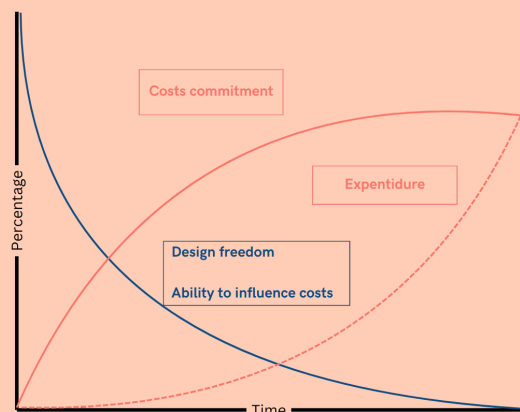


Economic drivers to adopt Safe-by-Design

Including a consideration of safety into the design of chemical products appears to be an obvious goal to any manufacturer, but integrating it in all aspects of product innovation may be seen as reducing flexibility at the start of the process and requiring much needed resources before commercialisation. This factsheet will present why application of Safety-by-Design (SbD) principles throughout the innovation process can reduce costs to a company.

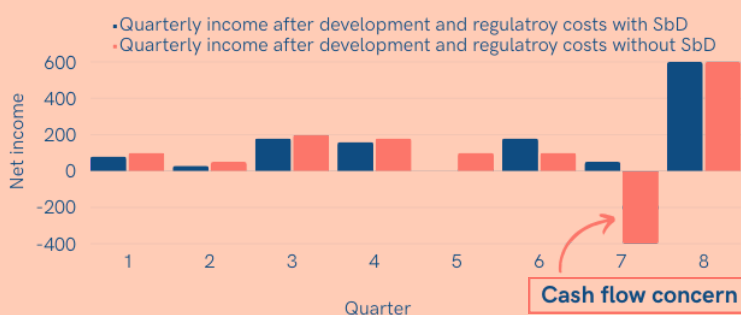
Avoidance of late stage product failure

- Unforeseen hazard and risk effects can halt commercialisation.
- Early identification avoids loss of committed resources at a stage where there is still flexibility in product design.



Reduction in regulatory barriers to commercialisation

- Obligations often occur at commercialisation or once volumes reach a certain level.
- The one of cost to meet all obligations at one time can be high, impacting on cash flow.
- SbD can generate relevant data across development, spreading these costs and lessening cash flow concerns.



Examples of costs arising from unexpected health issues after product launch

PFAS in fire-fighting foams and polymer synthesis

- Linked to cancer; reproductive and developmental harms; reduced effectiveness of vaccines.
- Lowering concentration in drinking water in California may cost \$1B.

→ How could SbD have helped?

- Prediction: Carbon halogen bonds known to be bio persistent.
- Development: Introduction of degradable functionality in molecular structure.
- Remediation: Development of remediation techniques in parallel to product development.

Chlorpyrifos as a pesticide

- Linked to neurobehavioral deficits in children after maternal exposure.
- Estimated annual impact to US economy of \$44.7B.

→ How could SbD have helped?

- Prediction: Similar substances designed to be nerve agents.
- Development: Design of targeted delivery approaches to minimise usage?

General worker safety issues

- Fines of up to \$10M + Lost time costs; Legal expenses; Increased insurance premiums; Reduced productivity

SbD4Nano tools

A simple excel tool to assist the prediction of the cost impacts of SbD options will be demonstrated in an SbD4Nano deliverable and key aspects of this are incorporated into the e-infrastructure.

Consumer demand for safe products

Academic research has shown:

- Consumers "willing to pay" EUR 500,000 to avoid major birth defects or cancer.
- US consumers willing to pay an 18 % premium for a product not containing a substance with a known health effect.
- 60 % were willing to pay a premium of an average of 16.8 % for a socially responsible product.

Conclusion

Implementation of SbD can give an company economic advantage and can spread costs to avoid cash flow issues. It can also reduce unforeseen risks giving both customers and investors more confidence in a company's products.

