Technologies for Improving Energy Conservation

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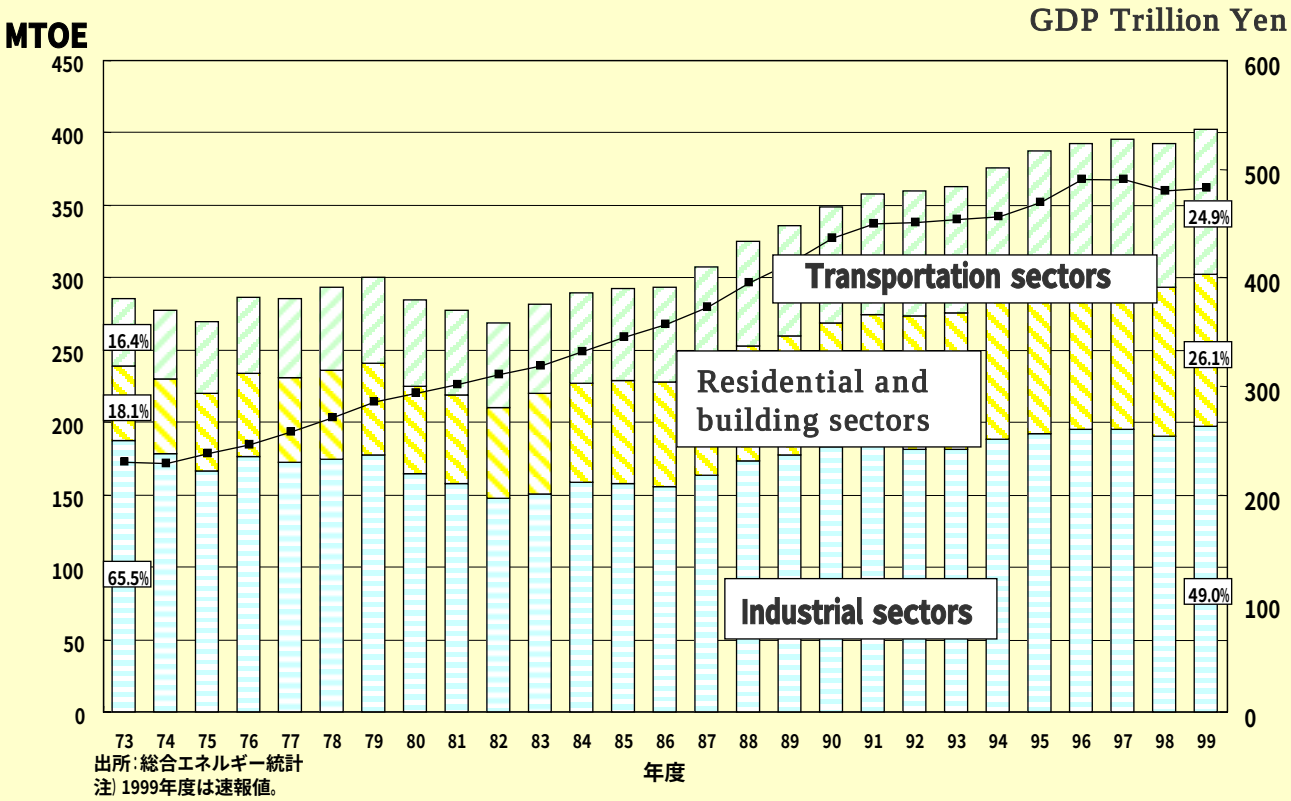
Purpose of Energy Conservation

