

Kansha Lab.

[Process Design for Sustainable Energy Society]

Institute of Industrial Science
 Collaborative Research Center for Energy Engineering

<http://www.energy.iis.u-tokyo.ac.jp/>

Process System Engineering

Exergy Loss Minimization for Industrial Process

To construct a sustainable society, it is necessary to reduce energy consumption in industrial section consuming a plenty of energy in Japan. For this issue, we must introduce energy circulation in industrial processes and minimization of process exergy loss during operation. In this research, theoretical investigation to design such processes is performed.

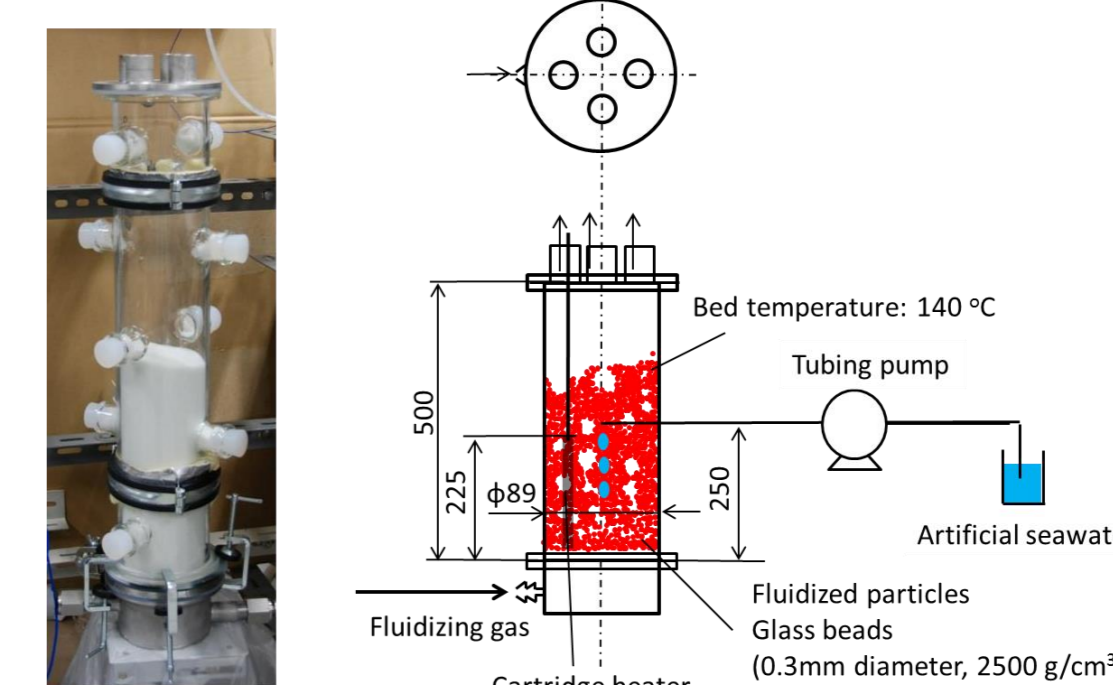
- Exergy analysis of process
- Process design for exergy loss minimization



