EPOS WP 5 – Cross-sectorial validation

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Operational validation of the EPOS tool

D5.5

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September, 2019

Summary

The EPOS project has developed the EPOS toolbox: a tool aiming to support Industrial Symbiosis (IS) identification, assessment and optimisation for cross-sectorial energy and resources integration.

The main focus in WP5 is on cross-sectorial validation of the IS toolbox, and for that the tool has been tested via its application to the various EPOS clusters. Within WP5, T.5 focuses on the operational validation of the EPOS toolbox as a single and simple IS management tool. This deliverable presents the work carried out in order to validate the EPOS toolbox from an operational standpoint, which includes three main sections:

1. The first subtask focused on the validation of the robustness of the EPOS toolbox as a web interface: meaning the assessment - from an IT and technical standpoint - of the integration between the web interface and the back-end calculation engine. This work was carried out by the development tandem of EPFL-Quantis, as well as by Veolia in collaboration with the other industries through on application of EPOS toolbox to the EPOS clusters.

   This work includes a review of features such as the reproducibility of results, dependency on hardware, dependency on user profile and sensibility to parameters such as input data.

2. The second subtask, the purpose of which is to validate the transferability (or deployability) of the EPOS toolbox, focuses on general user-friendliness and relevance for industries of the EPOS toolbox. This includes the assessment of features such as general user-friendliness, language and units, computation time, integration of libraries (e.g. technology libraries) and required skills to use the EPOS toolbox. These features were assessed based on feedback from users in the user club, and in particular, all industries contributing to WP5.

   EPOS toolbox robustness assessed based on user feedback (users directly using the EPOS Toolbox interface) differs in some cases from the test results obtained in Task 5.3. This can be explained as in T5.3 the computational back-engine of the tool uploaded with the EPOS blueprints was directly accessed by the industry users, whereas in current deliverable, feedback was provided upon direct use of the toolbox web interface.

   The main conclusion is that the EPOS toolbox is a very nice prototype, with specific deliverables such as the blueprints that are very interesting, and that this prototype can sustain the further development of the tool. There are still, at this stage, a number of technical issues with regards to the full integration between the computational back-engine and the front-end interface which impair access to some of the tool's features and capabilities, but this stems from a IT development issue more than from limitations on either the EPOS blueprints or the multi-objective optimisation calculation engine.

   In order to pursue developments and solve most of these problems, a number of corrections have been identified and carried out or listed as possible improvements.

3. The third subtask describes a complete case study fully defined, simulated and optimised in the EPOS toolbox computational back-engine as well as through the EPOS toolbox interface to give a detailed account of the "Neutral User" experience. This case study was done by Veolia team using both the CHEMICALS and STEEL blueprints but conducted by a user which is neither from the steel nor the chemicals sectors. The third step was to investigate the integration between steel and petrochemical process and

potential savings from this energy integration, using the calculation engine of EPOS. Similarly, the integration between each sector and DHN was also investigated. It is an attempt to provide insights on technology database, blueprints, knowledge requirements of user profile, relevance of results. It focuses on the potential gap between initially identified potential and actual potential once technical aspects such as heat loss are integrated - this points to the need of integrating new features and models. Finally, all tasks were repeated using the EPOS toolbox directly.

The work carried out in these three sections can answer the following question: "is the EPOS toolbox a generic simple and single management system for IS?"

To answer this question, the main strong and weak points of the EPOS tool are summarised. The main improvements done during the project are following:

- The EPOS toolbox interface improved a lot throughout the project and has become more flexible by allowing the integration of the real site's parameters and to compare them with default data. This is very useful for the final user as it considerably facilitates the expression of its needs.
- A lot of KPIs are available and this helps users to better understand the wide range of gains achievable through industrial symbiosis.
- Though a number of IS match-making tools exist, there are not many that encompass identifying IS opportunities through a multi-objective optimisation approach (that is with specific objectives in mind regarding OPEX, CO_2, etc…). It is a success to be able to access an optimisation engine and solver and to be able through a web interface to run multi-objective optimisation runs with as high as three objective functions. Indeed, even though the Osmose back-engine is able to optimise with more than three objectives, three objective functions is significant for a web-based optimisation tool treating a number of different sectors further customised by tool users.
- One of the weaker points though, relates to the gap in performance between using the EPOS toolbox back-engine (osmose + blueprints) relative to using the EPOS toolbox interface. The issues are mostly related to the IT technical integration between back-engine and front-end and are not related to intrinsic limitations by the blueprints or the computational back-engine. Further work is required to solve the integration of the technical challenges so as to provide an adequate tool with potential for industrial application and relevance.