(1) Prevention of world climate change

(2) To conserve the resource of fossil energy

(3) To conserve the material resource

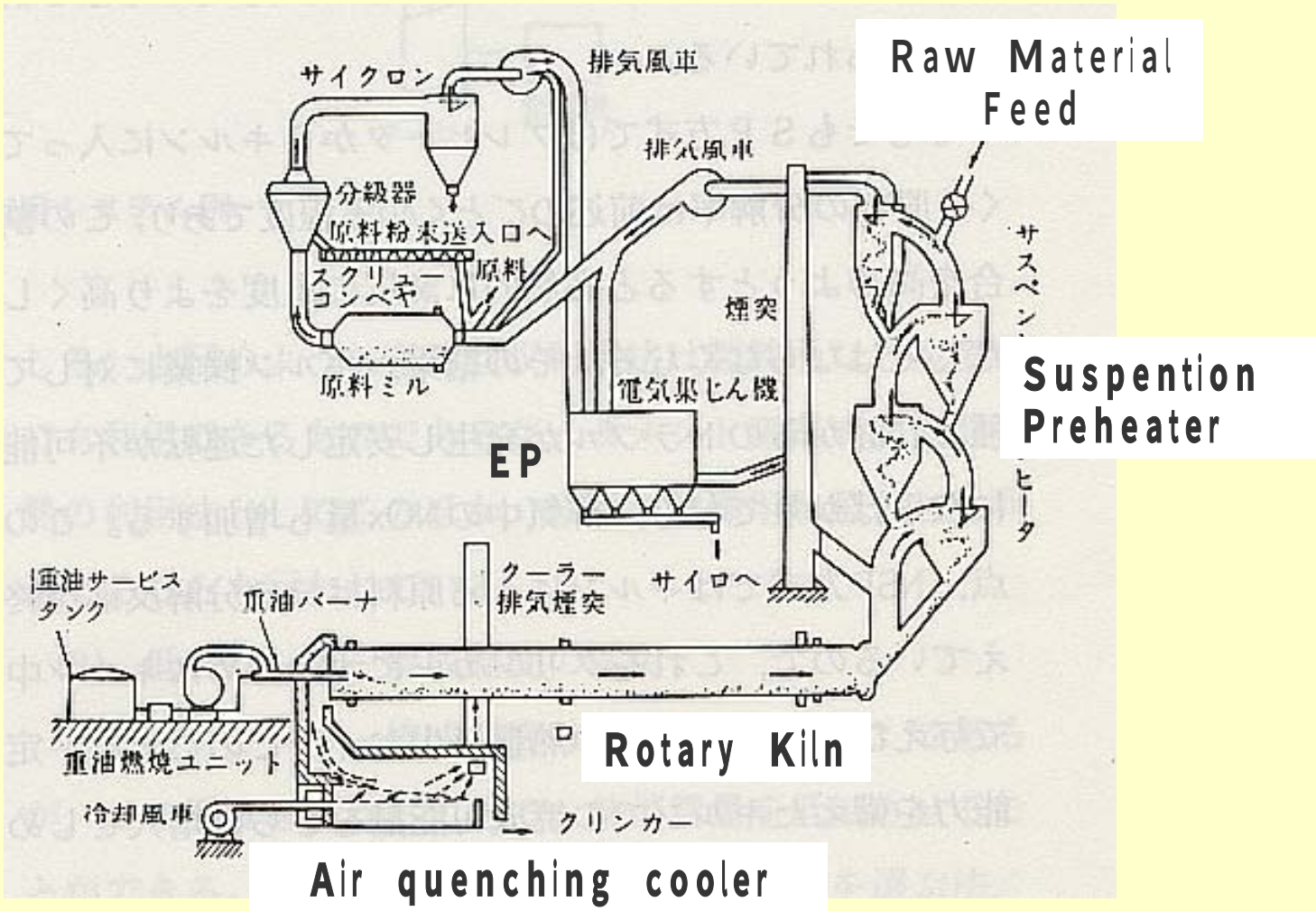
Japanese Annual GDP and Energy Consumption



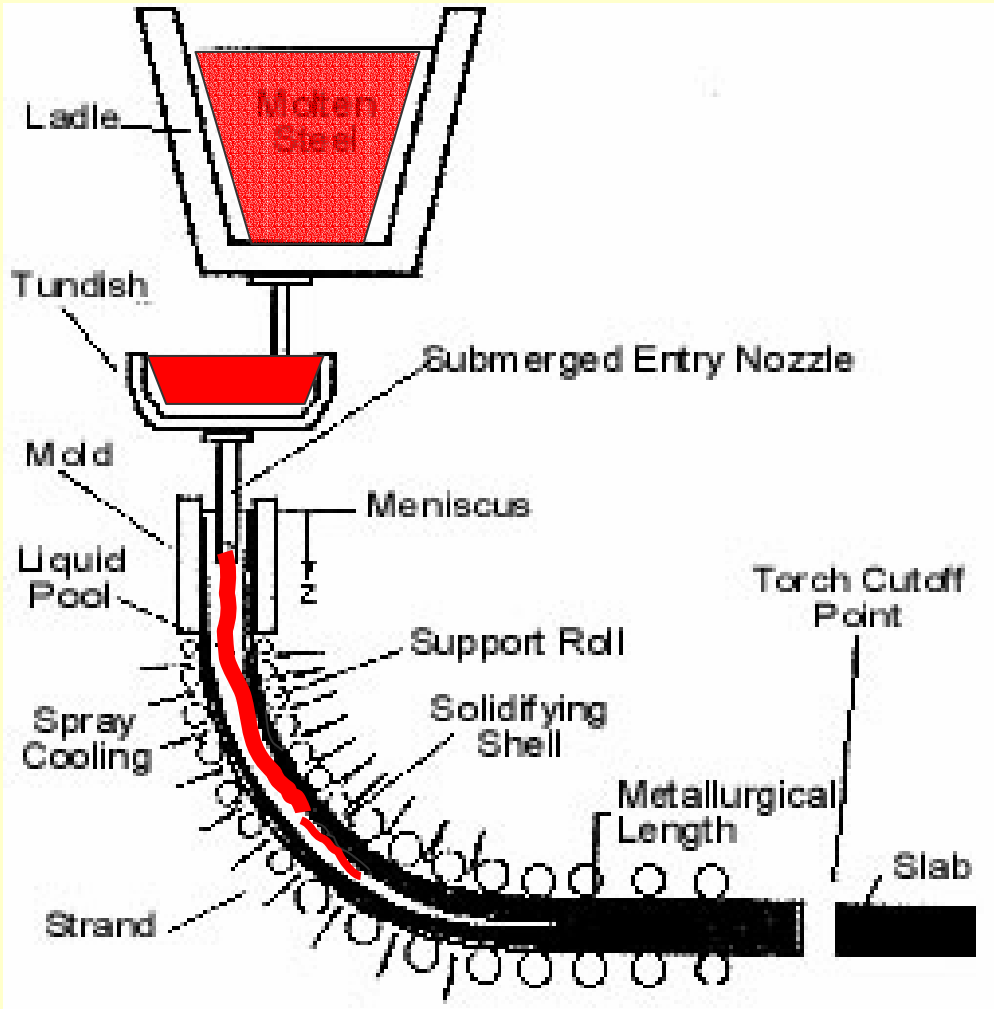
Effect of Measures and Dissemination Rate of Typical Equipment for Energy Conservation

