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BLUEPRINTS FOR INDUSTRIAL SYMBIOSIS (IS) DETECTION – CHEMICAL SECTOR

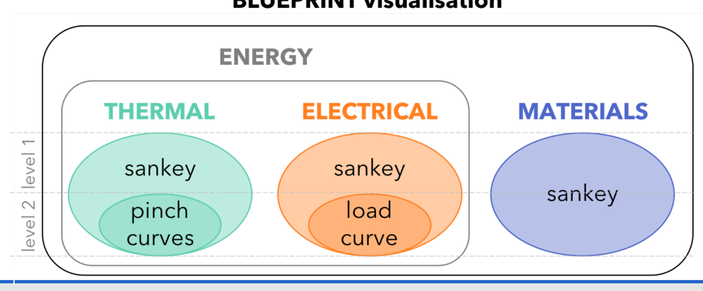
Challenge

How to overcome confidential issues when sharing data & results in and across process sectors?

Solution – sector blueprint

- typical process industry sites (refinery, steam cracking, chemicals)
- systematic methodology to produce blueprints
- 3 profiles summarising the material, thermal and electrical needs of a given industrial sector
- data anonymisation techniques (Parerto approach, aggregation, anonymisation factor) ensure data confidentiality while keeping the realistic nature of the blueprint
- customisable MILP models for identifying and optimising the best IS connections between process sectors