Exergy recuperative experimental device by magnetocaloric effect



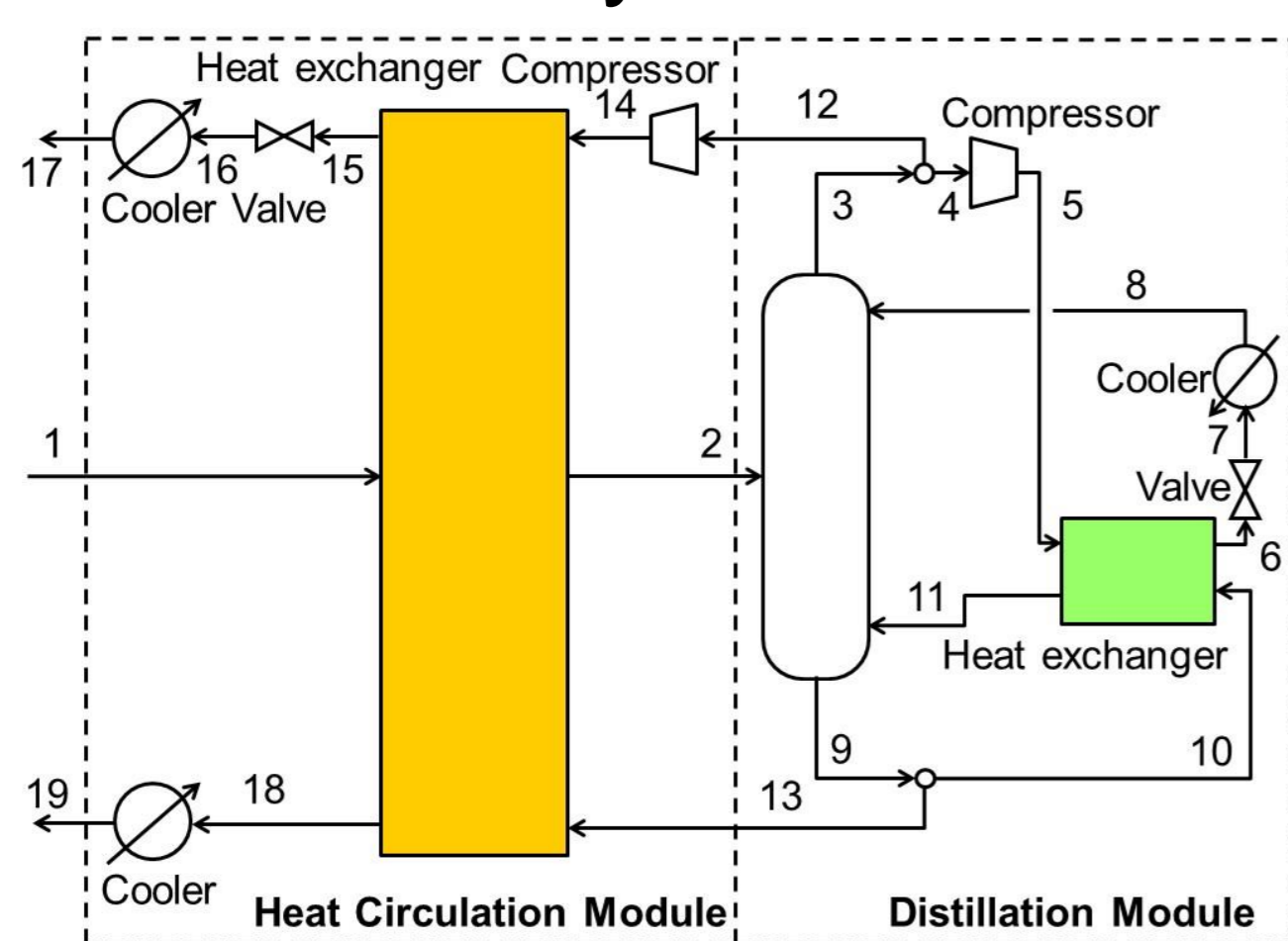
Fluidized Bed Dryer



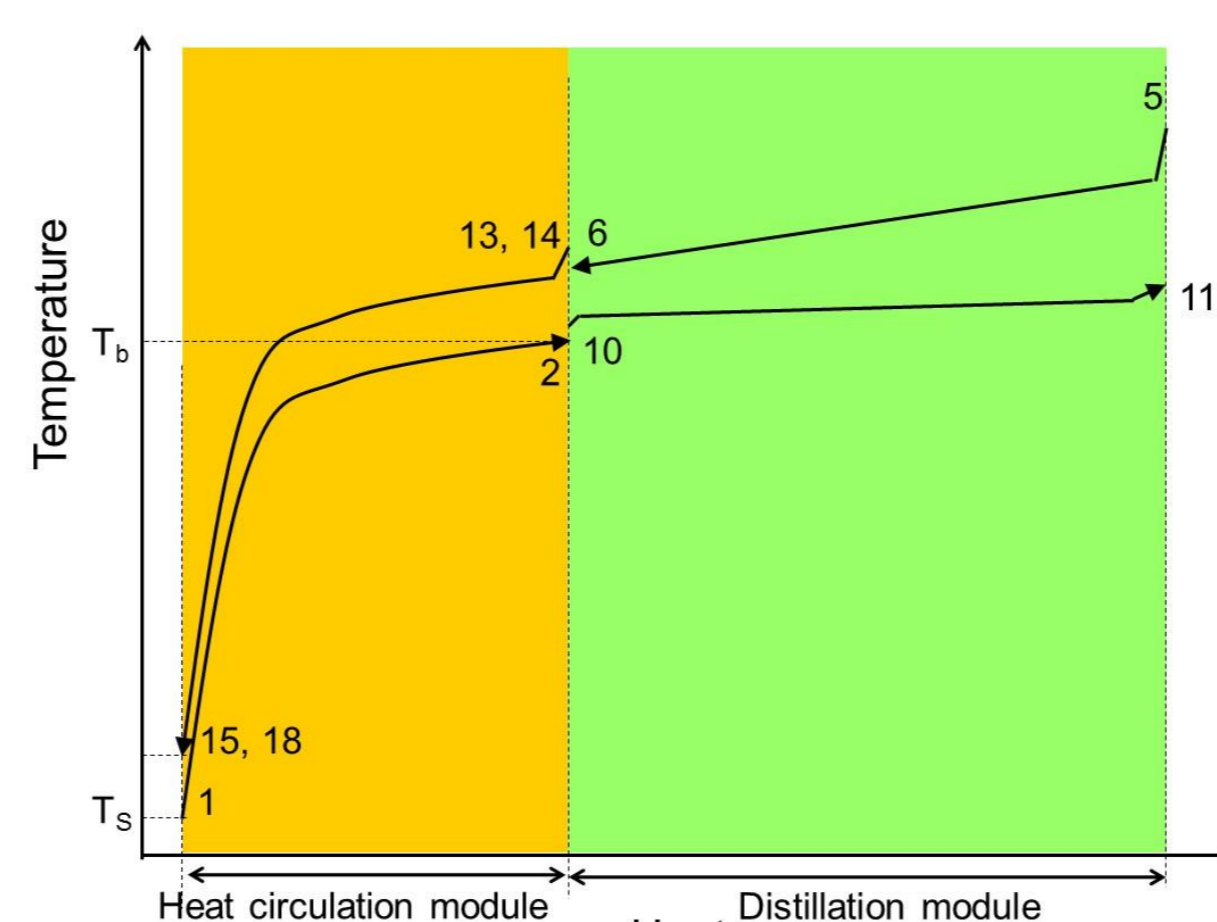
Fluidized Bed Evaporator

Development of Energy and Material Co-production System

The drastic energy saving and minimization of CO2 emission can be achieved by restructuring of industrial structure based on the co-production of energy and material. In this research, the feasibility of this co-production system and new design tools for this system are investigated.