Industry	Decrease of Energy Intensity (94/73)	Typical Energy Conservation Equipment	Dissemination Rate as of 1998
Iron &Steel	29 %	Continuous caster (CC)	100 %
		Blast furnace top gas pressure recovery equipment (TRT)	100 %
		Coke dry quenching equipment (CDQ)	91 %
Petrochemical	58 %	High-efficiency naphtha cracking reactor	100 %
		High efficiency compressor	100 %
		Gas turbine	100 %
Cement	65 %	SP, NSP kiln (Heat recovery)	100 %
Paper & Pulp	61 %	Continuous digester	100 %

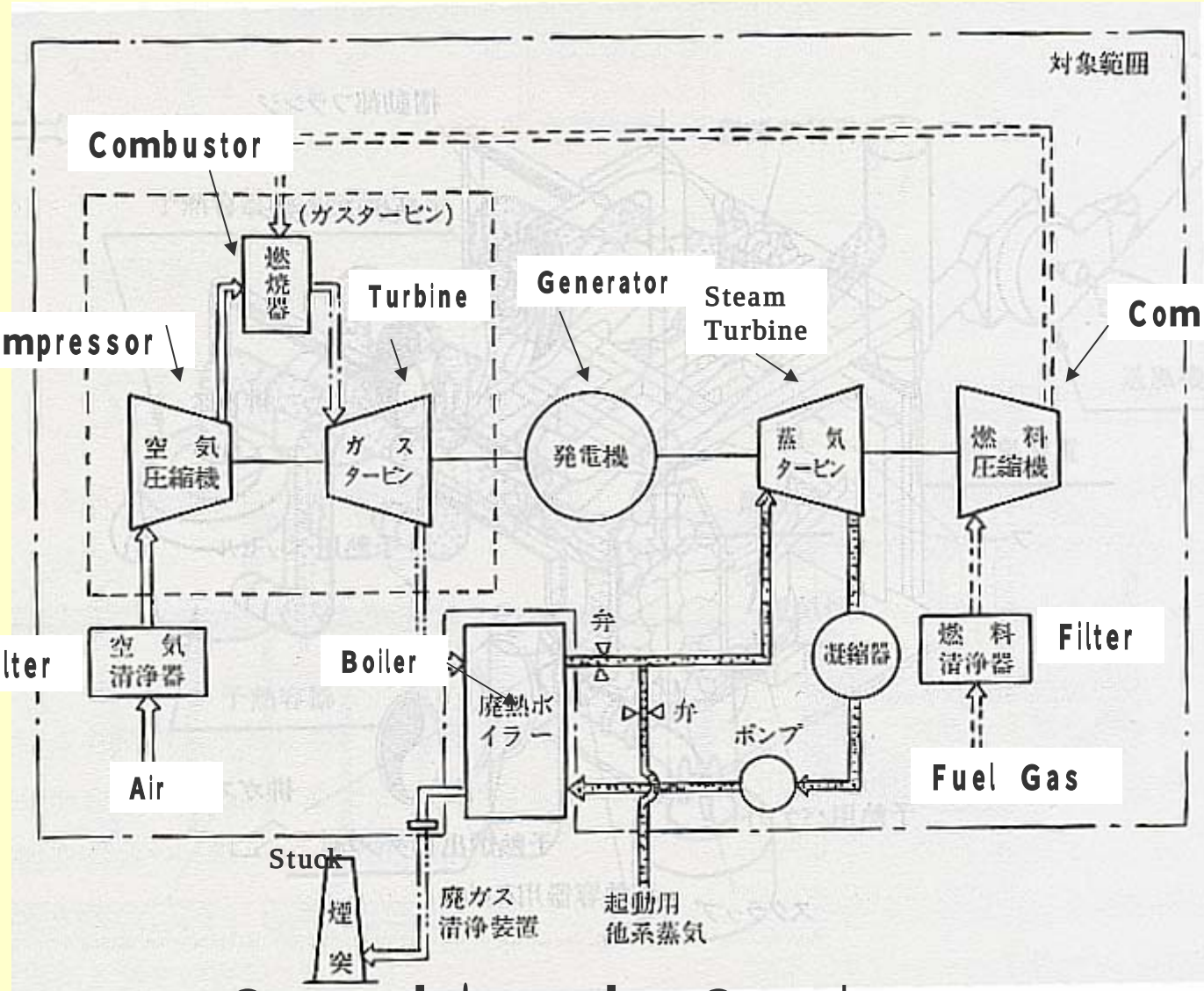
Source : ECCJ



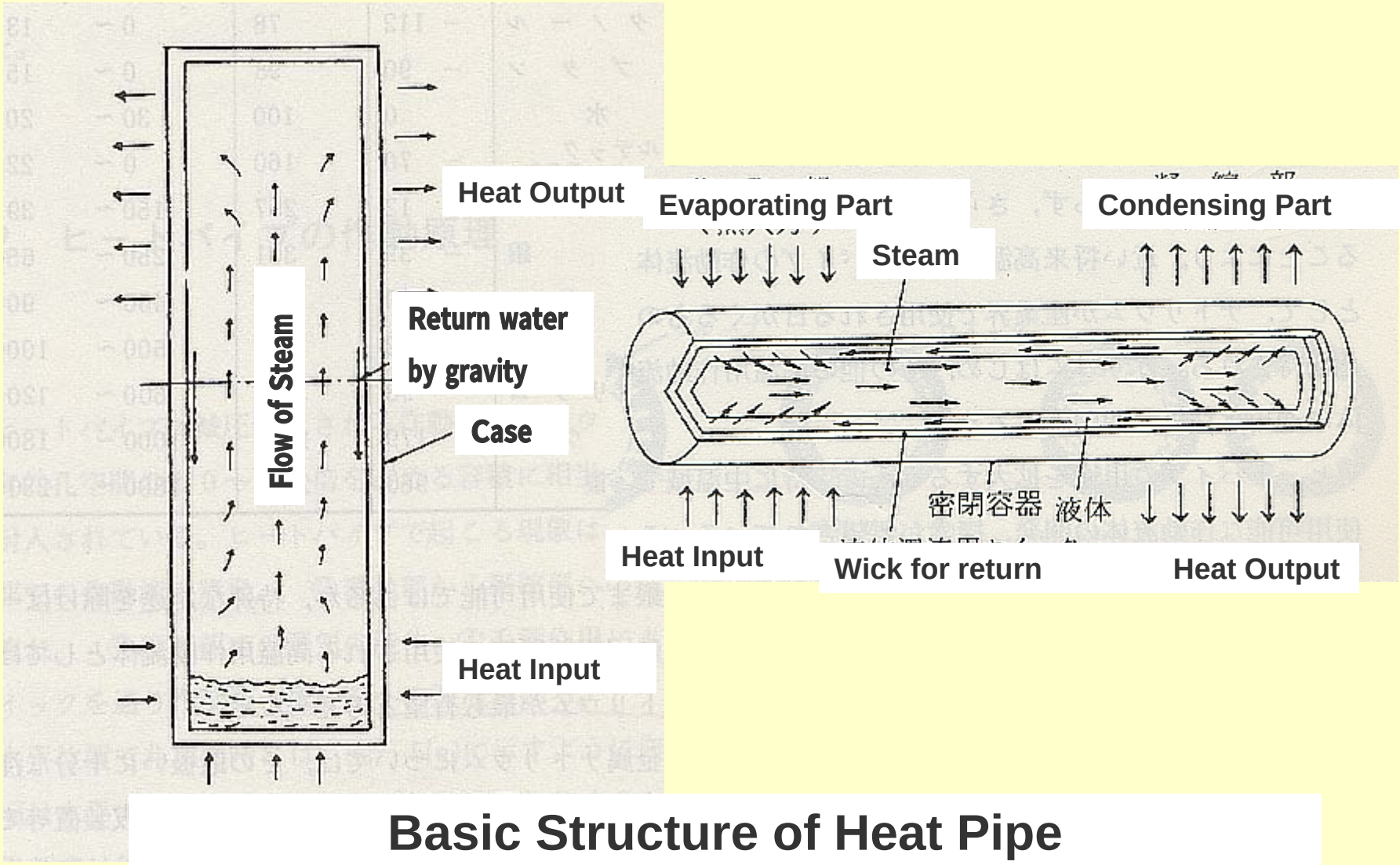
SP, NSP kiln (Heat recovery)



Continuous caster (CC)

