Infrastructures

1. Introduction

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

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

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

2-1. Electricity

Electricity is provided by Chubu Electric Power Miraiz Solution's duplicate lines. The receiving voltage is 77 kV. The total contracted power is 36,100 kW. (The industrial power for facilities is 34,500 kW, and the nonindustrial power for administrative/sitting rooms is 1,600 kW.) The electric power consumption in FY2020 was 186 GWh. Figure 1 and Table 1 show the trends of electric power use over the past five years.

For the periods of peak electric power demand, measures are implemented to ensure that the total consumed power remains below the contract limit. These measures include the increased monitoring of overall use, the adjustment of air-conditioning settings, and the implementation of energy conservation measures.

Additionally, facility management was responsible for supporting researchers' needs and their related organizations and divisions regarding electric power quality/stability enhancements toward upgrading/diversifying research.

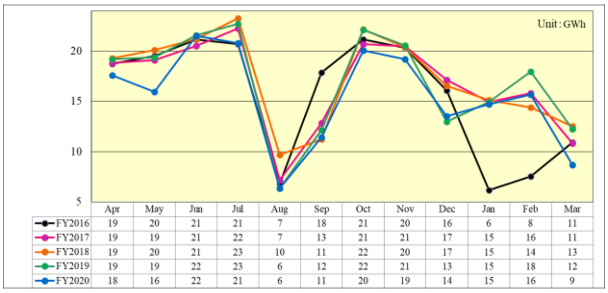

Fig. 1. Electricity consumption trends (at the Harima Campus).

Table 1. Electricity consumption.

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Industrial power	180.4	193.4	198.9	195.4	178.6
Nonindustrial power	6.8	7.3	7.0	6.9	7.0
SPring-8 as a whole	187.2	200.7	205.9	202.3	185.6
Comparative (±)	1.7	13.5	5.2	-3.6	-16.7

[Unit: GWh]

2-2. Water and sewage

Tap water from the Chikusa River is provided by the water sewage office Harima highlands wide-area administration association. The usage flow rate of tap water in FY2020 was 255 km^3, while the amount of sewage discharge was 100 km^3. Figure 2 and Table 2 show the water consumption trends over the past five years, while Fig. 3 and Table 3 show the sewer discharge trends over the past five years.

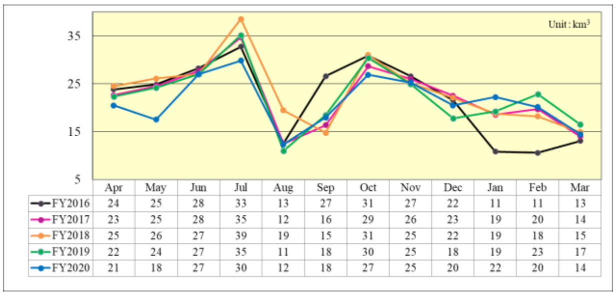

Fig. 2. Amount of water used (at the Harima Campus).

Table 2. Amount of water used.

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Shared facility	196.4	197.0	204.1	194.6	178
RIKEN facility	66.0	70.9	76.5	75.5	76.4
SPring-8 as a whole	262.4	267.9	280.6	270.0	254.7
Comparative (±)	2.9	5.5	12.7	-10.6	15.3

[Unit: km^3]

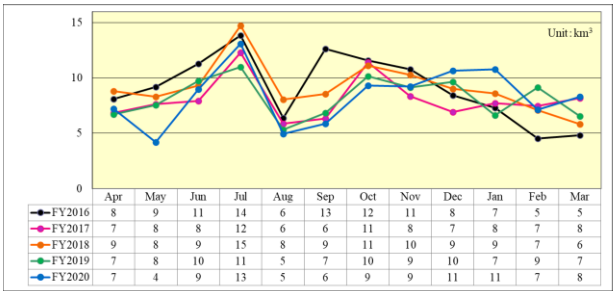

Fig. 3. Amount of sewer discharge (at the Harima Campus).

Table 3. Amount of sewer discharge.

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
SPring-8 as a whole	108.9	97.0	109.8	98.4	99.8
Comparative (±)	7.9	-11.9	12.8	-11.4	1.4

[Unit: km^3]

2-3. Gas

Town gas (13A) is provided by the West Harima Station of Osaka Gas. The FY2020 usage flow rate was 232 km^3. Fig. 4 and Table 4 show the trends of gas use over the past five years.

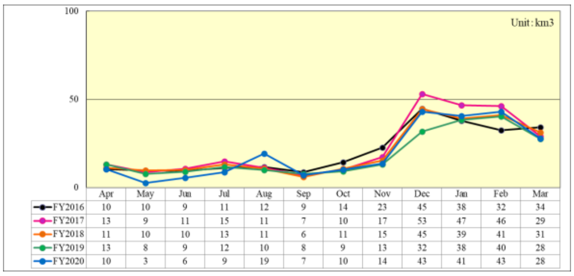

Fig. 4.Amount of town gas used (at the Harima Campus).

