SANKI ENGINEERING CO., LTD.

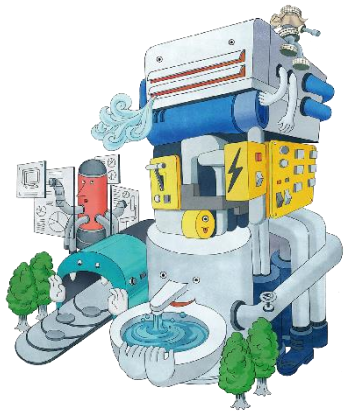
https://www.sanki.co.jp/

COP29 JAPAN PAVILION

Trans-Heat Container System: energy saving and CO_2 reduction

November 20, 2024

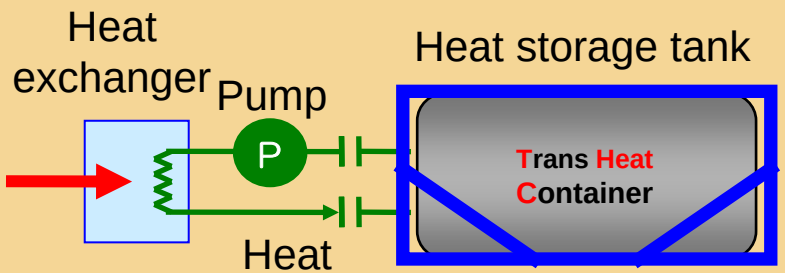
1. What is Trans-Heat Container System
(abbreviation : THC)



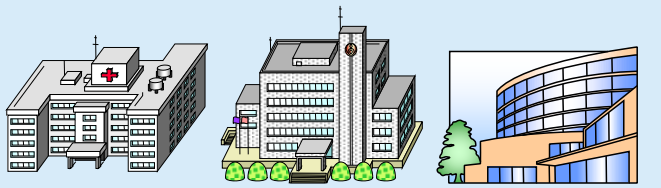
Overview of the THC System

Heat Source

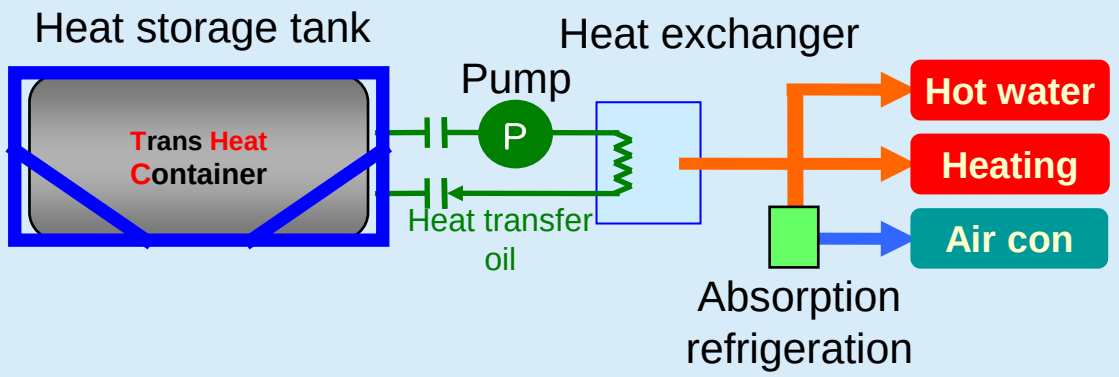
Waste incineration plant



Heat User



Hospitals Offices Gymnasiums



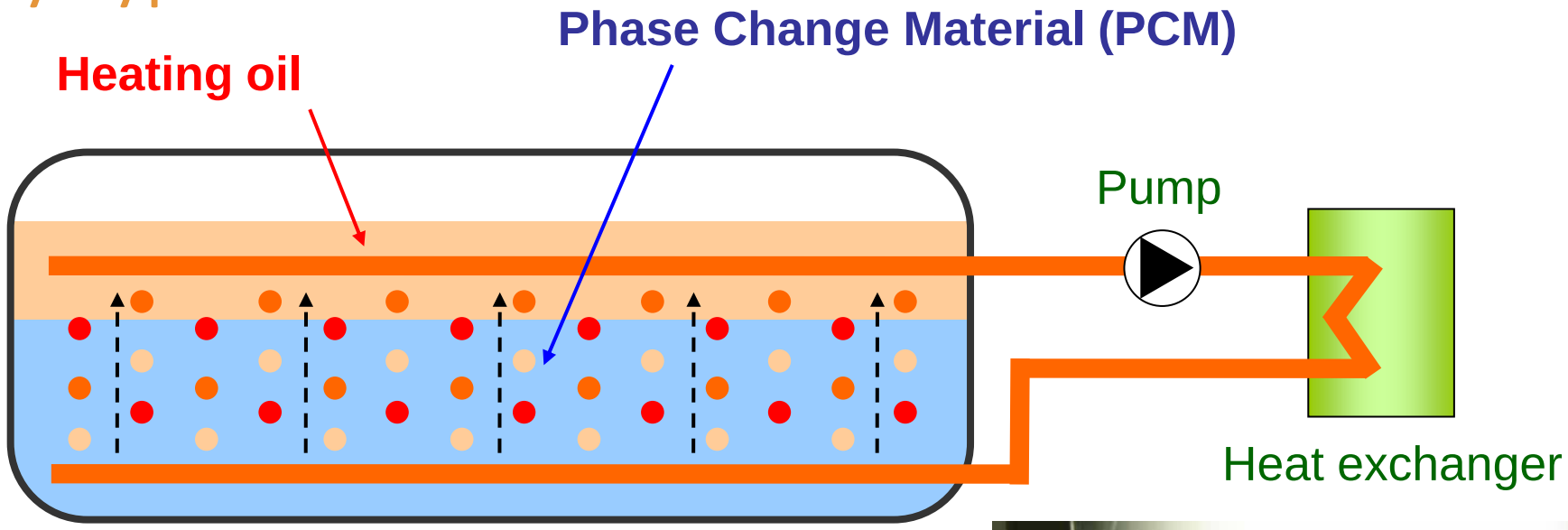
Phase Change Material（PCM）

- PCM suited to unutilized heat under 200℃
- Not poisonous and not hazardous material
- Commercially available material (≒low-cost)

PCM Type	Melting Point ℃	Heat of fusion	Heat Souce	Heat Application	
		kJ/kg	Temp ℃	Supply Temp ℃	Utilities
Sodium Acetate Trihydrate（$CH_3COONa \cdot 3H_2O$）	58	260	Over 90 Min 70	Less than 45	Hot water,Heating
Erythritol（$C_4H_{10}O_4$）	118	340	Over 160 Min 140	Less than 110	Hot water, Heating, Cooling※