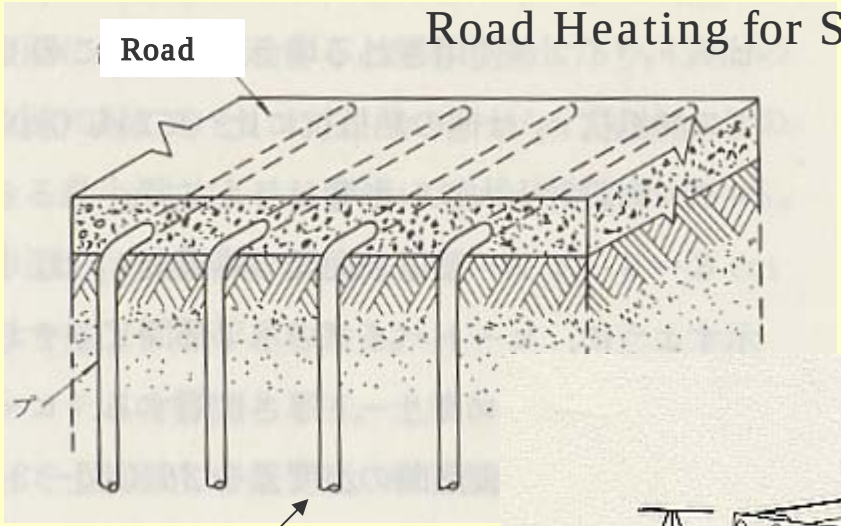


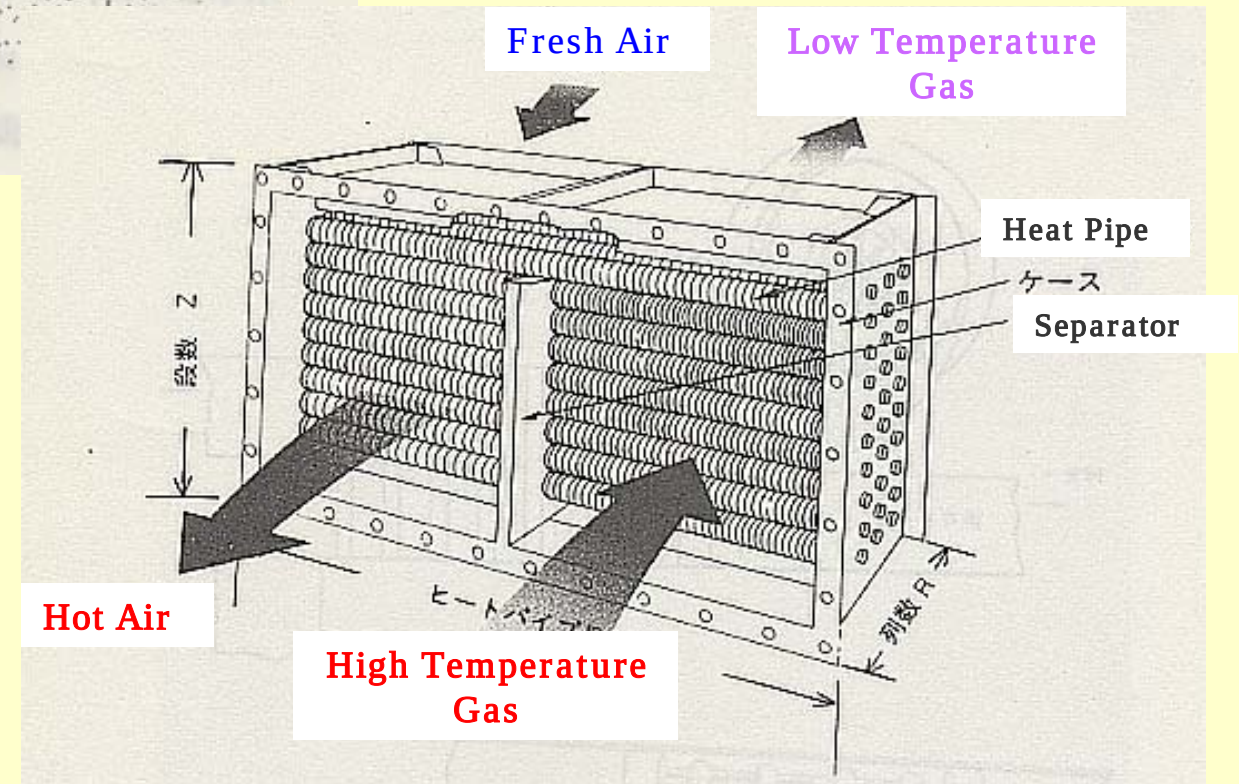
Combined Cycle



Basic Structure of Heat Pipe

Road Heating for Snow Melting





Heat Exchanger for Waste Heat Recovery

Application of Heat Pipe

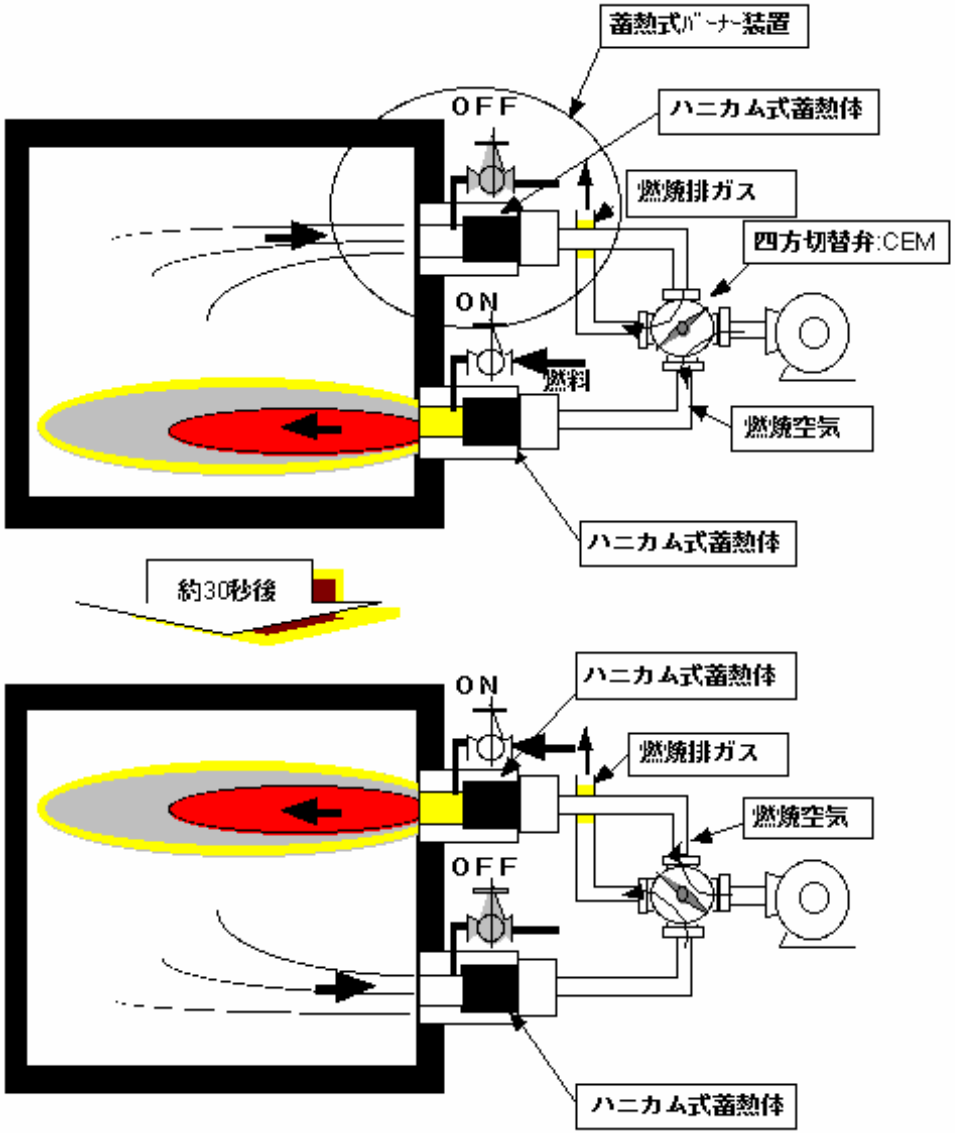
Merit of regenerative burner

* High thermal efficiency(Improvement is usually more than 30%.)

* Uniform temperature profile → high quality products

* Smaller space is needed.

* High production rate (high heat transfer rate)

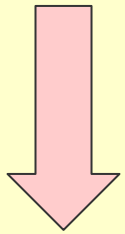


Re-generative Burner System

Energy saving activity in industries

TPM (Total Productive Management)

Activity



Effective Result in Improving Energy Efficiency

(1) Selection of the facilities to make investigation

(2) To make investigation on the facilities System,capacity of power

(3) To make investigation on operation

(4) Measurement on the energy consumption

(5) Analysis of the measured data

(6) To plan how to reduce the energy consumption in the same production capacity

(7) To make manual for the reduction of energy consumption in the similar facilities

Method of energy saving

(1) To measure the total energy balance of the process.
(2) To replace the inefficient machines by more efficient model.
(3) From the energy balance we could find the inefficient part of the process.
(4) Usually we must recover the waste heat and use it in the process.

Measures for energy saving in the industry

(1) Combustion process

(2) Heat insulation

(3) Steam traps

(4) Inverter motor

(5) Cascading of heat utilization

(1) Combustion process

- To improve the excess air ratio
- To recover the exhaust heat to use for air heater or recovery boiler or preheat of material to be heated in the process.
- Replace the burners to re-generative burners

