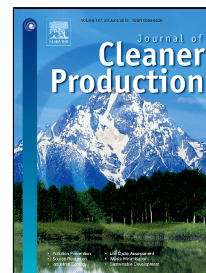


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Optimization of the Energy Supply in the Plastics Industry to Reduce the Primary Energy Demand

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Abstract

In the United States, approximately one third of the energy end-use is from the industry which makes the industrial sector ranked number one in terms of energy consumption. One way to lower the energy consumption and to enhance the energy efficiency in the industry is to combine intelligent linkage of energy consumer, distribution, storage, and energy supply. In this paper, the research is focused on the study of these combinations leading to a smart industrial consumer which can interact in a “smart grid” system. This model-based study considers the energy supply of a plastic processing company, the processing machines as well as the factory hall including a HVAC system. The energy flows of all technologies are linked and interdependent. Different energy efficiency measures are integrated, and an innovative flexible high-temperature system is introduced. The complex energy flows are shown and the end and primary energy demand as well as the CO₂ emissions are determined.

The plastic processing industry mainly uses electric power for their facilities. To obtain flexibility in using machines from many different energy sources such as combined heat and power plant (CHP), heat by the burning of natural gas, or electrical grid, the electrical heating method is changed to thermal oil heating in many production machines. The study shows the energy saving potential for a typical manufacturing company located in three different locations in Germany, Canada and the USA. Based on the results of the study, the end energy demand increases due to thermal losses. Besides the primary energy demand can be reduced up to 34 percent through a flexible use of different energy sources. Furthermore, a high degree of flexibility can be achieved.

Keywords:

Primary energy efficiency

Plastic processing industry

Intelligent linkage of energy flows

Simulation study

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