※：Heat source for the absorption - refrigerator

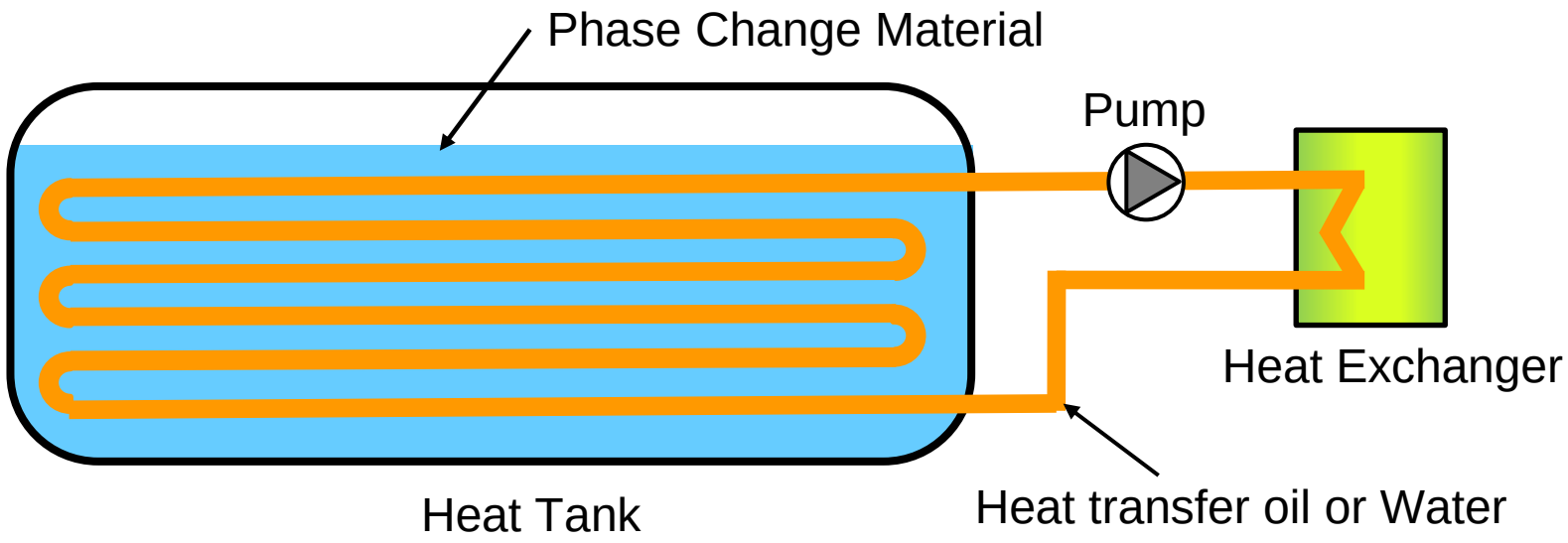
Large Capacity Type



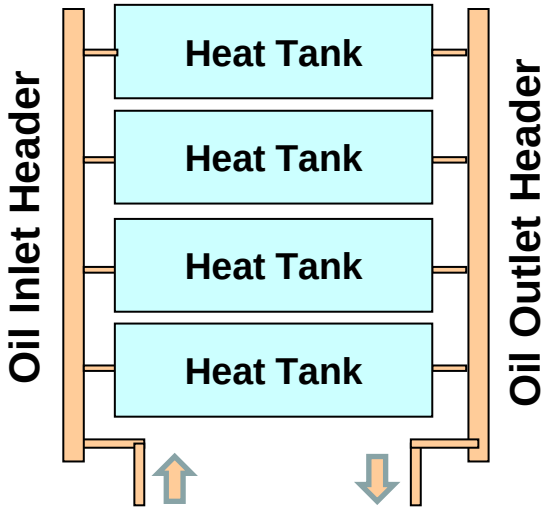
○ **Heat tank**
- Heating oil is directly contact PCM
- PCM and heat transfer mixture are separated by weight
- PCM: Solid at room temperature, liquid upon heated
- Heating oil: Transfers heat between the PCM and the heat exchanger

○ **Storage and release through heating oil circulation**
- Storage: PCM changes from solid to liquid
- Release: PCM changes from liquid to solid

Standard Type



- **Heat tank**
  - Shell and Tube heat exchanger
  - Heat medium does not directly contact PCM
  - Heat medium: Transfers heat between the PCM and the heat exchanger
- **Feature**
  - Heat container does not need to keep horizontal
  - Some units joining for necessity of heat capacity



2. Large Capacity Type Reference

Reference of Large Capacity Type




Location	Aomori pref	Okinawa pref	Gifu pref	Tottori pref
System	Transtport system	Transtport system	Transtport system	Stationary system
Heat source (Waste Incinerator)	Industrial waste incinerator	Industrial waste incinerator	General waste incinerator	Factory
	Steam 1.96MPa	Steam 1.96MPa	Hot water about 68～75℃	Hot water about 70～80℃
Recipient (Heat user)	①Aomori Fish Farm	Kariyushi Kanna Thalasso Laguna	Municipal hospital	Factory
	Warm water warming (Charged Temp.80℃)	seawater warming	heating ,ot water supply	heating and others
	②Private hospital	Supply temp.: Approximately 70℃	Supply temp.: Approximately40～50℃	Supply temp.. Approximately 50℃
	heating and hot-water supply (Approximately 70℃)			
Transportation distance	①Approximately 20km ②Approximately 10km	Approximately 28km	Approximately 3km	—
Phase Change Materal	Erythritol	Erythritol	Sodium Acetate Trihydrate	Sodium Acetate Trihydrate
Charged Temp.	Up to 145 ℃	Up to 145 ℃	Up to 75℃	Up to 70℃
THC introduction number	1.4MWh×2	1.4MWh×3	1.1MWh×2	1.4MWh×2
	1.1MWh×1			

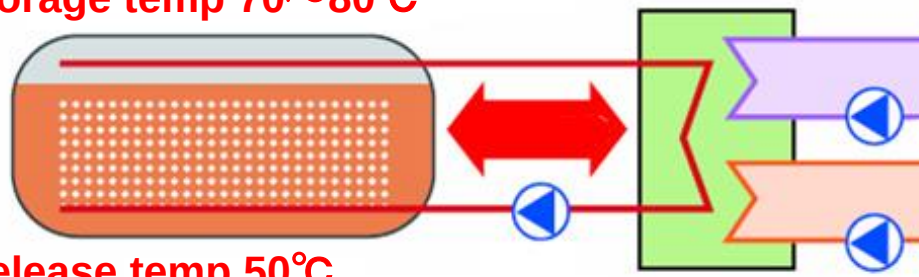
2.1 Stationary Type

Reference of Stationary Type (spring 2008～)