Table 4. Amount of town gas used.

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Shared facility	222.5	252.5	227.2	204.3	216.0
RIKEN facility	25.2	15.3	15.3	15.3	15.5
SPring-8 as a whole	247.7	267.8	242.5	219.6	231.5
Comparative (±)	-406.2	20.1	-25.3	-22.9	11.9

[Unit: km^3]

2-4. Energy conservation

The following measures were implemented in FY2020 to reduce CO_2 emission and save energy.

(1) Existing air conditioners were updated to "top runner" packaged air conditioners (a set of energy efficiency standards for energy initiative) at the following facilities: Synchrotron Radiation Physics Facility, Highthroughput Factory, and Cafeteria. These efforts eliminated 22 tons of CO_2 per year.

(2) All the lighting in the following facilities was updated with LEDs: the Storage Ring (Experimental Hall lighting), 1 km-long Beamline Facility (shared space lighting and parking area lighting). These efforts eliminated 808 tons of CO_2 per year.

(3) The substation equipment was updated at the following facilities: Accelerator and Beamline

R&D Facility and Machine Laboratory. These efforts eliminated 7 tons of CO_2 per year.

(4) The machine cooling equipment for the Synchrotron was replaced with a cooling facility for the Storage Ring, and the cooling equipment for the Synchrotron was stopped. These efforts eliminated 578 tons of CO_2 per year.

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

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

(7) The partial operation of the air handling units (AHUs) in the Experimental Hall at the Storage Ring during the summer/winter maintenance periods and at the fiscal year-end eliminated 638 tons of CO_2 per year.

(8) The partial operation of outdoor AHUs and air-exhaust ventilators of the tunnels for the injector and accelerator at the Storage Ring during the summer/winter maintenance periods and at the fiscal year-end eliminated 46 tons of CO_2 per year.

(9) The partial operation of air conditioners in the Experimental Hall at the RI Laboratory during the summer/winter maintenance periods and at the fiscal year-end eliminated 21 tons of CO_2 per year.

(10) The partial operation of the fan coil units (FCUs) in the tunnels for the injector and accelerator at the Storage Ring during the summer/winter maintenance periods and the fiscal year-end eliminated 25 tons of CO_2 per year.

(11) The partial operation of the humidifying function of the outdoor air handling units (OHUs) in the tunnels for the injector/accelerator and in the Experimental Hall at the Storage Ring eliminated 63 tons of CO_2 per year.

(12) The use of air-conditioning units during the night was suspended between 19:00 and 07:00 at the research building of the Medium-length Beamline Facility.

3. Environmental conservation

3-1. Industrial waste

Wastes discharged from operating activities were mainly experimental equipment, office automation equipment, scrap metal, waste plastics such as packing material/filters, and sludge in water treatment. Wastes containing poisonous and deleterious substances, such as experimental waste liquid and lead-acid batteries, used in operations and maintenance were 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 collected and stored for specially controlled industrial waste. Then, we hired a contracted waste management company to dispose of them.

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

Because cooperation from employees and users is necessary to properly conduct garbage separation, explanatory sessions on waste disposal were held and warning notices were issued via emails and posted announcements to employees not properly handling waste. Tables 5–7 show the amounts of waste over the past five years.

Table 5. Waste types and amounts in general industrial waste.

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Sludge	23,505	12,518	6,029	2,337	4,405
Waste oil/slush	7,080	3,041	3,390	7,892	3,560
Waste alkali	570	73	231	123	44
Waste acid	191	202	86	81	92
Waste plastic	27,346	21,354	12,211	11,141	8,898
Waste wood	5,370	7,569	3,937	2,886	1,949
Waste/scrap metal	132,772	121,964	110,199	93,505	60,779
Waste/cullet glass	1,126	1,093	1,079	710	628
Wastes other than above (concrete, stone, etc.)	982	1,027	212	75	44
Biochemically stable waste mixture*2	-	-	2,427	9,560	2,797
Biochemically unstable waste mixture*2	-	-	33,558	8,376	3,062
Waste plastic*2 (containing asbestos)	-	-	220	0	0
Mercury-containing product industrial waste*2	-	-	934	1,074	710
Dry batteries*2	-	-	130	301	210

[Unit: kg]

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

*2 In accordance with the waste reclassification, new items were added in FY2018.

Table 6. Amount of specially controlled industrial waste.

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Waste acid	2,488	807	183	2,694	489
Waste alkaline	18	708	423	428	430
Waste oil	403	182	279	237	305
Sludge	198	372	173	134	93
Infectious waste	3	16	12	7	10
PCB	—	—	—	—	—

[Unit: kg]

Table 7. Amount of general waste.

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Laboratory animals	499	410	566	444	36

[Unit: kg]

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