Process flow of self-heat recuperative distillation



Heat-temperature diagram

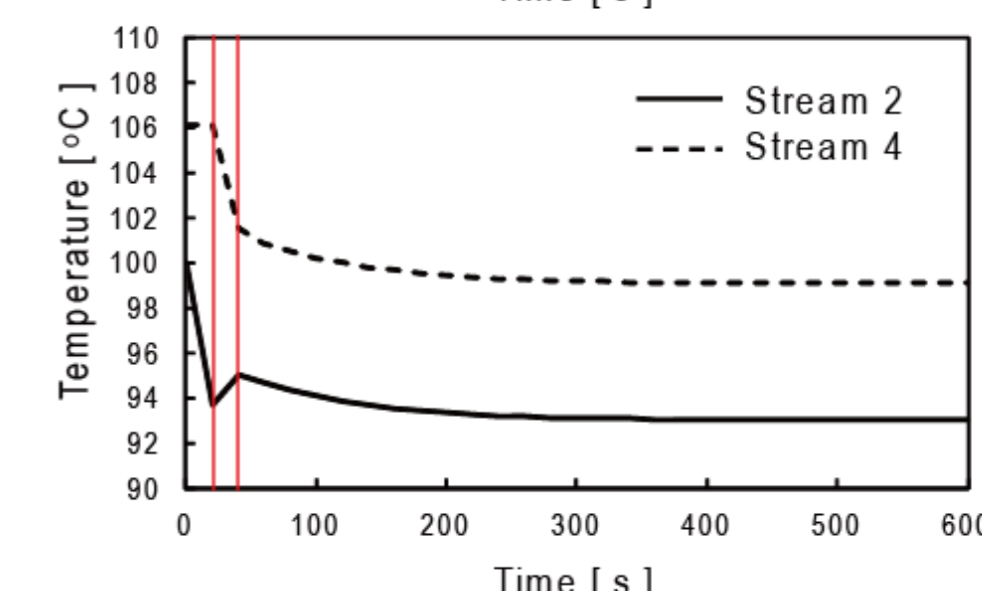
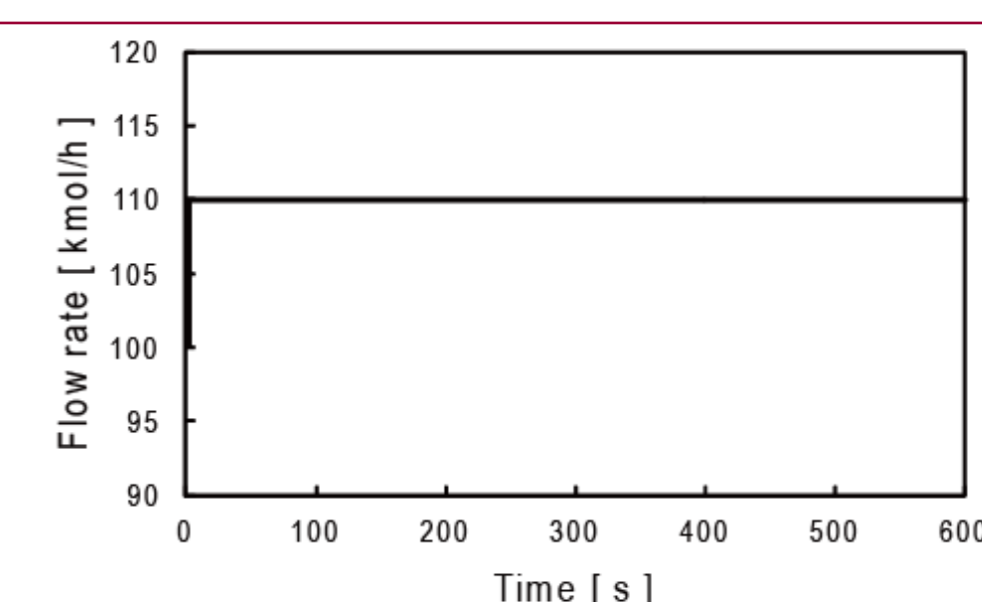
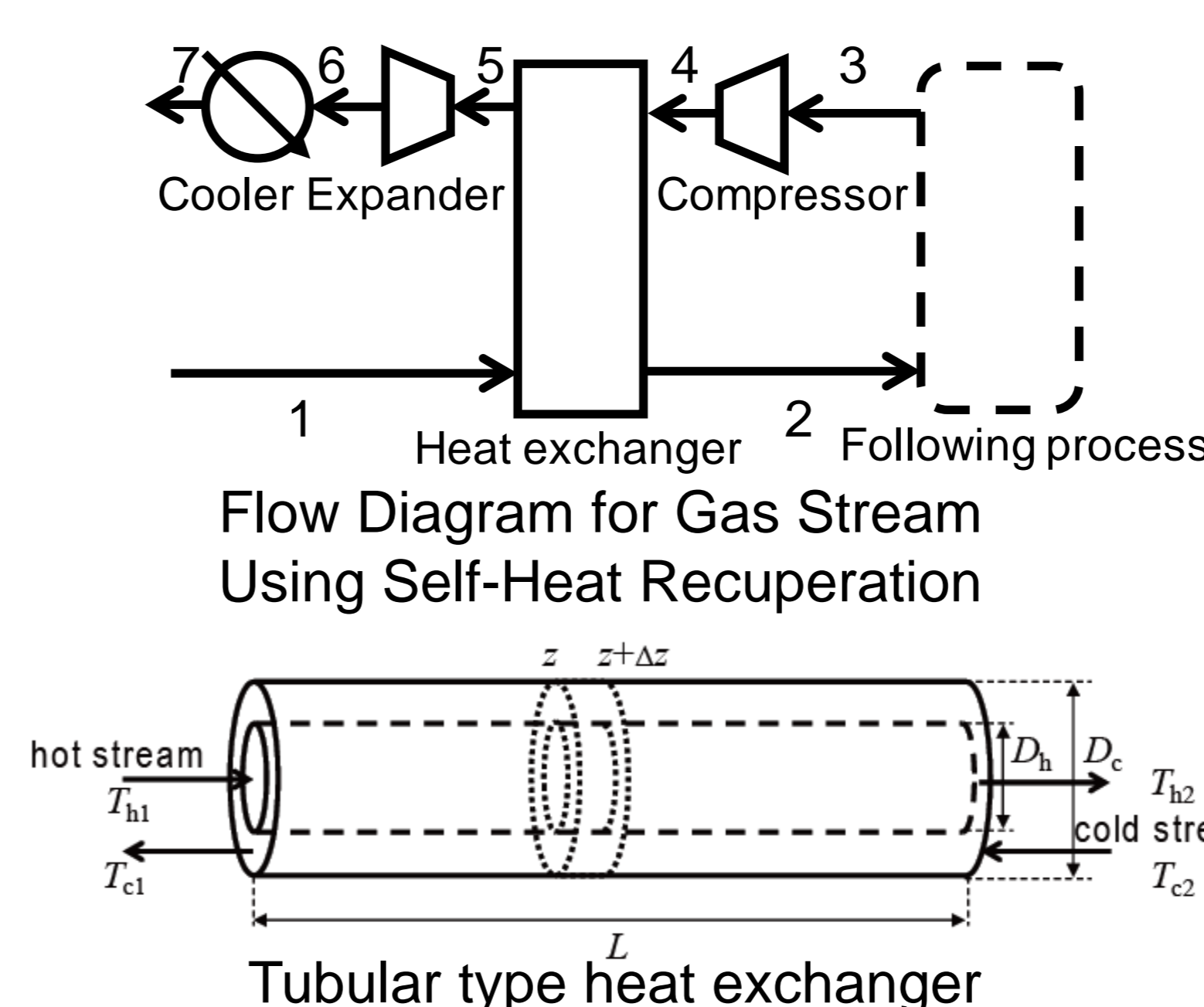


Pilot self-heat recuperative distillation for bioethanol

Nippon Steel Engineering
 Kitakyushu Environmental Technology Center

Process Control

The operation systems of the proposed industrial energy saving processes have been developed for the purpose of safety and high efficiency. Especially, most of chemical plants have difficulty installing new processes due to their nonlinear dynamic characteristics such as reaction. Thus, we are designing a suitable control and operation systems for these new processes in this research.



Step Change of Flow Rate (+10%) and Responses