Mineral Water Factory

Low temp heat was exhausted in the past
Heat is collected from production line

Storage temp 70～80℃

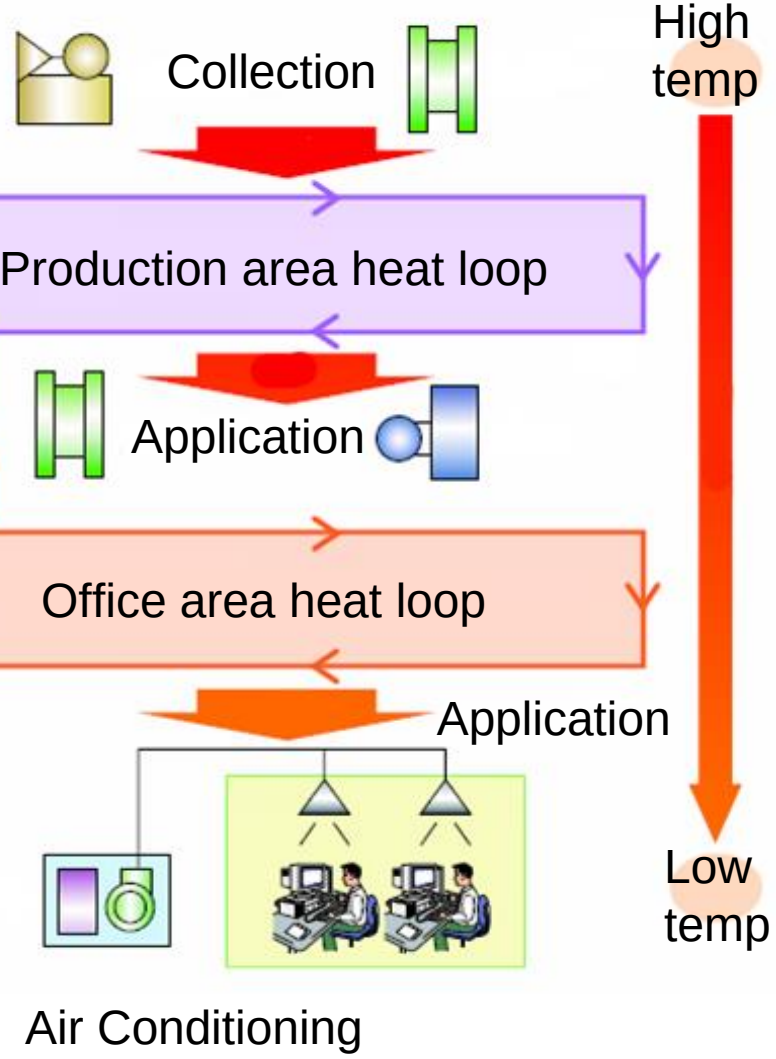


Release temp 50℃

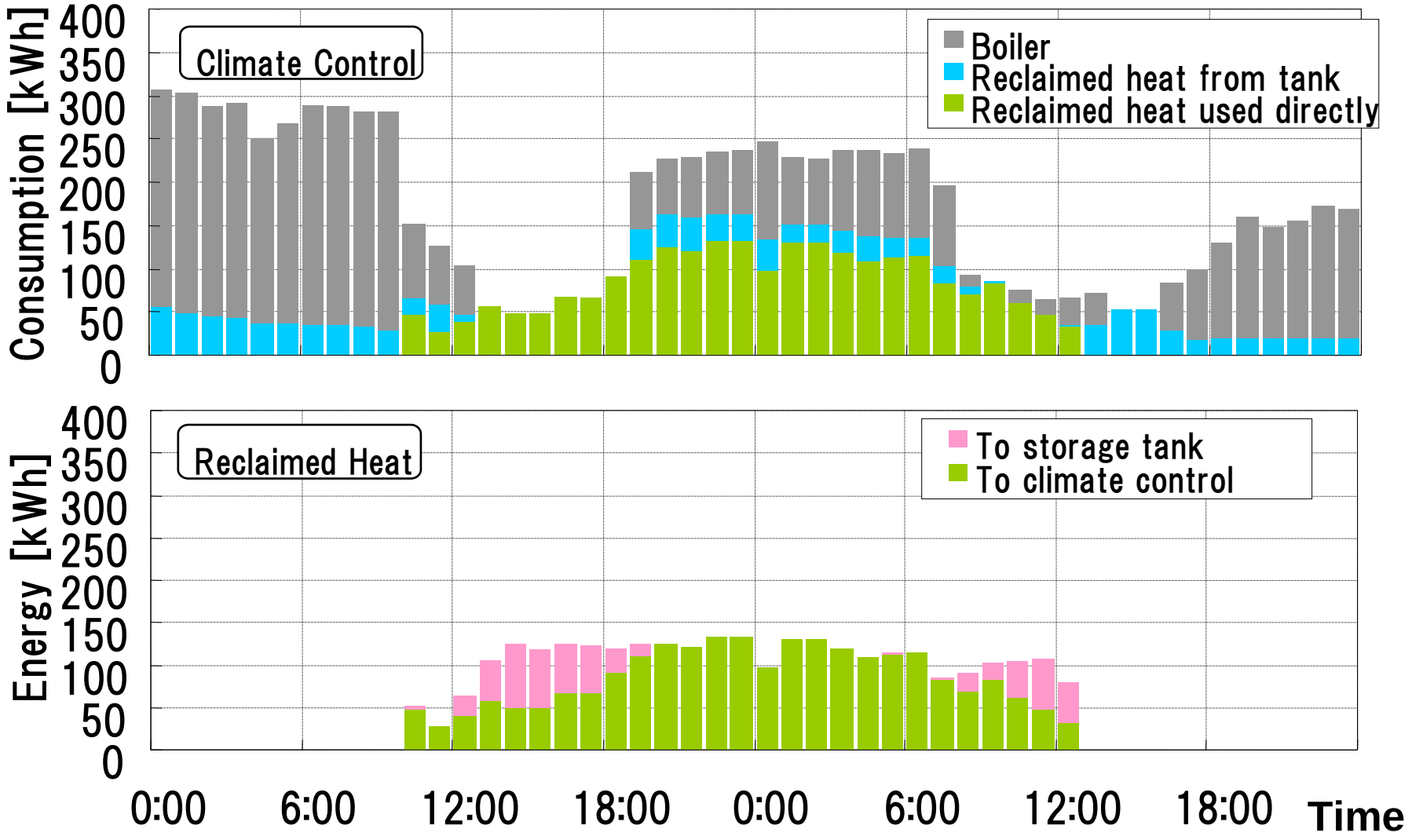
PCM: Sodium Acetate Trihydrate
Capacity: 2 x 1.4MWh tanks

As thermal energy may be stored, time differences of collection and usage does not matter.

Operational Record 2008/10 - 2009/9	
Waste heat	7,092 GJ/ year
Collected heat	5,062 GJ/ year



Energy Reduction at Stationary Type



3. Standard Capacity Type Reference

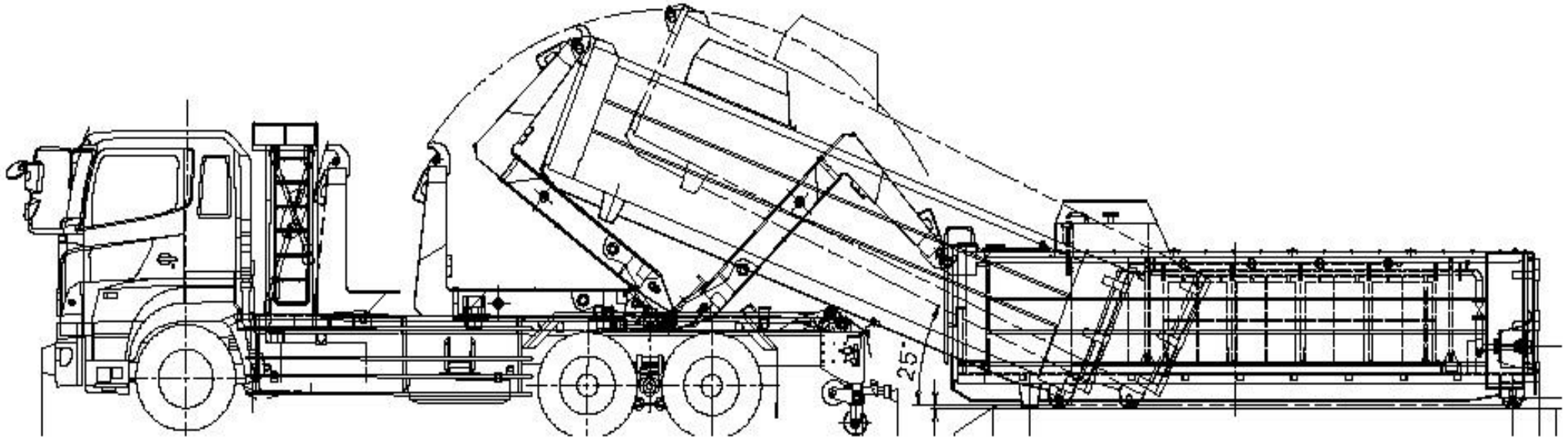
Reference of Standard Capacity Type





Location	Mie pref	Toyama pref	Shimane pref
System	Transtport system	Transtport system	Stationary system
Heat source (Waste Incinerator)	Industrial waste incinerator	Industrial waste incinerator	General waste incinerator
	Steam 1.96MPa	Steam 1.96MPa	Hot water about 68～75℃
Recipient (Heat user)	Sunpia Iga	Plant Factory	Municipal hospital
	Warm water warming (Charged Temp.80℃)	Water warming for air conditioning	Road heating
	heating and hot-water supply (Approximately 70℃)	Supply temp. Approximately 40～80℃ (Approximately 15℃ during summer)	Supply temp. Approximately40～50℃
Transportation distance	Approximately 11km	Approximately 3km	Approximately 3km
Phase Change Materal	Erythritol	Erythritol	Sodium Acetate Trihydrate
Charged Temp.	Up to 145 ℃	Up to 145 ℃	Up to 75℃
THC introduction number	0.5MWh×1	0.5MWh×2	0.35MWh×2

3-1　Transport Type



Reference: Mie Prefecture

<Heat source>

MIE CHUOH KAIHATSU Co.,Ltd.

●Industrial Waste Incinerator
Excess heat from industrial waste incinerator Surplus steam 0.5MPaG

