Introduction to Panel 2 Sustainable production design and supply chain initiatives

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Introduction

Energy efficiency experts often have a very narrow focus on energy efficiency in a given enterprise. Often that's their strength. Just examining what can be improved in a certain situation and take the appropriate actions leads in many cases to substantial savings of energy, reduction of emissions and saving of money.

But there is much more. Even higher savings can be achieved when the total supply chain of equipment and materials, upstream and downstream, is taken into account. A company does not operate in a vacuum but is connected to the rest of the world in many ways. Other companies supply production equipment. Materials are supplied by others or delivered to others. Also, energy is not a stand-alone issue. The relation with climate change issues is obvious, but energy issues should in the end also be considered in the broader context of sustainable development.

In Panel 2, searching for the broadening of the scope is the common denominator. We start with papers that deal with the design of industrial processes and how it is influenced by the choice of production equipment. We then continue with examining supply chain initiatives. Finally, the relation of energy issues with the broader quest for sustainable development will be discussed.

Designing for energy efficiency

First, we go back to the basics. Khattak et al. (2-080-12) revisit one of the early approaches in industrial energy use: exergy analysis. Exergy analysis has clear advantages above straightforward energy analysis. Using the textile industry as an example, the authors explore the possibilities and problems of exergy analysis. There are quite some issues with respect to determining the exact exergy values for complex materials like cotton. Whereas exergy analysis has been applied regularly for basic material production processes, applying it to light manufacturing seems to be still an area of early development. Maagøe Petersen and O'Sullivan (2-016-12) describe a methodology for the energy efficient design (EED) of industrial processes. It is based on the 'Onion' diagram, taking into account all relevant aspects, i.e. starting from the energy service, it includes processes, equipment, control, operation and maintenance, and good housekeeping. The paper describes how the EED method can be built into the design process of industrial installations. Also a number of examples from pilots are shown, achieving savings of 35–50 % with payback times ranging from zero to 2.5 years. Design of industrial processes is not only done by the private sector, it is also a policy issue. The EU Ecodesign Directive for energy-using products is generally associated with efficient household appliances. Toulouse et al. (2-031-12) discuss the importance of this directive for industrial energy use. They provide an overview of all relevant regulations and show, for example, that the energy savings impact of the regulation on electric motors is three times higher than the impact of the ban on incandescent lamps. The authors discuss the specific problems of the directive in the industrial environment, including definition issues, data problems and the challenge of verification and enforcement.

Cooperation across the supply chain

The supply chain session starts with an overview by Goldberg et al. (2-049-12) of ten different supply chain initiatives, most of them initiated by large companies. All of them have an upstream scope. The initiatives vary widely in character, elements that are included can be mandatory performance require-

ments, reporting and monitoring, capacity building, supplier forums and labelling. Quantitative information on impact is still limited as most schemes are quite new. Nevertheless, some notable successes could be identified. Based on the experience so far, the authors have identified seven success factors. One of the interesting initiatives identified by Goldberg et al. is the CO_2 Performance Ladder started by Dutch railway infrastructure company Prorail. Rietbergen and Blok (2-023-12) describe how in this initiative suppliers are given a 'virtual discount' on their tendering prices if they have implemented greenhouse gas emission monitoring and reduction measures. The discount increases with increasing implementation of the measures. The scheme has led suppliers to start reduction programmes aimed at an estimated absolute emission reduction of 1.1 % per year. Hasanbeigi et al. (2-035-12) focus on a particular technology to reduce greenhouse gas emissions, i.e. the co-processing of municipal solid waste and sewage sludge in cement kilns. The focus is on application in developing countries where co-processing is an option to avoid poor waste management practices. The paper provides a global inventory and examines the various process elements. It is concluded that, if applied under strict environmental regulations, there are no additional environment and health risks associated with wider application.

Towards greater sustainability

How can we make major steps by regional cooperation of companies? Jönsson et al. (2-141-12) explores long-term pathways to achieve greater sustainability for a cluster of chemical companies in Sweden. The energy and environmental impact of this cluster can be greatly reduced by two classes of technology. The first is heat integration, reducing the use of fuel in boilers to a large extent. The second is the use of bio-feedstock, for example the use of imported ethanol for the production of ethylene. The move towards such a system requires much deeper integration of processes than currently practiced. McKenna et al. (2-107-12) examines what the impact is of direct secondary reuse, i.e. the reuse of components without destroying their design. The authors examine what energy can be saved in the German automotive industry by reusing parts. It turns out that this is 3–6 % of the final consumption of the sector. Finally, the question that rises is of course: how do we measure progress? Bocken et al. (2-083-12) have surveyed how key-performance indicators (KPIs) for sustainability are used in practice. They find that measuring full sustainability is still in an early stage. There is doubt whether the introduction of sustainability KPIs is a strong enough driver for performance improvement. Also, sustainability is found to be a complex concept when it comes to operationalization, and managers are uncertain about the choice of indicators.

Conclusions and key messages

This panel has covered a wide variety of topics. Looking beyond the borders of the individual production site opens up a broad horizon, with lots of opportunities for saving energy and costs, and reducing emissions. However, it is not easy to structure all these options in a transparent way. This makes it difficult for companies to choose directions.

Also, we note that we are only in an early stage of quantitative assessment of the potentials for energy and emissions savings and of the associated economic costs and benefits. Nevertheless, from the variety of papers presented in this panel, it becomes evident that the potentials are substantial and worth further investigation. Also, we have seen a number of interesting options to harness this potential, be it driven either by the public or the private sector.