(2) Heat insulation

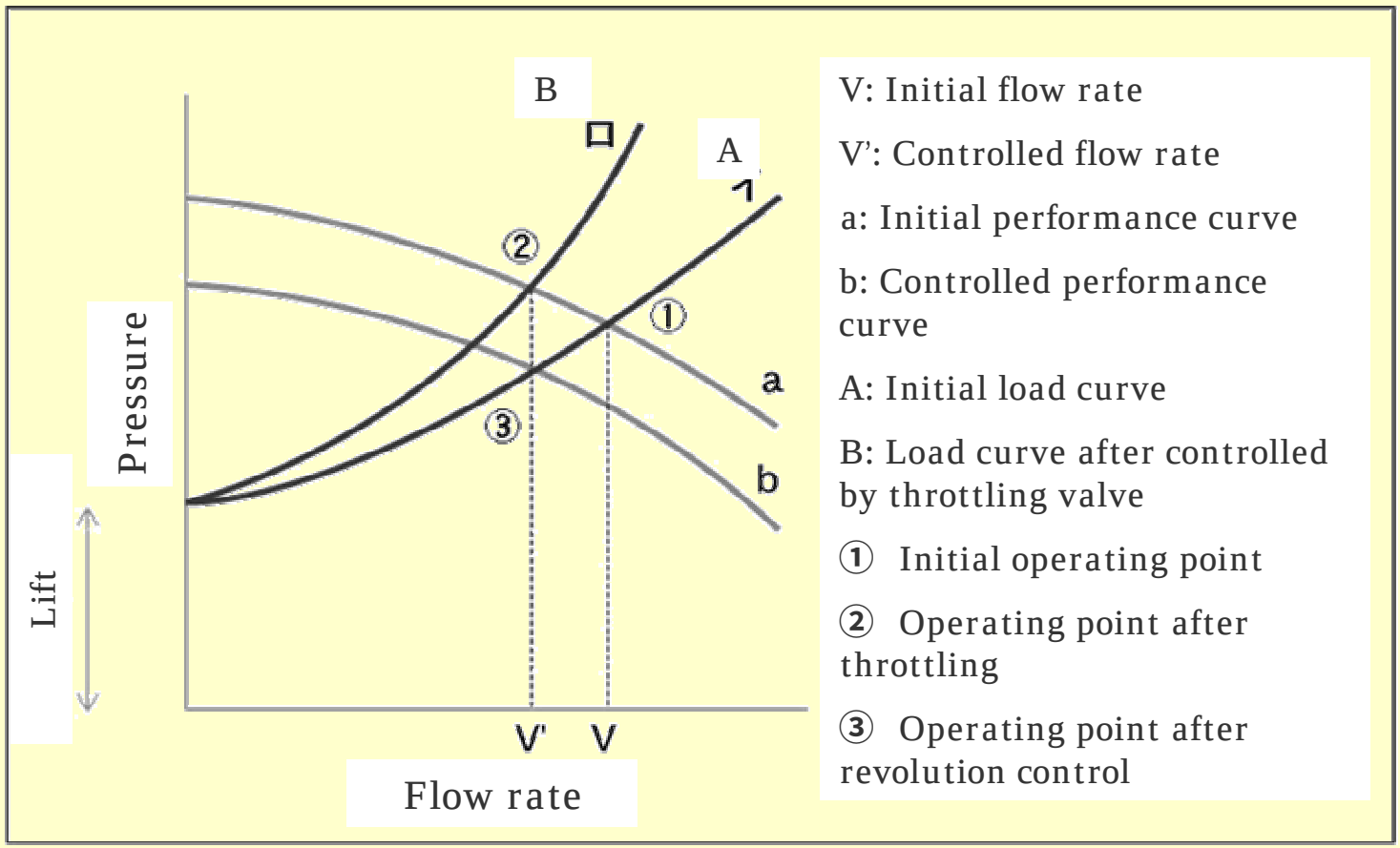
To make heat insulation completely

(3) Steam traps

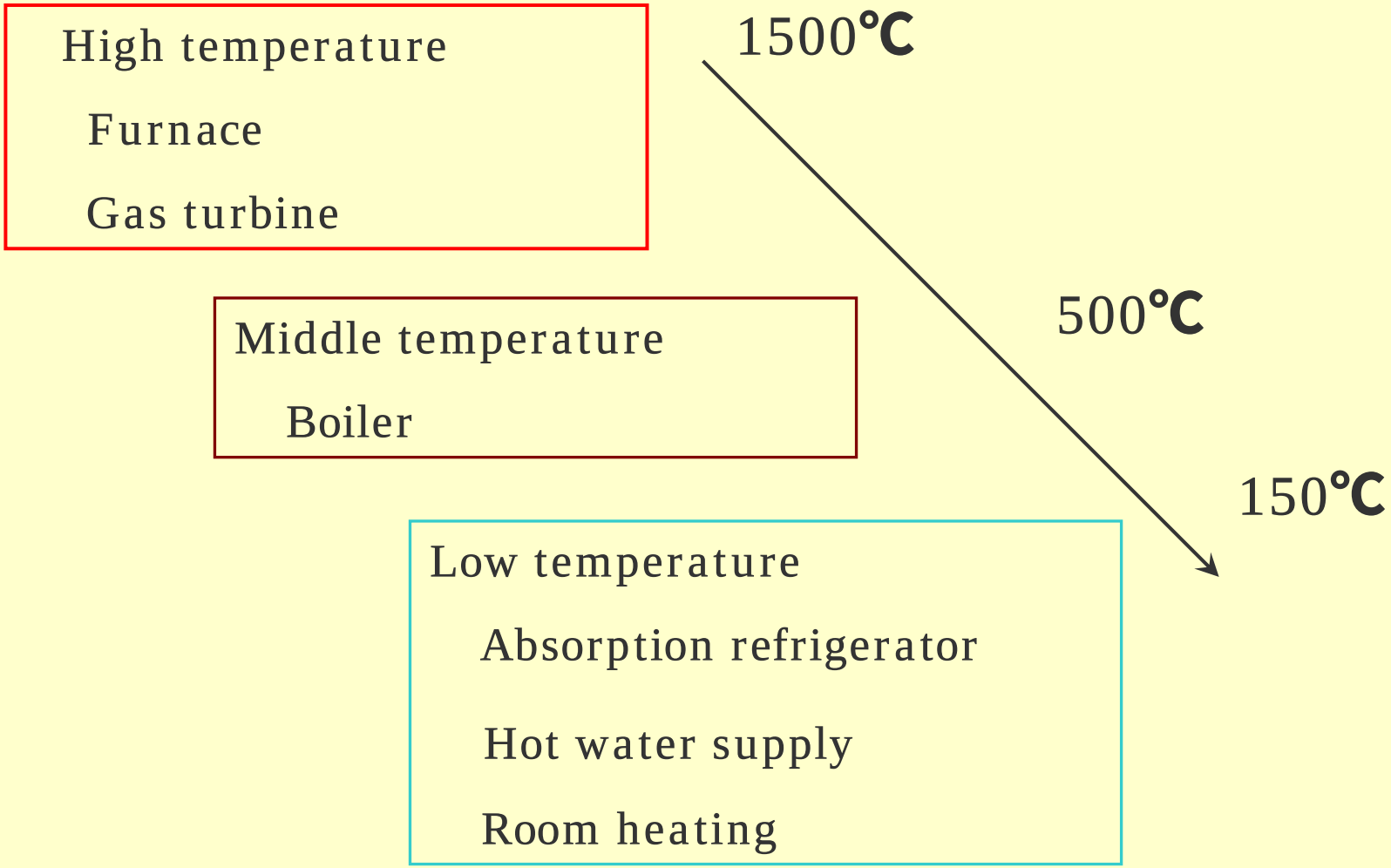
To check the steam traps to reduce the leakage of steam

Leakage tester

(4) To use the inverter motor to control the power of fan, blower and pump to most economical condition.