THC： 10t tank×1
PCM：Erythritol
Heat capacity：0.5 MWh

Distance
11km

2011～2013… Ministry of Environment Subsidy

<Heat Receipient>

Hill Hotel Sunpia-Iga

●Hot-Spring facility
hot water supply, supply temp. about 65℃

< Demonstration >

Term 2014/5～2015/1

Operation From Monday to Saturday 1/day

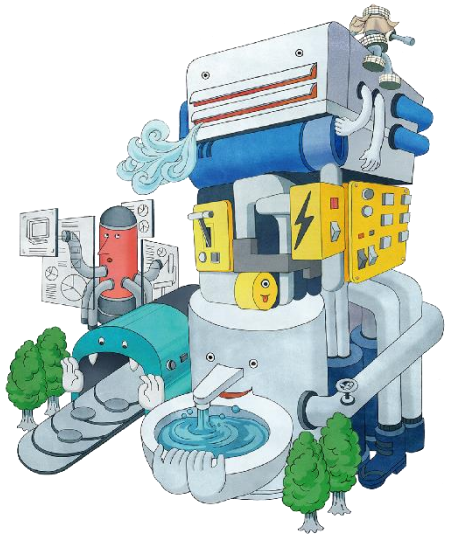
The number of transport 161times

< Practical use >

Term 2015/10～continuing at present

Operation From Monday to Saturday 1/day

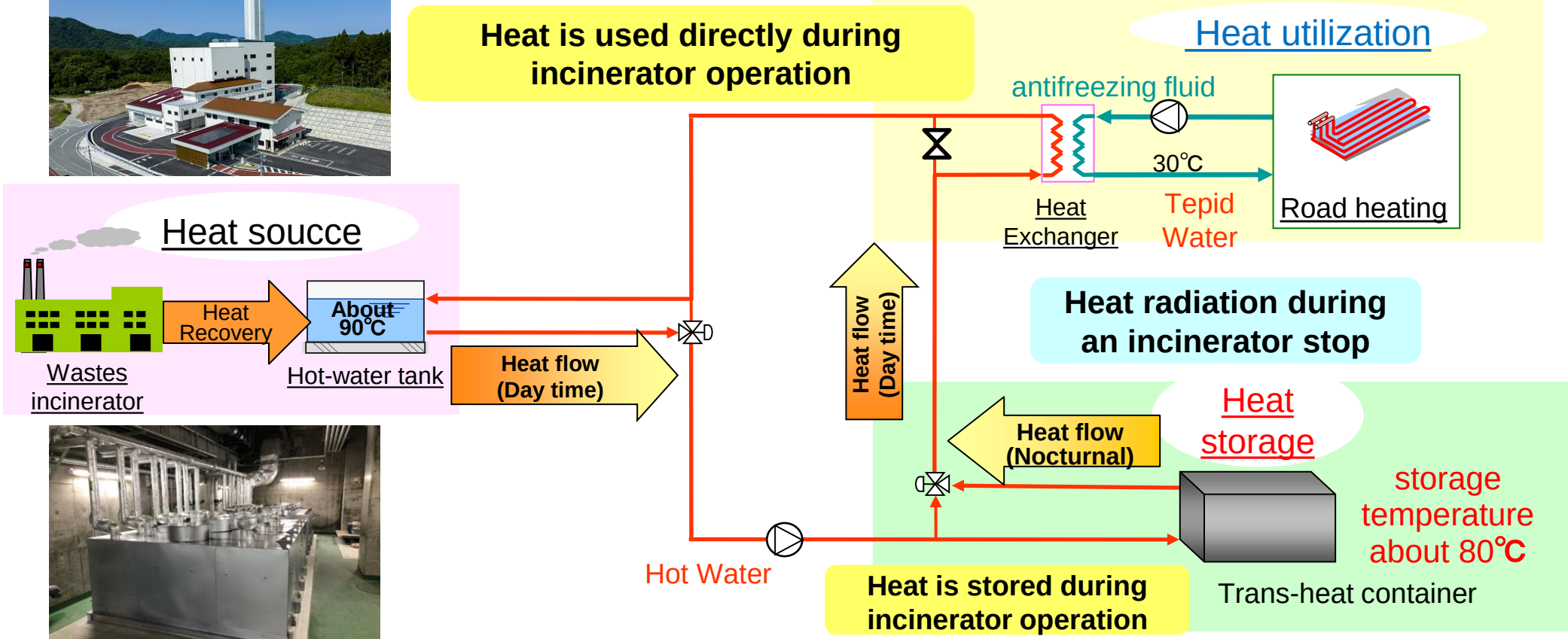
3-2. Stationary Type



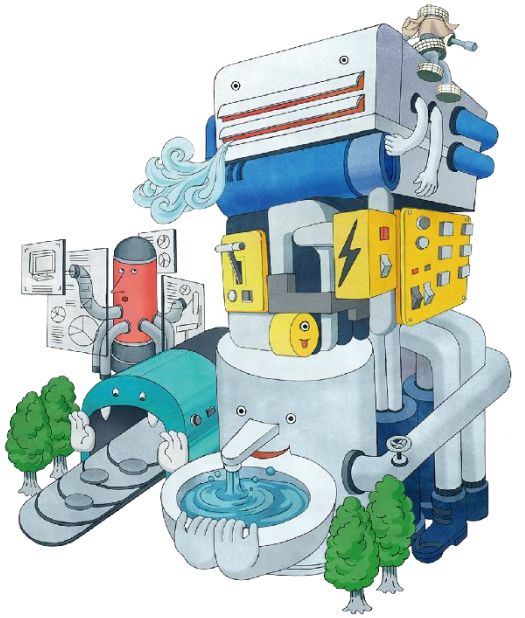
Standard Capacity Type

Shimane Pref.

PCM：Sodium Acetate Trihydrate
Available heat capacity：0.35MWh/unit×2units



4.Conclusion



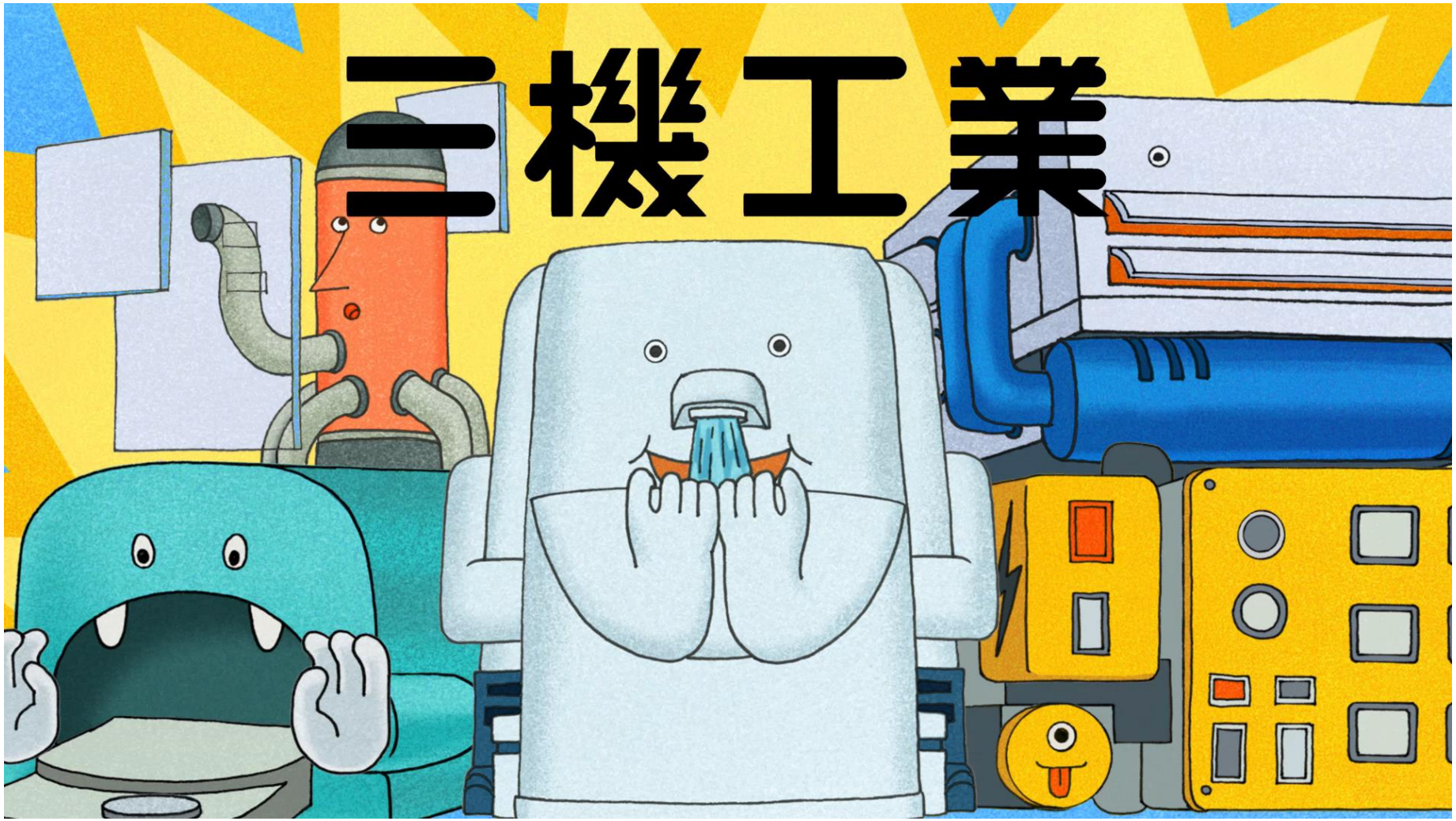
CONCLUSION

- Latent heat storage provides an efficient and stable heat supply for hot water or room heating.
- Transport system contributes to reduction of CO_2 emission.
- Feasibility of the system is influenced by traffic regulation, road condition, driver cost and so on.

If driverless vehicle is authorized near future, feasibility of this system will expand dramatically.

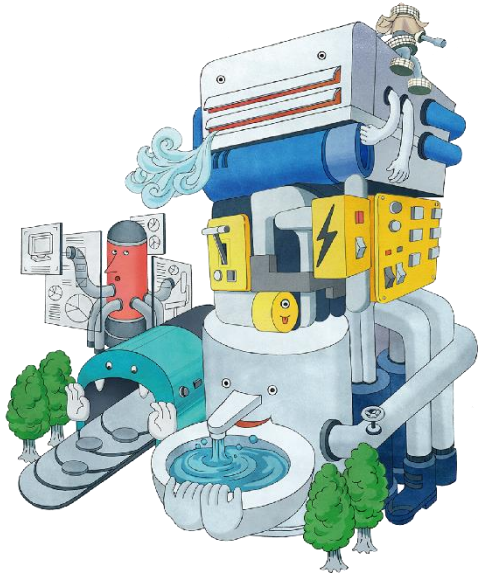
This development has been carried out with the support of the Ministry of the Environment.

COMFORT MADE SUSTAINABLE BY SANKI



Thank you for attention

Please visit our HP
https://www.sanki.co.jp/



SANKI ENGINEERING CO., LTD.

