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Work flow in reactive processes: systematic approach to process synthesis

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ABSTRACT

The industrial sector's large energy use presents itself as a vast potential for energy saving and technology improvements, making it an attractive target for industrial sustainability through increased energy efficiency.

Process synthesis is a tool used early in the design stage of a process to generate flowsheets with optimized efficiency, environmentally friendly and economically viable. By understanding flowsheets design and parameters' effects on the flow of heat and work through a reactive process, one is able to create processes capable of utilizing heat and work efficiently.

Energy as heat and work is fundamental in the analysis of process performance. This dissertation therefore proposes two case studies which reflect investigations done on the effect of temperature, conversion and heat capacities on reactive processes.

Findings show that temperature, conversion affect the heat and work use across the process in such a way that they can be adjusted to minimize heat and work lost across the process or a unit. Work lost minimization is an indication that heat and work supplied to the process is being utilized rendering the process efficient. Findings also show that the larger the difference between the heat capacity at the stream going into the process and the heat capacity at the stream going out of the process, the larger the required temperature and conversion manipulations to produce an efficient process by minimizing work lost.