost of alternatives and how they interlink into the SEA”

practical experiences:

DCC – Pigment Yellow 34 and Pigment Red 104

Roquette Frères – TCE

Yara – As2O3

What you need to take away from this presentation?

1. AoA determines the outcome of the SEA because of the non-use scenario
    - Non-use scenario ≠ plant relocation or closure
2. Economic considerations in the AoA
    - Economic viability is one of four criteria for AoA
    - Break down into cost of installation or elasticity
3. Chosen alternative in the SEA
    - Least bad = possibly acceptable
    - Economic consequences for society
    - Negative outcome for applicant ≠ negative outcome for society

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DCC – Pigment Yellow 34 and Pigment Red 104

Use: in industrial and professional applications to provide colour and technical needs (visibility, safety, durability, shade functionality and colouristic and technical performance)

Likely non-use scenarios: switching to a number of unsuitable alternatives (e.g. bismuth vanadate pigment - PY.184 - to replace PY.34 and a group of red pigments to replace PR.104).

AoA: Technical assessment combined with price elasticity assessment (quantitative and qualitative methodology)

Total costs of the non-use scenarios (all uses): ~ € 180 M (per year)

Paint sector:

- The higher price of the alternative pigments – ranging from 2x to 10x
- The need to increase the pigment concentration in paint/coating when alternatives are used
- The need for more coats due to the lower opacity of alternative pigments compared to paint based on PY.34 and PR.104
- The need for more frequent painting due to the low durability of paint based on alternative pigments *(not included in the above costs)*
- Poor durability and low opacity of alternative pigments

Plastic sector:

- Need to increase the usage level of masterbatches in plastic applications when PY.34 and PR.104 free masterbatches are used

Final impacts of the non-use scenarios: negligible benefits to the society (in terms of monetized risk) vs high costs to switch to the unsuitable alternatives

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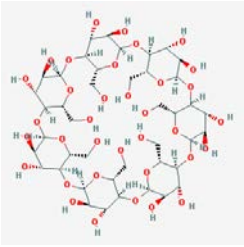
Roquette Frères - TCE

Use: Use of trichloroethylene (TCE) as a processing aid in the biotransformation of starch to obtain betacyclodextrin



Final product: oligosaccharide with 7-membered sugar ring molecules (a great number of industrial applications)

AoA: 1 solvent free process and 5 solvents assessed:

- Solvent free = non scalable to industrial level
- Solvent chosen: achieves roughly 55% complexation of the starch into BCDs whilst TCE achieves over 75% and acceptable to DU of Roquette

Likely non-use scenario: switch to toluene

Costs of switching to non-suitable alternative:

- Factoring energy/time)
- Toluene Additional risk due to high flammability of toluene
- Investment (compliance with ATEX Directive) : € 11 M
- Administ arketing authorization regulator

Cost that would be faced by any operator

Cost more related to Roquette's specific situation

Final impact of switching to toluene: negligible benefits to the society vs high direct and indirect substitution costs

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Yara – diarsenic trioxide

Use: Decarboxylation step of ammonia production

Original proposal: Complex reconstruction of plant (requiring 7 years) to switch to amino solution

AoA: Substitution possible with Vanadium pentoxide

- Alternative found in BREFS (BATs);
- Originally discarded because C2 but process uses non classified Vanadium potassium carbonate
- Substance much more compatible with existing installation – transition possible in 2.5 years

SEA : Faster substitution = lower (health) costs

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Q&A

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