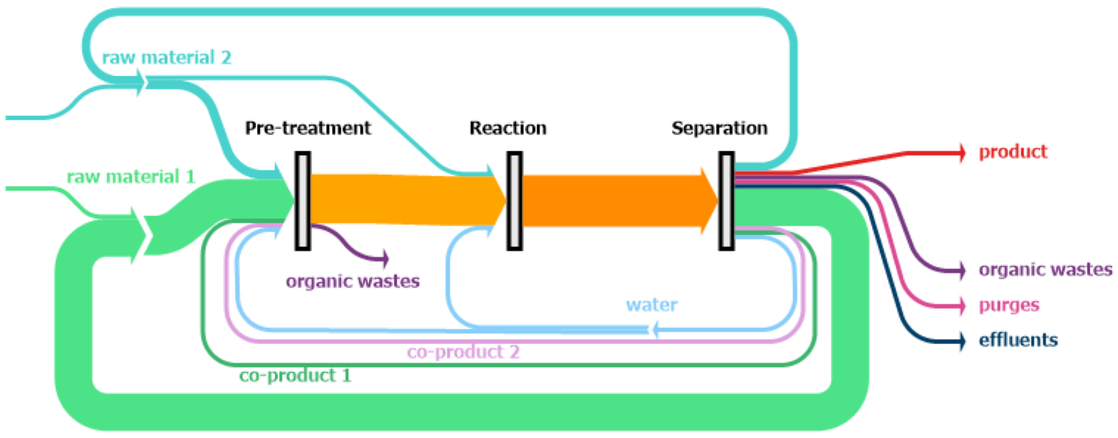
BLUEPRINT visualisation



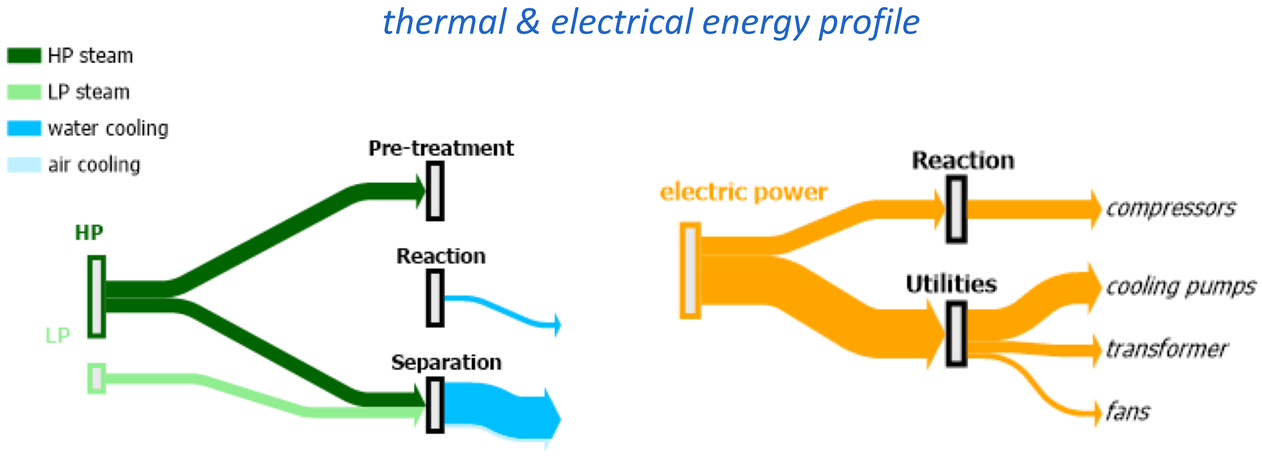
Blueprint visualisation – level 1

Synthesis process

material profile



thermal & electrical energy profile

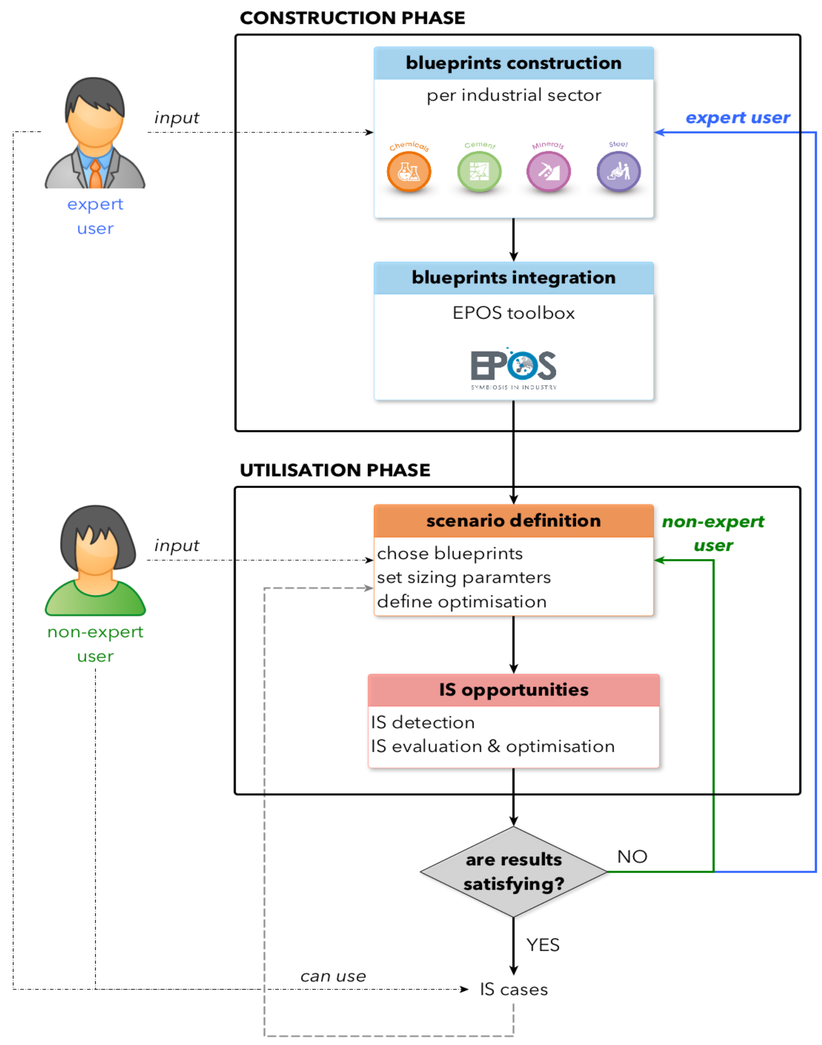


Conclusion

The use of blueprints is a powerful tool for overcoming the burden of industrial data confidentiality. They provide an easy and clear solution for industries to share data and learnings that can lead to better practices, operation optimisation and even new businesses. The case of heat integration between a refinery and a DHN demonstrates that blueprints can be used for the identification and evaluation of new IS opportunities.

blueprint life-cycle

How will the blueprints be used?



Case study - Heat integration between a refinery and a District Heating Network (DHN)

Methodology

- use of refinery [1] and DHN [2] blueprints
- thermal energy profiles (level 2 – pinch curves)
- refinery capacity = 35'000 t/d, city = 10'000 inhabitants in zone 5 [2]
- objective function: maximise heat integration

Results

Table 1. DHN thermal power consumptions before and after integration with the refinery

	Power Business as Usual (kW)	Power after integration (kW)
Refrigeration	200	200
Centralised heating	142.2	0
Electrical heating	47.84	0
Heating District Hot Water	2'031	2'031
Space heating	7'446	7'446
Boiler	9'380	0
TOTAL	19'247	9'677

→ DHN's energy consumption reduced by 50% when integrated with the refinery

→ next step: include OPEX and CAPEX

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[1] H. Cervo et al., 'Virtual Sector Profiles for Innovation Sharing in Process Industry – Sector 01: Chemicals', in Sustainable Design and Manufacturing 2017, 2017, pp. 569–578.
[2] S. Raluca, K. Ivan, B. Hur, G. Luc, and M. Francois, 'Geographically parameterized residential sector energy and service profile', Chem. Eng. Trans., pp. 709–714, 2018008.

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