Trends in enhancing the energy efficiency of industrial zones

Efficient utilization of energy is considered number one priority on the global level, as a consequence of the climate change effects on ecosystems, as well as due to economic concerns regarding quantities of accessible fossil fuels and their prices. In order to protect ecosystems, and provide sustainable development to societies, it is estimated that the average annual emissions per capital will have to be reduced to less than 1 metric ton of CO2 by 2050. The rapid increase in global energy consumption, as well as the population growth makes the problem even more complicated. Efficient utilization of energy in manufacturing industry can be achieved in different ways. For example, the development of more efficient equipment, the design of new energy efficient processes, and the utilization of better energy recovery and integration methods all help make energy utilization more effective in manufacturing industry. To achieve this goal, systematic methodologies and tools, have to be developed and implemented.

The first part of the talk is devoted to energy recovery and reuse. Common industrial practice is to reject excess of heat to cooling utilities water or air. We are presenting two practical approaches to utilize this rejected heat. The first approach considers application of Organic Rankine Cycle process to convert low grade heat to power. The second approach considers enhancing heat and power cogeneration of an industrial zone via integration across plants.

In the second part, we talk about the Catalytic Naphtha Reforming process. This process is one of the basic oil refining processes and it is noticeably energy-intensive, and thus offers prospects for significant energy efficiency increase. The primary role of the process is to upgrade low octane gasoline, as well as to produce hydrogen, which is a key component for sulfur and nitrogen removal, production of jet fuel, diesel, and liquid petrol gas. In addition, the process found applications for upgrading low-octane hydrocarbons, produced from natural gas and coal using Fischer-Tropsch synthesis. We present an optimization based approach to enhance energy efficiency and process performance. Moreover, we present our concept of a new technology that could considerably improve process performance.