Avatar：Vidnoz AI

References: Driving status

Reference in AOMORI (Spring 2008～2014)

Heat source
Waste Incinerator

Excess steam from industrial waste incinerator.
Temperature: 140℃

Containers: 2 x 24t
PCM: Erythritol
Maximum heat capacity: 1.4MWh

Distance
20km
(12.4miles)

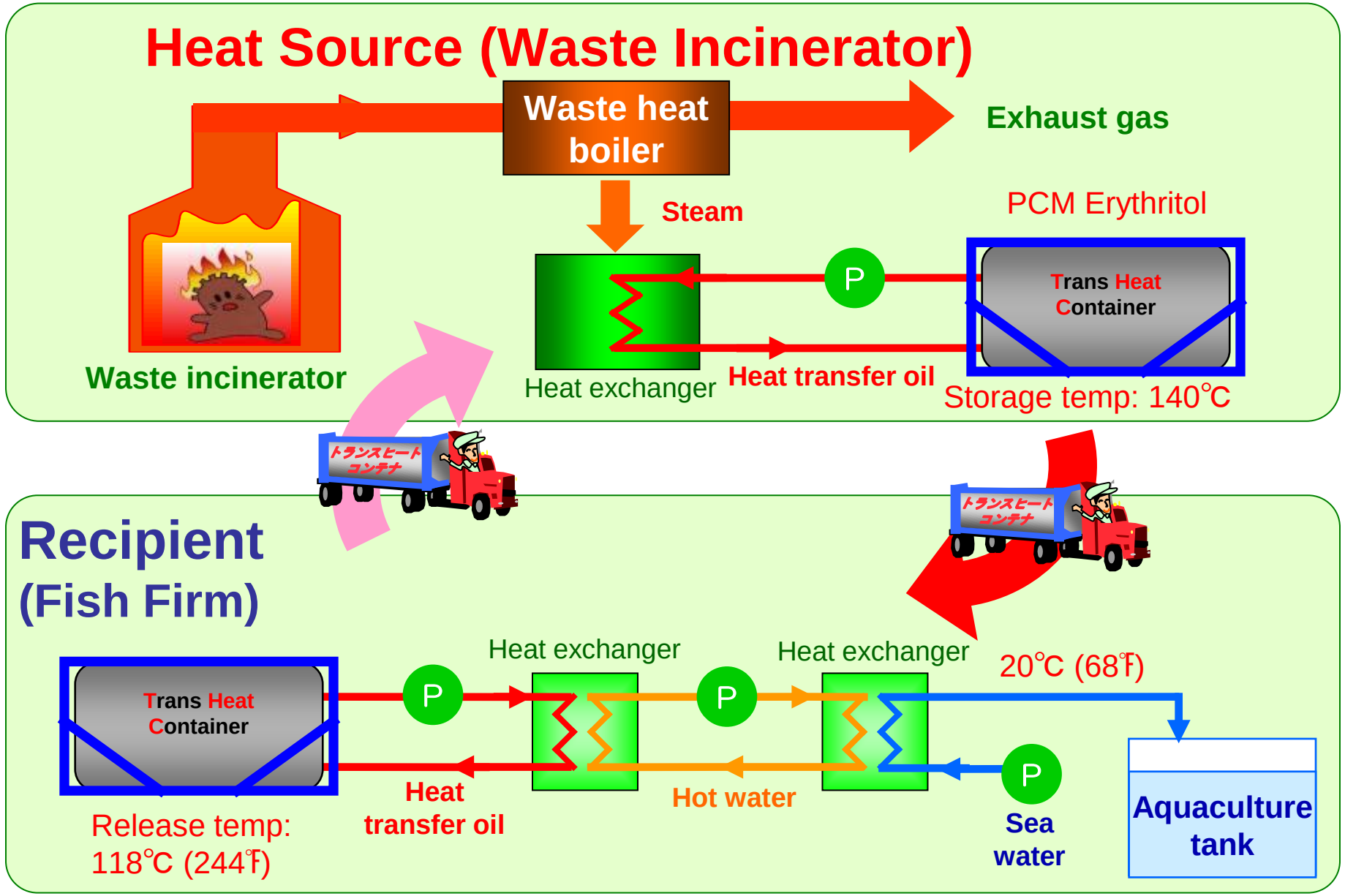
Recipient (heat user)
Fish Firm

Warm sea water up to 20℃

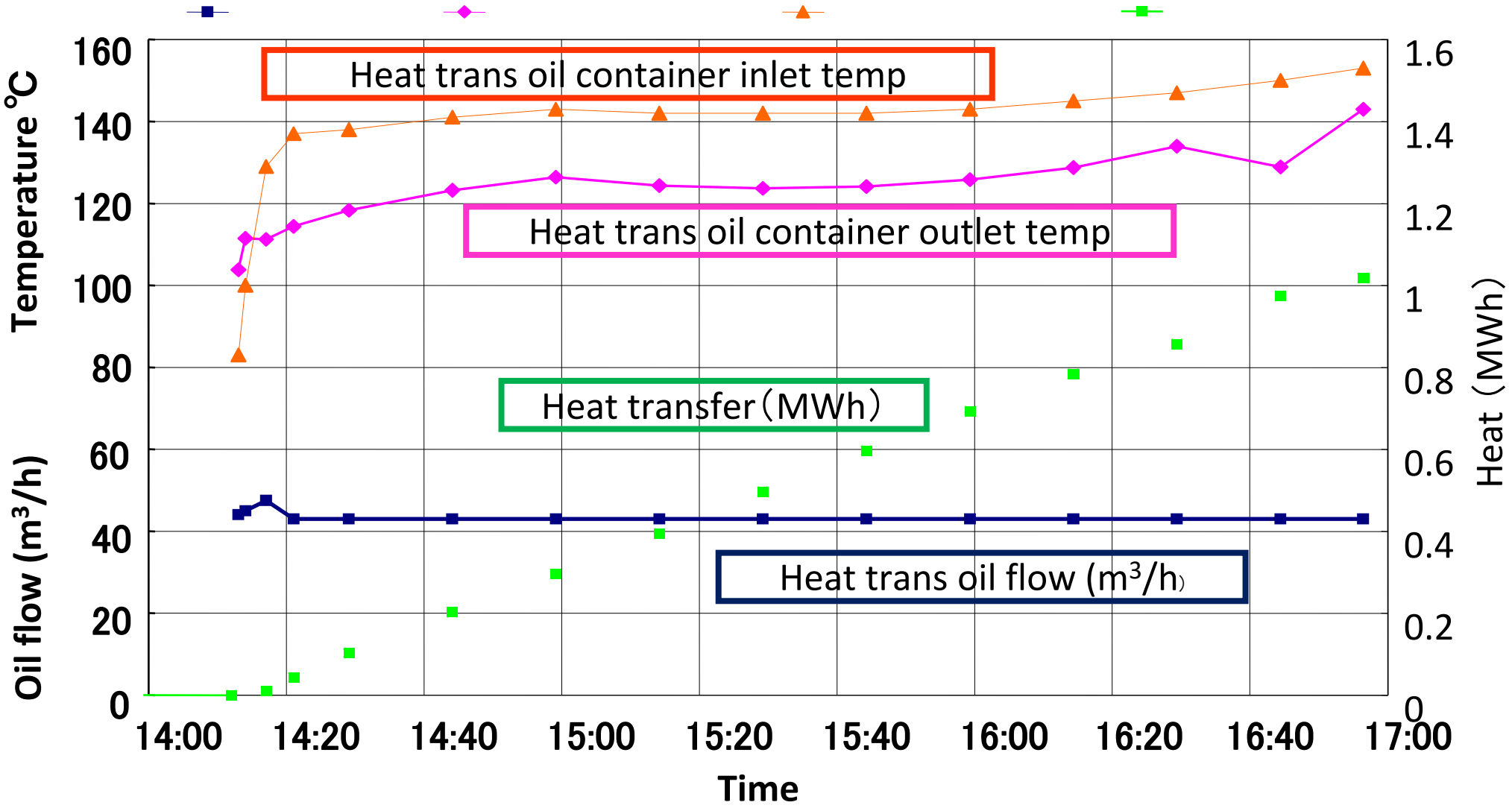
2007 Ministry of Environment Subsidy: Anti Climate Change Initiative in Waste Processing Plants

2009 Operational Record
Period: Jan 16 to June 10
Deliveries: 214 (1-2 times/ day)
Heat transport: 1000GJ/ year
(Compared to heating oil)

