EPOS INSIGHTS #7

AN INTRODUCTION TO VIRTUAL SECTOR PROFILES

Led by:

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EPOS insights are publications summarising the most relevant outcomes of the EU funded EPOS project. The overall aim of the EPOS project is to enable cross-sectorial industrial symbiosis and provide a wide range of technological and organisational options for making business and operations more efficient, more cost-effective, more competitive & more sustainable across process sectors.

INTRODUCTION

Do you have a good view of your company's energy profile, its utilities, resources and waste streams? Have you optimised your onsite heat and power demand-supply but still have some waste heat, electrical flexibility or side streams that can be valorised? Did you explore and exploit all third-party potential on your site? Then the time is right to externalise residual inefficiencies through industrial symbiosis.

But how to know what companies in your vicinity do, have or need? How to screen for potential, raise an interest, share information and data, show clear economic and sustainability gains and thus build a business case?

As a first step towards industrial symbiosis, sufficient information has to be shared between industrial sites so that potential opportunities can be identified. This can be problematic, as companies strive to ensure their industrial data remains confidential, as they typically include process design and technology details.

Sector blueprints provide a smart solution for any company interested in exploring symbiosis with neighbouring process industries, irrespective of sector or size. These blueprints are comprised of typical processes that are used in an industrial sector. In addition to typical assets and flows, they give a rough idea of the heat, power and material streams that can be expected. With this information, a typical plant operating in a sector can be portrayed.

As the EPOS project includes four major process industries, data sensitivity is of great concern. To break the barriers preventing information sharing, sector blueprints are used. The EPOS toolbox uses these blueprints to gain insight into potential symbiosis options. All profiles for the EPOS project have heat and electricity data from each process unit as well as the major operations within the unit. Additionally, the material streams into and out of the units are included.

METHODOLOGY

In compiling sector profiles, there must be a sufficient level of detail for potential symbiosis identification, but they must also be generic so that other sites outside of the EPOS project can benefit. To ensure that the profiles appropriately represent their associated industries, the information used comes from real industrial sites or other public sources.

EPOS
SYMBIOSIS IN INDUSTRY

Any data provided by industrial partners are anonymised so that confidential information is not shared. The profiles use three interconnected layers:

- heat
- electricity
- materials

HEAT PROFILE

Industrial site heat profiles are represented by composite curves (Figure 1), depicting the amount of heat required and available at different temperatures within a site. The hot curve represents the amount of available heat while the cold represents all of the required heat. These curves can be done for individual sites or combined with other sites to identify potential exchanges.

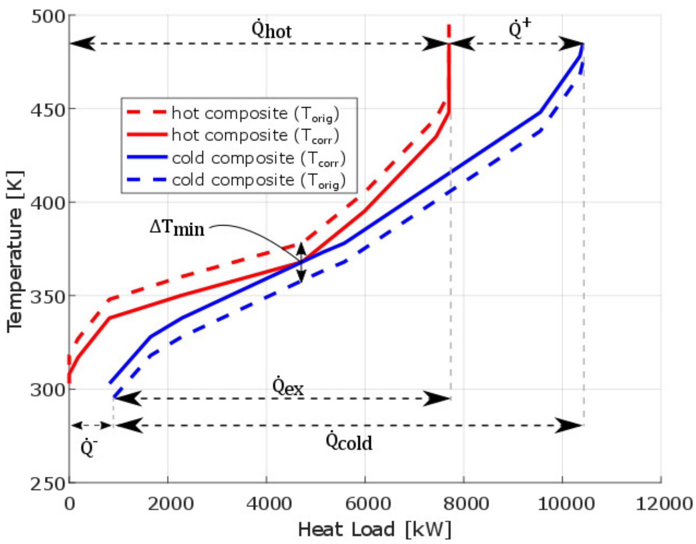

Figure 1: Hot and cold composite curves

ELECTRICITY PROFILE

The electricity profile represents the electrical consumption on a site. The profile considers both consumption and the potential for flexibility. In creating the electricity profile, an overall impression is obtained through a load duration curve showing peak loads, minimum loads and all in between. This curve provides insights into the capacity, the potential for peak shaving and local generation impact. From here, a list is made of electrical equipment. This list is then categorised based on function and location (Figure 2).

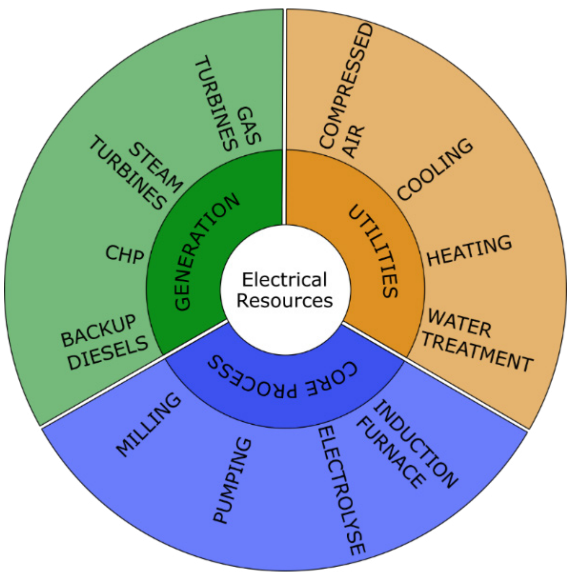

Figure 2: Electrical resources

Three factors are important when considering further investigation:

- Power – the larger the power, the higher the potential effect on the profile
- Capacity – units that must always run at maximum power are rarely used, a unit working at 70% might be a candidate to shift its time of use
- Role in process – core process, utilities and generation
  - Core processes may be critical for production
  - Utilities may have the potential for adaptation
  - Onsite generation may have an impact on revenue

MATERIAL PROFILE

To construct the material profile, flows both into (feedstock) and out of (products, waste) the system is considered. Air, water and land emissions are considered as waste material, which allows for the identification of waste-exchange synergies and for the environmental performance of the process.

Within the context of industrial symbiosis, material streams entering or leaving processes are of particular interest. They are the interfaces used to interact with other processes without significant process modifications. Within EPOS, the major flows across system boundaries are identified so as to provide a comprehensive list of requirements and availabilities.

DATA ANONYMISATION

The primary concern for industries when building sector profiles using real data is that of data confidentiality, intellectual property protection and guarding trade secrets. This is addressed through anonymising data to a point where the companies involved are satisfied. During this anonymisation, care must be taken in order to satisfy physical laws and to remain realistic.

- Random factor – data values are multiplied by a random factor decided by the data owner. The factor must be reasonable, as a lower factor may resemble the original data too closely but a higher factor may not represent reality. After the random factor is applied it is necessary to ensure that physical laws are obeyed.
- Surrogate models – making use of simulation models constructed numerically or with software. Real data can be used for calibration purposes.
- Input-output relations – using mathematical modelling to determine relationships between inputs and outputs.
- Averaging – making use of data from similar processes at multiple sites. This allows for a realistic value without specific site correspondence.
- Public data – any data that are available in academic, industrial or governmental literature.

COLOPHON

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