Facility Management

1. Introduction

Facility management is focused on securing safety, stability, and high reliability for facility equipment and systems at each experimental facility. It must provide the efficient and effective delivery of support services not only to domestic academia, research institutes, and industry but also to foreign ones because SPring-8/SACLA offer world-leading highly brilliant X-rays. We efficiently control and provide support 24/7 to all facilities.

We use a five-year plan to manage the construction and maintenance of the facilities and their equipment systems such as electrical equipment, cooling units, experimental drainage, telephones, and hygiene air conditioning. This plan includes daily systematic monitoring and periodic inspections. In addition, we implemented a plan to improve the overall research environment through initiatives to address aging equipment and energy-saving measures.

2. Management of utilities (lighting, heating, and water)

2-1. Electricity

Electricity is provided by KEPCO's (Kansai Electric Power Company) duplicate lines. The receiving voltage is 77 kV. The total contracted powers is 36,200 kW. (The industrial power for facilities is 34,500 kW, and the non-industrial power for administrative/sitting rooms is 1,700 kW.). The electric power consumption in FY2018 was 206 GWh. Figure 1 and Table 1 show the trends in electric use over the past five years.

At peak electric demand times, we implemented measures to ensure the total consumed power was below the contract limit. These measures included increased monitoring of overall use, controlling air-conditioning set points, and implementing periods with energy conservation measures.

Additionally, we took responsibility for researchers' needs and their related organizations and divisions regarding electric power quality/stability enhancements toward upgrading/diversifying research.

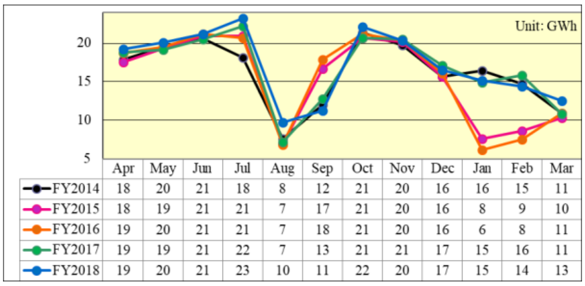

Fig. 1. Electricity consumption trends (at Harima).

Table 1. Electricity consumption.

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Industrial power	188.6	179.4	180.4	193.4	198.9
Non-industrial power	6.0	6.0	6.8	7.3	7.0
SPring-8 as a whole	194.6	185.4	187.2	200.7	205.9
(±)	9.6	-9.2	1.7	13.5	5.2

[Unit: GWh]

2-2. Water and sewage

Tap water is provided by the water sewage office Harima highlands wide area administration association from the Chikusa river. The usage flow rate of the tap water in FY2018 was 281 km^3 while the amount of sewage discharge was 110 km^3. Figure 2 and Table 2 show the trends for the past five years for water consumption, while Fig. 3 and Table 3 show the trends for sewer excretion for the past five years.

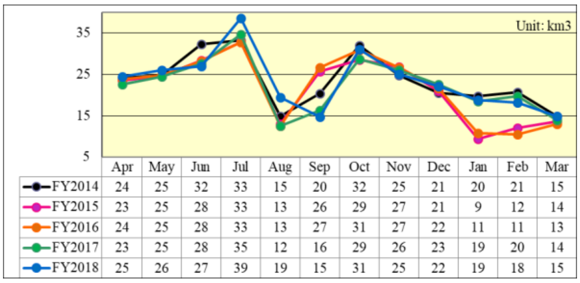

Fig. 2. Amount of water used (at Harima Campus).

Table 2. Amount of water used.

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Public facility	214.0	191.4	196.4	197.0	204.1
RIKEN facility	68.4	68.1	66.0	70.9	76.5
SPring-8 as a whole	282.4	259.5	262.4	267.9	280.6
(±)	8.4	-22.9	2.9	5.5	12.7

[Unit: km^3]

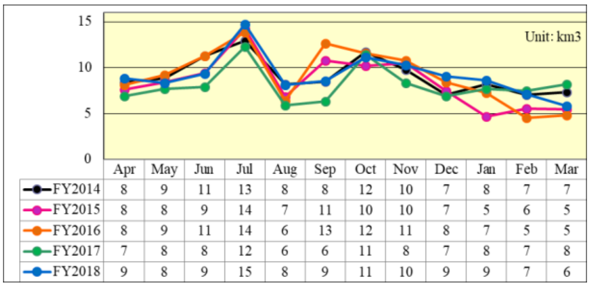

Fig. 3. Amount of sewer excretion (at Harima Campus).

Table 3. Amount of sewer excretion.

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
SPring-8 as a whole	109.0	101.0	108.9	97.0	109.8
(±)	8.0	-8.0	7.9	-11.9	12.8

[Unit: km^3]

2-3. Gas

Town gas (13A) is provided by the West Harima station of Osaka Gas. The FY2018 usage flow rate was 243 km^3. Figure 4 and Table 4 show the trends of gas use for the past five years.

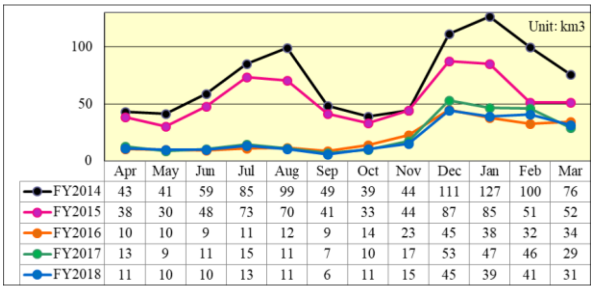

Fig. 4. Amount of town gas used (at Harima Campus).

