

The Development of Energy Sharing in Industrial Areas of Japan with Pinch Technology

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Chiyoda Corp. is tackling the new business, which aims at from the proposal of the energy-saving enterprise by the energy-sharing between two or more factories, such as industrial area, to realization using the technology of "pinch technology."

1. Energy sharing in the industrial area by pinch technology

(1) "Industrial area wide version" Pinch technology"

In recent years, it is a common understanding in Japan that there is little room for further energy reduction in the major industrial sites such as oil refining and petrochemicals.

We, Chiyoda, thought that there should be a new possibility for further energy reduction if we combine some sites so that the waste heat of one site may be still useful for another site.

This idea was accepted in the New Energy and Industrial Technology Development Organization (NEDO), an affiliated organization of Japan's government, which sponsored our research "The Development of Energy Sharing in Industrial Areas of Japan with Pinch Technology" for three years from 2000 fiscal year to 2002 fiscal year.

We have applied Pinch Technology to analyze the energy system in a single site until now. In the research project we have studied the possibility of the expansion application of the pinch technology to be used for the energy-sharing analysis between two or more sites in industrial area since the energy system is required and useful for all the sites. That is, we have done the research and development for developing the "industrial area wide version" Pinch technology.

(2) Large theoretical energy-saving room

In the research, we selected "Chiba industrial area" which is one of the major industrial areas in Japan, and cooperation of a total of 20 companies (23 sites) was obtained and carried out from three blocks in Goi, Anegasaki, and Sodegaura in Chiba industrial area.

According to the result, it became clear that there is a large theoretical energy-saving room -- crude-oil conversion -- about 640,000 kL(s)/a year exists at the whole Chiba industrial area by optimization of energy system. This is equivalent to one day on amount of crude-oil consumption in Japan.

(3) Energy-sharing project

Development of an energy-sharing project proposal was performed based on a little more than 1200 sets of the heat exchanger data offered from all the sites, the argument with the sites was

repeated to narrow down the available heat exchangers for the feasible proposals, and eventually eight project proposals constituted from a little more than 30 sets of heat exchangers were devised. The amount of energy saving rate of the eight projects was 90,000 kL(s).

Furthermore, adding the evaluation of economical efficiency with cooperation of the corresponding sites, it was narrowed down to the leading project proposal, consequently amount of energy saving rate little mote than 10,000kL was obtained as an energy- sharing proposal for two sites, Fuji oil and Sumitomo Chemical.

This project obtained the NEDO's support and was materialized by the business plan for three years after the second half in 2003 fiscal year.

(4) Study for the industrial areas in Japan

After the Chiba industrial area, with "Industrial area wide version" Pinch technology" we have done the energy-saving investigation projects under contracts with NEDO in the Mizushima industrial area and Kashima industrial area from finding the theoretical energy saving room to devising the energy-sharing proposals from 2002 to 2004 fiscal year.

According to the investigation projects, it became clear that there is a large theoretical energy-saving room, Mizushima industrial area has "two days" on amount of crude-oil consumption in Japan and Kashima industrial area has "1.2days". Moreover, the energy-sharing projects have been realized from these industrial areas.

We also have done the energy-saving investigation projects in the Ohita industrial area and Ube-Onoda industrial area in 2005 fiscal year.

2 . A future view

It is almost time to renew the plants and equipments at large-sized sites in the industrial areas of Japan because those become over thirty years old after construction.

This is in the situation of arguing about the countermeasures against the updating time of the aging equipments as the so-called "bath tub curve tendency" in the industrial areas of Japan. It is necessary to provide a drastic policy of the grand design for the industrial areas as early as possible considering their future.

However, it is not easy for one company or one site to decide on a new investment independently in the present economic situation.

It is thought that the solution would be applied to progress most smoothly by catching the updating time of aging plants and equipments aiming at reduction of cost by advancing joint use and accommodation.

We believe that one of the radical measure proposals to such a subject is an "energy-sharing project" as stated above. And it is helpful and useful to provide the optimal system of energy-sharing project with Pinch Technology.

As a further view of the grand design in industrial area, it is necessary to consider what is the best way to use the fuel in the process system in the heavy and large-sized sites, such as oil refining and petrochemicals. We have just started to research what is the ideal scheme for process system from the viewpoint of exergy based on the second rule of the thermodynamics aiming to develop a new tool for an innovative process system. In near future Pinch Technology and the new tool would be useful to provide the grand design proposal for industrial area in using the energy most efficiently.