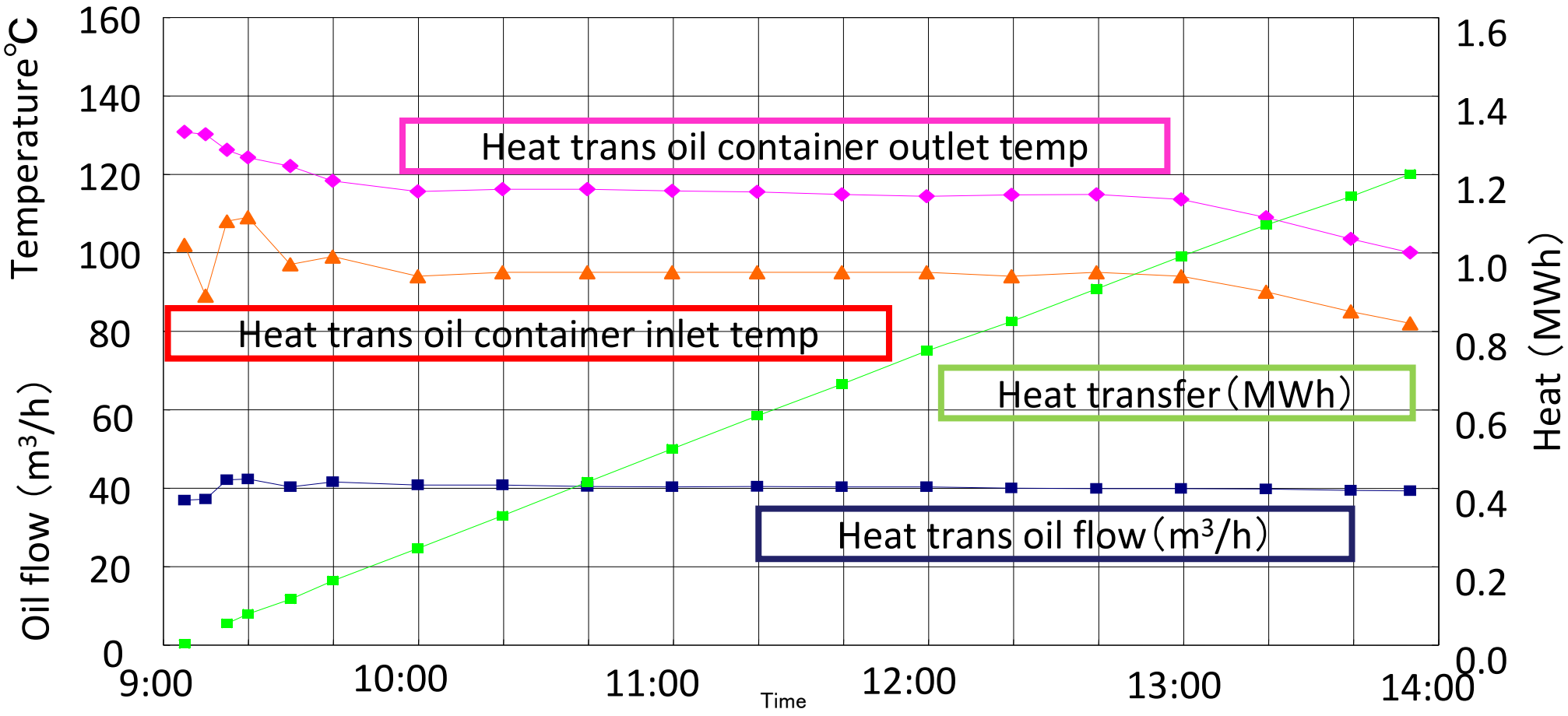
Facility Overview



Heat Storage Operation



Heat Release Operation



Reference in Mie Pref. :Summary

<Heat source>

MIE CHUOH KAIHATSU Co.,Ltd.

●Waste Incinerator
Excess heat from industrial waste incinerator Surplus steam 0.5MPa

THC： 10t tank×1
PCM：Erythritol
Heat capacity：0.5 MWh

Distance
11km
（2014…）

2011～2013… Ministry of Environment Subsidy

<Heat Recipient>

Hill Hotel Sunpia-Iga

●Warm-bathing facility
hot water supply, supply temp. approximately 65℃

< Demonstration >

Term 2014/5～2015/1

Operation From Monday to Saturday 1/day

The number of transport 161times

< Practical use >

Term 2015/10～

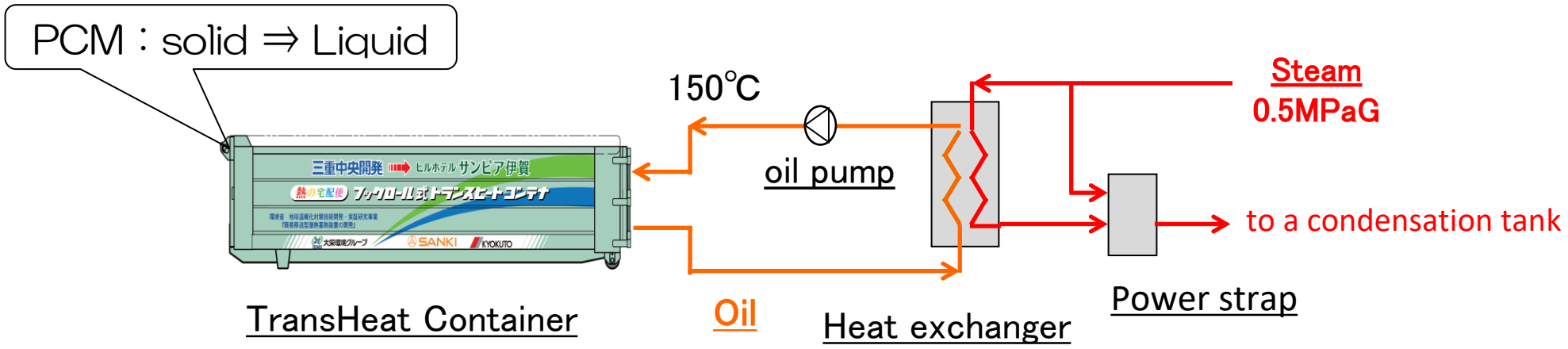
Operation From Monday to Saturday 1/day

The number of transport 217times

（until 2016/6/22）

Reference in Mie Pref. : Heat source

＜ Heat Storage＞



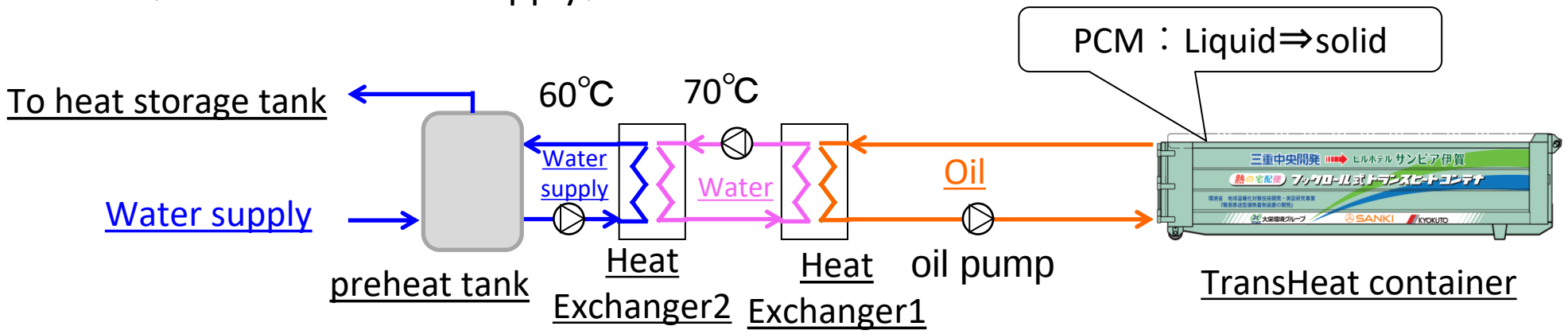
TransHeat Container

Heat exchanger

Control Cabint

Reference in Mie Pref. ：Heat User

＜User site：water supply＞



Heat supply facilities

Reference in Mie Pref : Operation Results of Heat Release

<The supply results: All data>

- The supply number of times: 378 times
- Supply heat capacity: 193,587kWh
- Quantity of city gas reduction：18,591m^3_N

<Only as the complete heat release data>

- Supply times : 302 times
- Average heat release ：525kWh
- Average Heat release rate: 109kW

