Introduction to Panel 4
Undertaking high impact actions: The role of technology and systems optimisation

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On the way towards a low carbon economy the role of technology and systems optimization in industry plays a major role to deliver energy savings. From the papers presented in this panel, five thematic clusters have been formed covering the most relevant aspects of the overall topic.

The first cluster deals with the cross cutting technologies, the second with the energy intensive industries. Within the third cluster, the role of systems optimization is highlighted. In the fourth cluster, the topic of waste heat utilization comes into focus, and the fifth cluster contains three papers with practical examples (presented as posters).

Cross Cutting Technologies

The main characteristic of cross cutting technologies is their broad application across the whole industry. Therefore, technological optimization is of special interest, as the customer base for improved technologies is rather large and the implementation of efficiency measures can lead to significant energy demand reductions. The three papers in this thematic cluster deal with different aspects of cross cutting technologies.

Hirzel et al. (4-060-14) discuss the use of compressed air systems compared to electric applications. In their paper, they provide insights into the energy efficiency and costs of pneumatic and electric linear drives introducing a framework for comparing these two types of drives. They conclude, that in some cases, electric linear drives are more energy-efficient and less expensive while in other cases, pneumatic systems perform better. This example shows that simple generalizations do not always apply when it comes to energy efficiency.

Frequency converters are an important technological option to increase the energy efficiency of motor driven systems. Ahonen et al. (4-083-14) analyze the life cycle costs of this technological option and highlight the advantages of frequency converter application in motor driven systems.

Ecodesign is the EU's major instrument to foster energy efficiency of cross cutting technologies. An insight into the ecodesign process is given by Rohde et al. (4-034-14). They present the general methodology of the ecodesign process as well as the application for industrial steam boilers and the specific challenges regarding this product group.

Energy Intensive Industries

Within the cluster dealing with energy intensive industries, the first two papers deal with an analysis of specific sectors, whereas the other three papers look at the wider scope.

The energy efficiency improvements in the American petroleum refinement industry are analyzed by Morrow et al. (4-062-14). Within their analysis, they present the whole range of energy efficiency measures applicable for this industry and derive a cost curve considering the economic conditions.

Arens & Worrell (4-081-14) deal with the diffusion of efficiency technologies in the German iron and steel industry. They found that only for very mature (or old) technologies have reached a complete diffusion, whereas more sophisticated technologies are hindered by various barriers.

Hills et al. (4-027-14) look beyond the border of a single plant and have a look at the potentials for inter-site heat integration in energy intensive industries. They analyze which kind of process may profit (economically) from such integration. With an exemplary case study, they show the potentials, but also the limitations of such a concept.

An approach for data collection concerning industrial energy efficiency is presented by Sommarin et al. (4-028-14). Looking at the example of foundries, they show how improved bottom up data can be gathered to increase the knowledge about the energetic performance of this sector.

Schneider et al. (4-082-14) use a transdisciplinary approach to develop developed differentiated bottom up climate change mitigation strategies for the major energy intensive industries in North Rhine-Westphalia (Germany).

Systems Optimization

Rantanen (4-068-14) looks beyond the classical production systems and encourage a wider systemic thinking in the assessment of energy efficiency. The paper highlights the importance to look at the implications of "local" improvements to the whole system.

Also Biere et al. (4-041-14) look beyond the production process and show the importance of space heating for industrial energy demand. This issue has been widely discussed for domestic buildings but is still neglected for industry. With a model approach they show the significant saving potentials for this energy application in industry.

The increase of variable renewables in the European electricity landscape requires a development of flexibility means to match generation and demand, and an assessment of additional wind power integration by industrial demand side management are analysed by De Keulenaer et al (4-109-14). The authors conclude that eleven flexible industrial processes could in Europe accommodate 68 GW of additional wind capacity, delivering 176 TWh/year of electricity, out of which ⅔ would be self-consumed on-site.

Trygg & Karlsson (4-009-14) look at energy measures such as energy efficiency, conversion from electricity to district heating and the co-operation on heat between industry and energy supplier. Such measures may significantly contribute to a cost end energy demand reduction as shown by examples from Sweden.

A tool to quantify energy savings targets in large industrial process clusters is presented by Mossberg et al. (4-017-14). They show how decision support can provided for a multi-party cooperation in a joint energy efficiency investment. The methodology is illustrated by the application in two case studies.

The large amount of data which is gathered in industrial process may help to learn about the energetic performance and lead to the identification of energy saving potentials. In their paper, Boutin & Héliot (4-033-14) show how analytics contribute to improving energy efficiency in industry. The show the application of their methodology in field studies in a practical context.

Waste Heat

In their paper, Forni et al. (4-006-14) present an innovative installation of heat recovery for electricity generation through an ORC in the steel sector. They outline the characteristics of the steel shop, the system layout and the solutions for the heat exchange.

Hummel et al. (4-086-14) analyze the options for the integration of industrial waste heat into a district heating system. Based on a techno-economic modelling, they derived the most relevant influencing factors for the integration.

Suomalainen & Hyytiä (4-087-14) studied the use of industrial surplus heat in nine industrial plants and in one combined community and industrial plant. Based on these cases, they developed generalized principles to deal with this topic which may lead to a wider use of industrial surplus heat.

Papers presented as posters

Within the cluster of papers that will be presented as posters at the Industrial Summer Study, there are three papers that deal with green cooling tower, energy management in municipal solid waste treatment, and optimization of heat processing parameters in die-casting mould manufacturing.

Mishra (4-003-14) discusses in his paper how green cooling towers that uses pressurized water lead to a 100 % electricity cost reduction and is the best-in-class cooling tower technology currently available for refineries, power, chemical and processing plants. In addition it will also mean lower annual maintenance costs, improved reliability, safety and potential to generate carbon and green credits.

Energy management in municipal solid waste treatment are analysed by Bernardo et al. (4-093-14). The paper presents results of an energy audit performed to a mechanical biological treatment facility in Portugal. Bernardo et al. discuss that there is a considerable potential for reducing energy use and greenhouse gases emissions within mechanical biological treatment units through a continuous energy monitoring and management system.

Ji (4-110-14) discusses optimization of heat processing parameters in die-casting mould manufacturing with high-speed steel. The author discuss how the adoption of new process parameters in manufacturing die-casting molds can reduce time for traditional theoretical process by 40 %, save energy use and also reduce electric power consumption by almost 40 %.