Exergy Analysis within Process Simulation Software to Enhance Process Energy Management

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ProSim
Software & Services In Process Simulation

Introduction

Context

Industrial sectors account for one third of global energy consumption. A common feature of industrial processes is reliance on fossil fuels as the primary source of energy and a large part of the energy consumption is spent on production of utilities (electricity, steam at various pressure levels, hot/cold water, hot flue gas…). As this reliance on fossil fuels has huge negative impacts on the environment, the scientific world makes a significant effort to find alternative sources of energy. However, even by the most optimistic assessments, these alternatives are long-term solutions and many projections show that in the near future, fossil fuels will remain as primary sources of energy.

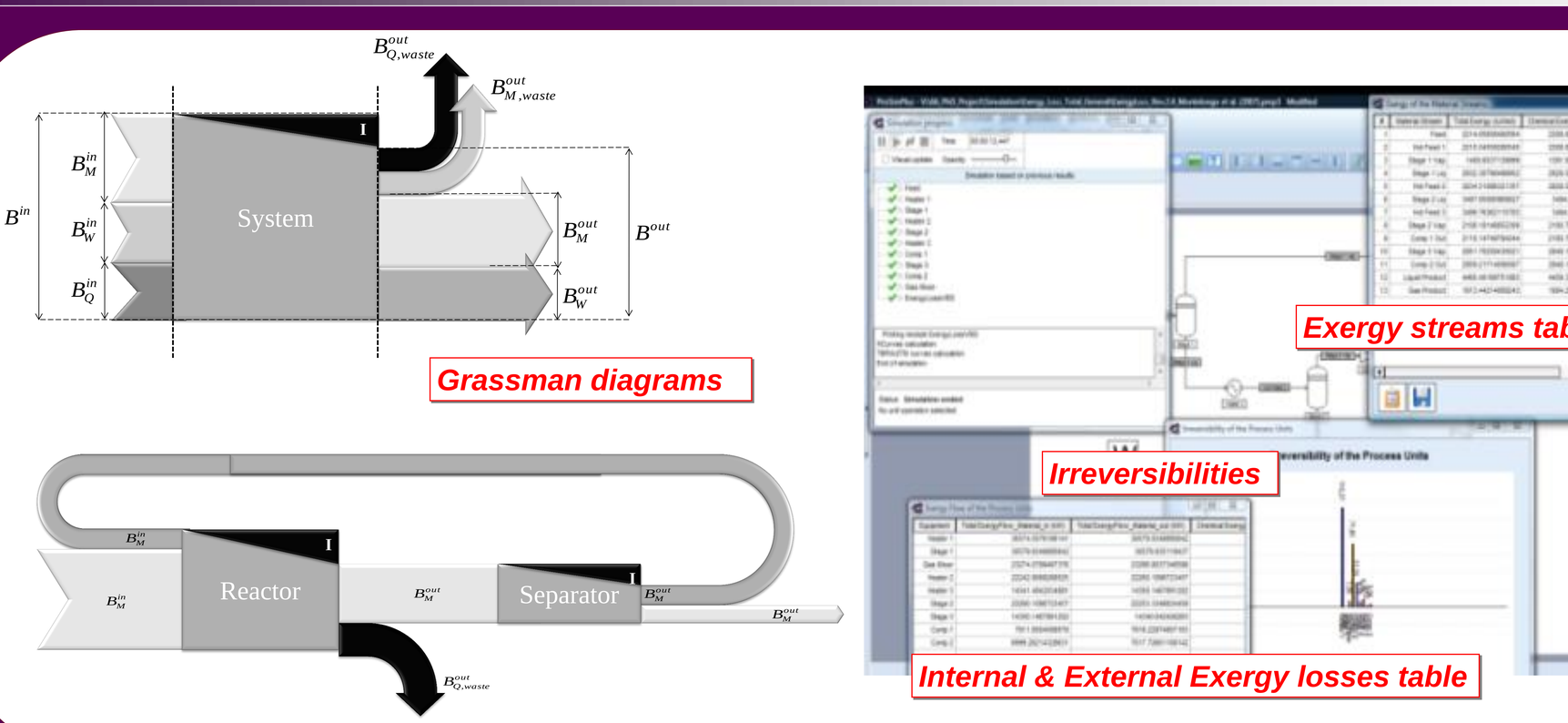
Definition of Exergy

Exergy is defined as the maximum theoretical useful work obtained if a *system* S is brought into thermodynamic equilibrium with the environment by means of *(reversible)* processes in which the *system* S interacts only with this environment. (Sciubba and Wall, 2007)

The **COOPERE** (COmbiner Optimisation des ProcédEs, Récupération énergétique et analyse Exergétique pour une meilleure efficacité énergétique des sites industriels – Combine process optimisation, energy recovery and exergetic analysis for a better industrial energetic efficiency) project, focusing on the development of a software platform for simulation and energetic optimisation of industrial processes, has been selected by the ANR (French National Research Agency, **ANR-11-SEED-0012**).

The project brings together 4 partners from the academic world (AgroParisTech and INP Toulouse) and the industry (Veolia and ProSim).

Exergy of Material Streams



"The amount of work obtainable when a material stream is brought to a state of thermodynamic equilibrium with the common components of the natural surroundings by means of reversible processes, involving interaction only with the abovementioned components of nature". (Szargut *et al.*, 1988).

Exergy Analysis within a Simulation and Optimization Software: ProSimPlus

Grassman diagrams

References

J. Szargut, D. R. Morris, and F. R. Steward, *Exergy analysis of thermal, chemical, and metallurgical processes*. Hemisphere Publishing Corporation, 1988.
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E. Sciubba, G. Wall, *A brief commented history of exergy from the beginnings to 2004*, Int. J. of Thermodynamics, 10 (1), 2007

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