<Energy consumption>

- Storage 9.5kWh/time
- Release 9.3kWh/time
- Transportation 56.1kWh/time

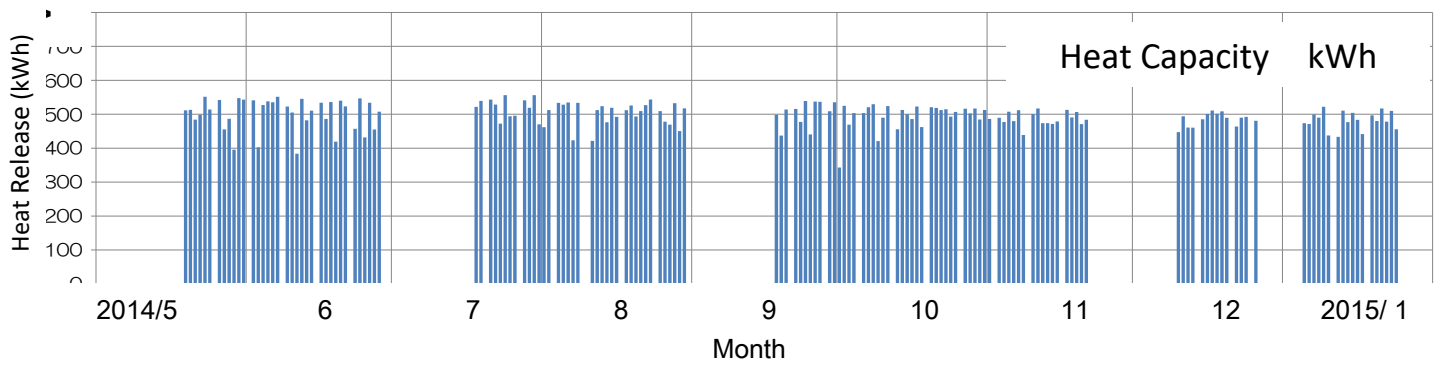
Total 75.4kWh/time

<Energy Efficiency>

85.6%

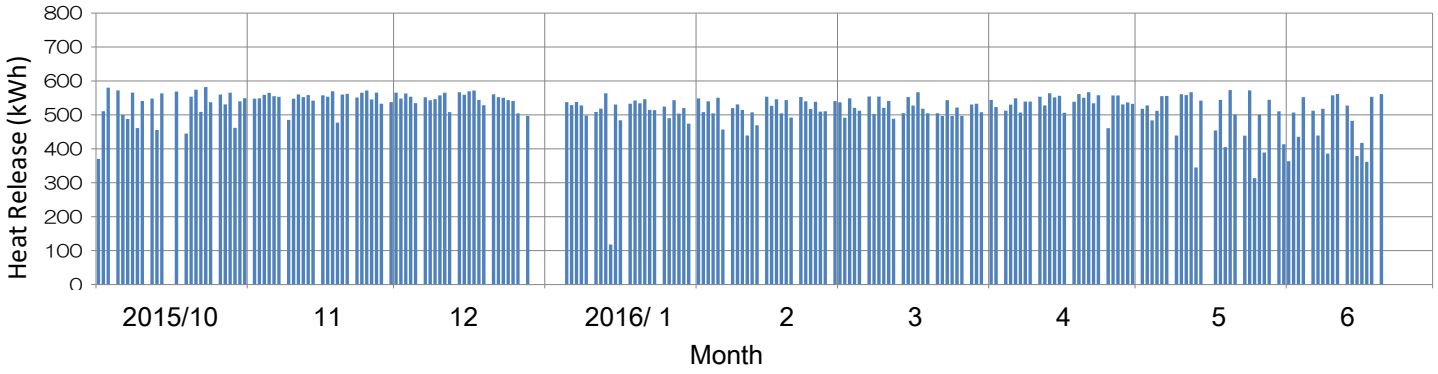
< Demonstratic

●Transfer oil



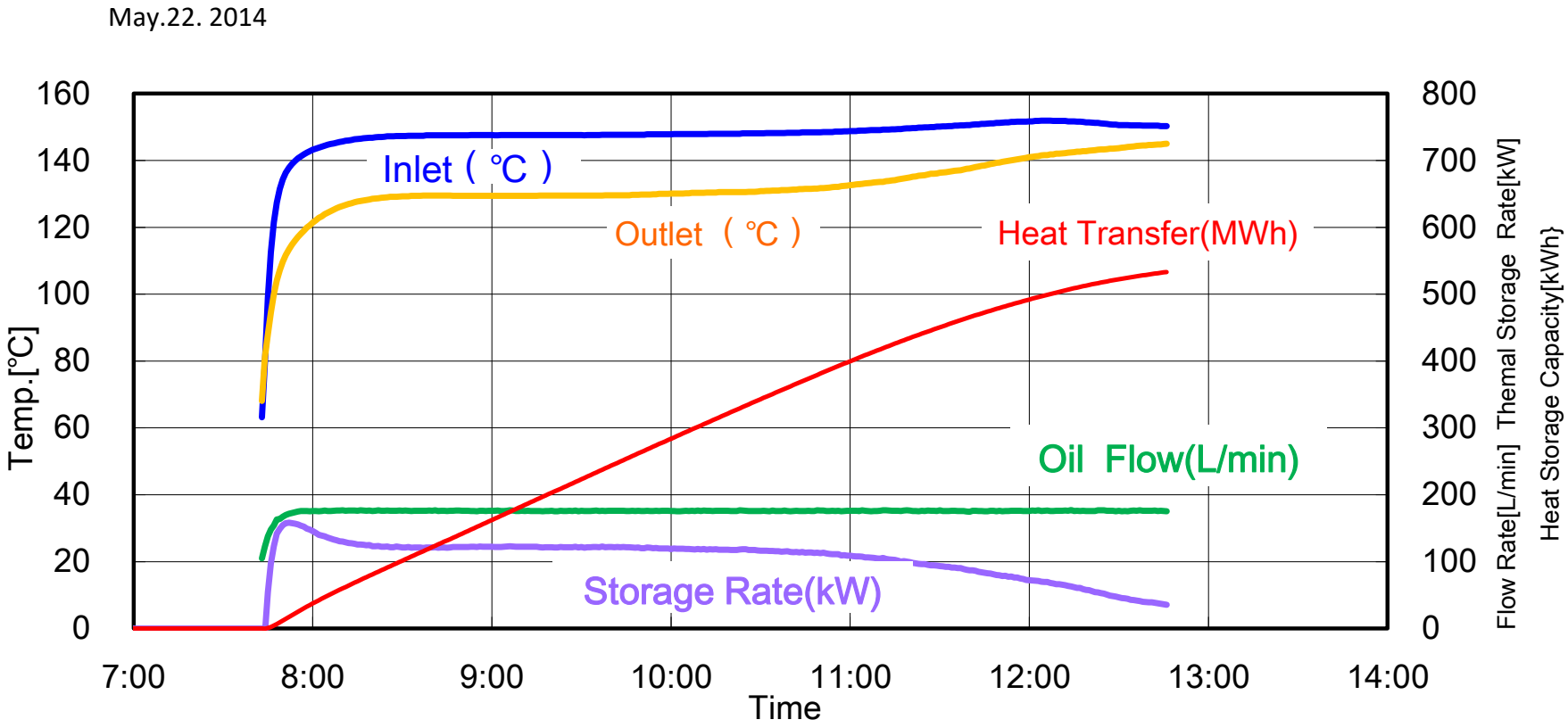
＜Practice use＞

●Transfer oil



Reference in Mie Pref. :Thermal Storage

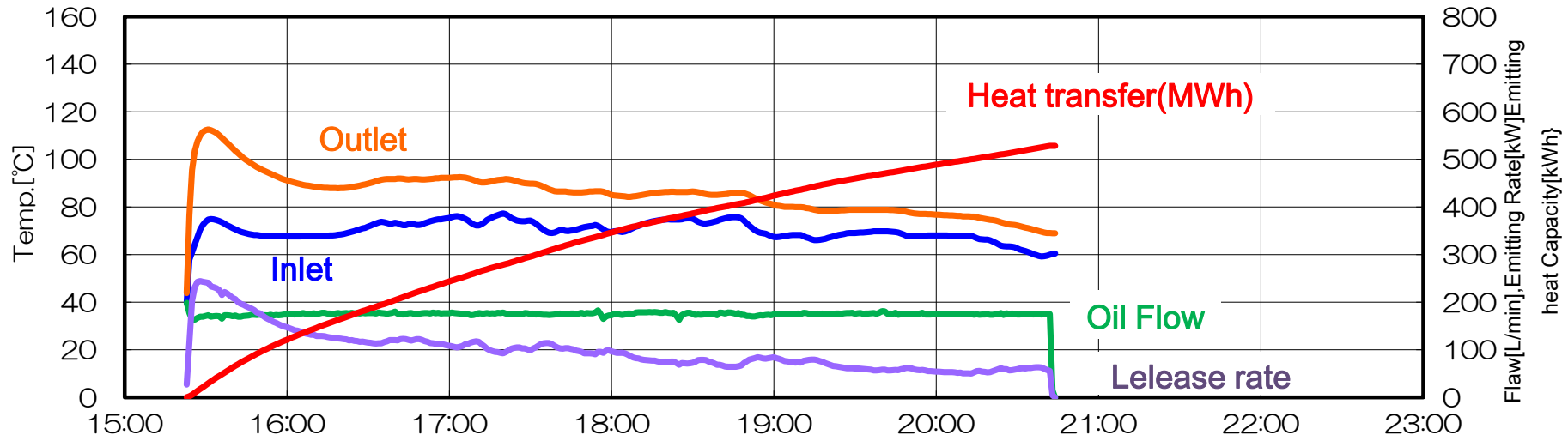
Average of Thermal Storage Rate : **Up to 100kW**