(5) Cascading of heat utilization



Energy saving by combined process

(1) To use waste heat of the front process in the downstream process

That type of energy using system is named as cascade system.

(2) Combined cycle power generation is the successful example of combined process.

(3) Combined heat and power system is useful for the building using a lot of heat and power such as hotels and hospitals.

Energy saving in the residential and building sectors

- Heat-island phenomena
- Extensive use of OA equipment
- OA machine to be energy saving type
- Control the air conditioner to keep proper temperature.
- Control of lighting

Energy saving in buildings

Reduction of cooling load

solar heat/ insulation/ventilation

Energy saving of circulating pump/fan

Lighting system

Efficient refrigerator

BEMS

Energy saving in transportation sector

Fuel efficient car model(shifting to small size car)

Hybrid car, electric car, fuel cell car.

Idling stop mechanism

Reducing traffic jam

Using public transportation

Energy saving in waste disposal

Three R in waste management,
Reduce,
Reuse, and
Recycle
are important before landfill and incineration of waste material.

Strategy for Energy Conservation Technology

Four priority points

- Needs oriented
- Development with marketing strategy
- Innovative point of view
- Spill-over of the technology

Direction of strategy in Commercial and residential sector

・Thermal energy use both for improvement of residential quality and thermal efficiency

(1) Direction of improvement in Commercial sector

・Efficient HVAC and lighting system

・Higher performance Building

・New energy saving technologies in accordance with improved OA equipment

(2) Direction in technology for transportation sector

- lower fuel consumption rate by higher performance
- New technology of innovative new fuel
- Infra structure for efficient use of motor cars

(3) Direction of development in industrial sector

- Reduction of fixed energy consumption

(for example:energy for clean room, air conditioning, hydraulic power source etc.)

- improvement of elemental and general-purpose units
- Energy saving looking at heat demand

⑷ Spill-over of technologies throughout the various demand sectors and technical fields

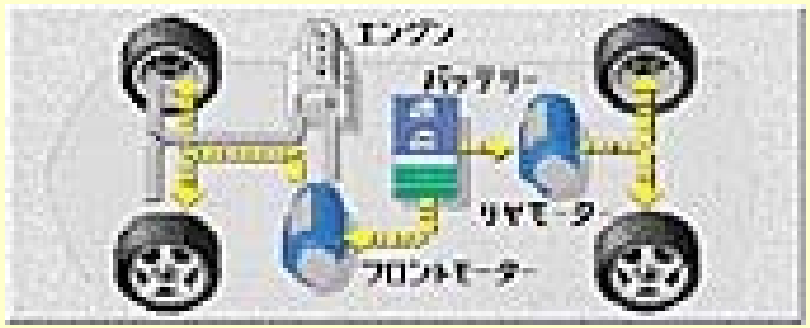
- Spill-over of technologies throughout various demand sectors
- Spill-over of advanced technologies in industrial sector to the commercial and residential sector
- Spill-over of technologies throughout the various technical fields
- Spill-over of basic technologies such as high efficient component units to the wide area of applications

Sho-ene Taisho 2001
(The energy conservation Prize)

Awarded Products

(1)Automobile section

- Hybrid car (mini-van and bus)
- Ultra low fuel consumption car
- Eco tire
- Nox treatment system for GDI engine



Sho-ene Taisho 2001
(The energy conservation Prize)

Awarded Products

(2)Business section

- Metal halide lump
- Commercial use air conditioner
- Copying machine
- Semiconductors for Switching power source
- Gas fired water heaters for business use

Sho-ene Taisho 2001
(The energy conservation Prize)

Awarded Products

(3)Residential use section

- Refrigerator with triple cooling system
- Heat Pump using CO2 as refrigerant
- Ink-Jet printer
- Digital copying machine
- Fluorescent lamp
- Oven range
- Self-ballasted fluorescent lamp
- Circulator
- Inverter type range hood

Trend of technologies found in recent “Sho-ene Taisho ”(1/2)

1. Introduction of high performance inverter

2. Improvement of heat exchanger,both heat transfer coefficient and heat exchanging surface

3. Higher performance of heat pump by improvement of compressor performance through higher machining accuracy

4. Using high efficiency motor with strength permanent magnet or low resistance coil

5. To shorten the time of start-up and time till shifting to energy saving mode

Trend of technologies found in recent “Sho-ene Taisho”(2/2)

6. To reduce the energy loss in power converter

7. Recovery of latent heat

8. Energy recovery such as hybrid car

9. Reduce the loss by expanding the control range to cover the wide range load change

10. Reducing the energy for production by improving the recycle ratio

Characteristics of Energy Saving

- Total technology with wide background
- New idea will be found for each site
- Application of technology to deferent area of energy using can be possible
- Endless effort is needed and it leads you to the very high level energy conservation

Concluding comment

* Energy conservation is for the global environment
* Energy efficient equipment should be used
* TPM is effective policy for energy conservation in industrial sector
* Human resource for energy conservation activity
* NEDO carries out important roll in new energy conservation technology