Table 4. Amount of town gas used.

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Public facility	294.8	261.4	222.5	252.5	227.2
RIKEN facility	578.3	392.5	25.2	15.3	15.3
SPring-8 as a whole	873.1	653.9	247.7	267.8	242.5
(±)	-228.9	-219.2	-406.2	20.1	-25.3

[Unit: km^3]

2-4. Energy conservation

We enacted the following measures in FY2018 to reduce CO_2 emission and save energy:

(1) Heat source equipment of accelerator and beamline R&D facility was updated, and five module chillers were installed to offer energy-efficient solutions for partially loading operations.

(2) Existing air conditioners were upgraded to "top runner" packaged air conditioners (a set of energy efficiency standards for energy-intensive products based on the government's initiative) at the following facilities:

· Machine Laboratory (eight outdoor units, eight indoor units)

· RI Laboratory (nine outdoor units, 18 indoor units)

(3) Fluorescent lights were updated to LED lights at the following facilities:

Common spaces at the Storage Ring, toilet cubicles at the Main Building, offices at the Public Relations Center, entrance hall at the SACLA Accelerator Building and Undulate Building, and Experimental Hall at the SACLA Experimental Facility.

(4) As part of the roof of Storage Ring and external wall coating repair work (for the first and second term), we applied a promising paint with a shielding effectiveness to the roof and external walls as an energy-saving measure.

(5) Operations of an injection system and machine cooling system at the Storage Ring were temporarily suspended during an inspection adjustment period in the summer, winter, and fiscal year-end. These efforts eliminated 1,977 tons of CO_2 per year.

(6) Machine cooling equipment, which was a recirculating piped water system to remove waste heat at the Storage Ring, was upgraded into a more energy-efficient one, which uses cold outside air in the winter and a refrigerating machine in the summer.

(7) During summer/winter maintenance periods and fiscal year-end, we eliminated 638 tons of CO_2 per year by partially running air handling units (AHUs) in the experimental hall at the Storage Ring.

(8) During summer/winter maintenance periods and fiscal year-end, we eliminated 46 tons of CO_2 per year by partially operating outdoor AHUs and air-exhaust ventilators of the tunnels for the injector and accelerator at the Storage Ring.

(9) During summer/winter maintenance periods and fiscal year-end, we eliminated 21 tons of CO_2 per year by partially operating air conditioners in the experimental hall at the RI Laboratory.

(10) During summer/winter maintenance periods and fiscal year-end, we eliminated 25 tons of CO_2 per year by partially operating FCUs (fan coil units) in the tunnels for the injector and accelerator at the Storage Ring.

(11) We eliminated 63 tons of CO_2 per year by partially operating the humidifying function of outdoor air handling units (OHUs) in the tunnels for injector/accelerator and in the experimental hall at the Storage Ring.

3. Environmental conservation

3-1. Industrial waste

Wastes discharged from operating activities are mainly experimental equipment, office automation equipment, scrap metal, waste plastics such as packing material/filter, and sludge in water treatment. Wastes containing poisonous and deleterious substances such as experimental waste liquid and lead-acid batteries used for operations and maintenance are collected and stored as specially controlled industrial waste. Additionally, because tools such as sterilized syringe needles and scalpels are difficult to distinguish from medical waste, they were also collected and stored for specially controlled industrial waste. Then we asked a specific waste management company to dispose of them.

Although animals used for lab experiments are supposed to be disposed of as general waste, we buried them in an animal cemetery to express our sympathy for the loss of the lab animals by following the guidance of the local municipality.

Cooperation from employees and users is necessary to properly conduct garbage separation. Therefore, we engaged in explanatory sessions about waste disposal and issued warning notices to employees not properly handling waste via emails and posting announcements.

Tables 5–7 show the amounts of waste for the past five years.

Table 5. Waste amount in general industrial waste.

	FY2014	FY2015	FY2016	FY2017	FY2018
Sludge	58,845	16,015	23,505	12,518	6,029
Waste oil/slush	1,820	4,193	7,080	3,041	3,390
Waste alkali	412	879	570	73	231
Waste acid	365	466	191	202	86
Waste plastic	16,900	30,131	27,346	21,354	12,211
Waste wood	6,697	7,149	5,370	7,569	3,937
Waste/scrap metal	69,256	206,606*1	132,772	121,964	110,199
Waste/cullet glass	903	739	1,126	1,093	1,079
Wastes other than above (concrete, stone, etc.)	68	1,569	982	1,027	212
Biochemically stable waste mixture	-	-	-	-	2,427*2
Biochemically unstable waste mixture	-	-	-	-	33,558*2
Waste plastic (containing asbestos)	-	-	-	-	220*2
Mercury used product industrial waste	-	-	-	-	934*2
Dry batteries	-	-	-	-	130*2

[Unit: kg]

*1: Since we disposed of a concrete shielding wall (covered by iron plate), there is an increase in waste metal.

*2: In accordance with a reconsideration of the waste classification, new items were added in FY2018

Table 6. Amount of specially controlled industrial waste.

	FY2014	FY2015	FY2016	FY2017	FY2018
Waste acid	580	276	2,488	807	183
Waste alkaline	58	31	18	708	423
Waste oil	471	1,051	403	182	279
Sludge	267	221	198	372	173
Infectious waste	7	9	3	16	12
PCB	-	-	-	-	-

[Unit: kg]

Table 7. Amount of general waste.

	FY2014	FY2015	FY2016	FY2017	FY2018
Laboratory animal	516	636	499	410	566

[Unit: kg]

Harima Administrative Division, RIKEN
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