Reference in Mie Pref. :Thermal Release

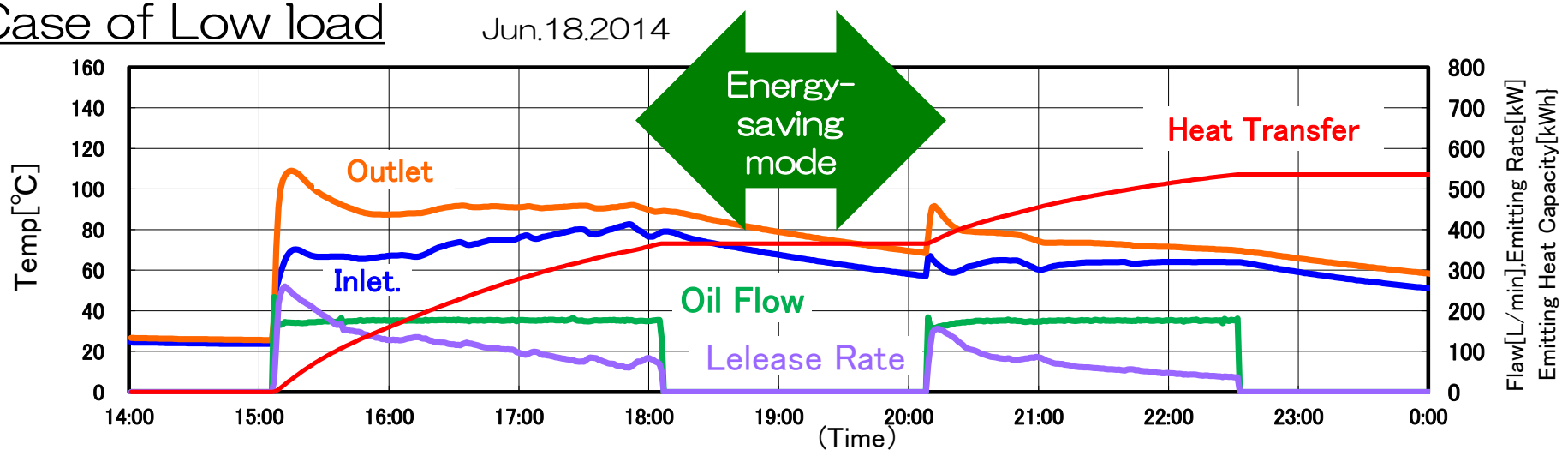
①Case of High load

July.22.2014



②Case of Low load

Jun.18.2014



REFFEENCE Toyama：Summary

＜Heat source＞

Toyama Kankyo Seibi CO.,LTD.

●Waste Incinerator
Exces steam 0.5MPa

THC：10ton tank×2
PCM：Erythritol
Heat capacity ：0.5 MWh

Distance
2km
（2015…）

2014. Subsidy of Ministry of Agriculture

＜User ＞

Toyama Kankyo Seibi CO.,LTD.

●Air conditioning of the tomato house
Period of heating ： Hot water (55℃)
Period of cooling ： Hot water75～ 8 5℃

＜Practical use＞

term 2015/ 5～

operation From Monday to Saturday 1～2/day

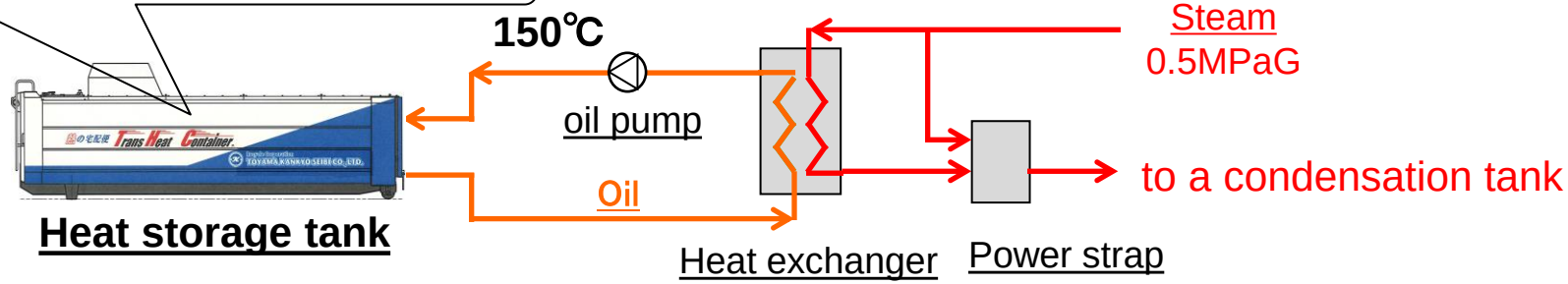
the number of transport 217times

（until 2016/5/22）

REFFERENCE Toyama：Heat USER

＜ Heat Storage ＞

PCM※：PCM：solid ⇒ Liquid



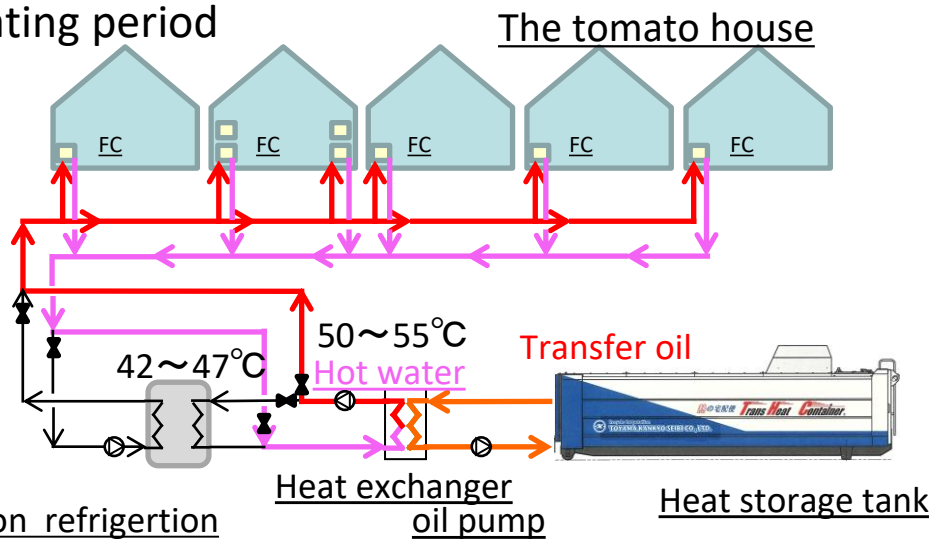
Heat storage tank

HEAT RECOVERY EQUIPMENT

EXPERIENCE Toyama：Summary

＜Emitting Heat：Air conditioning>

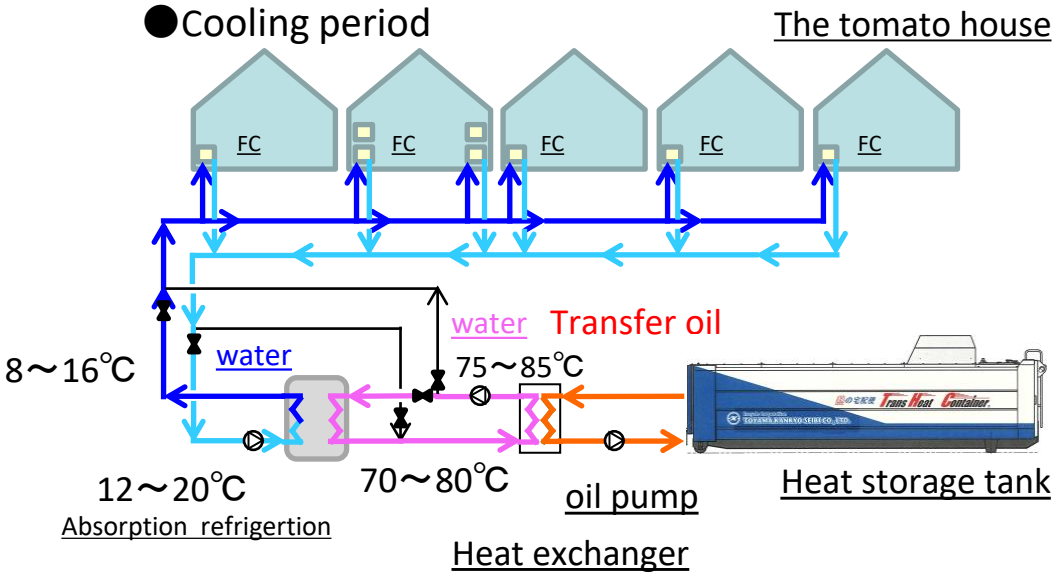
●Heating period



fan coil unit（FC）

The tomato house

●Cooling period



EXPERIENCE Toyama
Operative results heat release

＜The supply results: All data＞

- The supply number of times: 272 times
- Supply heat capacity: 115,890kWh
- Quantity of city gas reduction：11,130 m^3_N

<Performance: Only as for the complete heat radiation data＞

- The supply number of times : 214 times
- Mean heat release ：463kWh
- Mean heat radiation speed: 79kW