10. 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 31,500 kW. (The industrial power for facilities is 30,000 kW, and the nonindustrial power for administrative/sitting rooms is 1,500 kW.) The electric power consumption in FY2022 was 176 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.

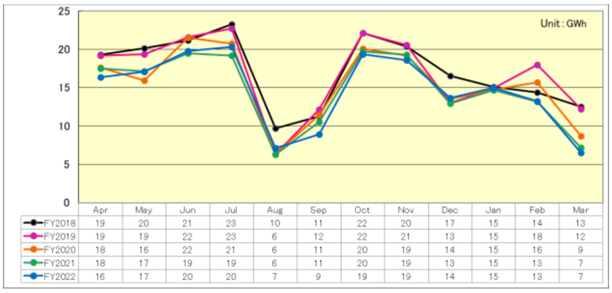

Fig. 1. Electricity consumption trends (at the Harima Campus).

Table 1. Electricity consumption.

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Industrial power	198.9	195.4	178.6	170.0	169.1
Nonindustrial power	7.0	6.9	7.0	7.3	7.1
SPring-8 as a whole	205.9	202.3	185.6	177.3	176.2
Comparative (±)	5.2	-3.6	-16.7	-8.3	-1.1

[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 FY2022 was 230 km^3, while the amount of sewage discharge was 84 km^3. Figure 2 and Table 2 show the water consumption trends over the past five years, while Figure 3 and Table 3 show the sewer discharge trends over the past five years.

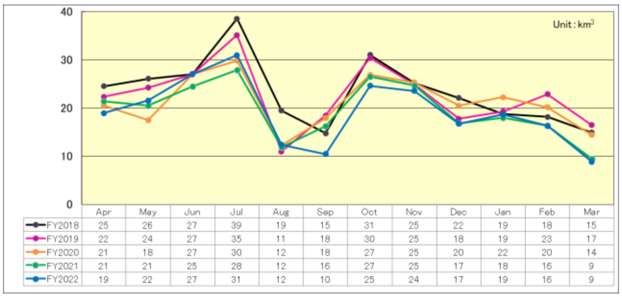

Fig. 2. Amount of water used (at the Harima Campus).

Table 2. Amount of water used.

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Shared facility	204.1	194.6	178.3	156.2	152.4
RIKEN facility	76.5	75.5	76.4	78.3	77.9
SPring-8 as a whole	280.6	270.0	254.7	234.5	230.3
Comparative (±)	12.7	-10.6	-15.3	-20.2	-4.2

[Unit: km³]

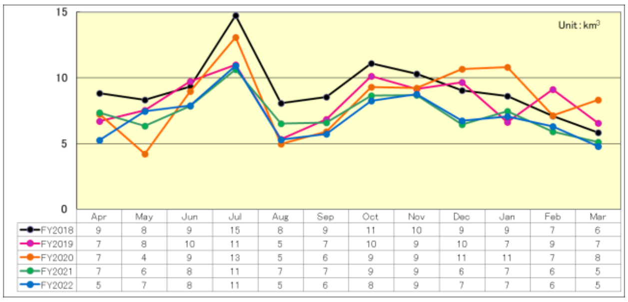

Fig. 3. Amount of sewer discharge (at the Harima Campus).

Table 3. Amount of sewer discharge.

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
SPring-8 as a whole	109.8	98.4	99.8	87.5	84.4
Comparative (±)	12.8	-11.4	1.4	-12.3	-3.1

[Unit: km³]

2-3. Gas

Town gas (13A) is provided by the West Harima Station of Osaka Gas. The FY2022 usage flow rate was 237 km³. Figure 4 and Table 4 show the trends of gas use over the past five years.

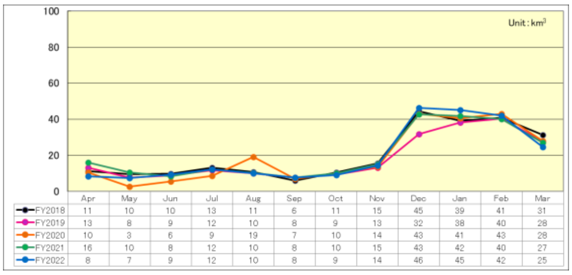

Fig. 4. Amount of town gas used (at the Harima Campus).

Table 4. Amount of town gas used.

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Shared facility	227.2	204.3	216.0	225.4	221.1
RIKEN facility	15.3	15.3	15.5	16.3	15.5
SPring-8 as a whole	242.5	219.6	231.5	241.7	236.6
Comparative (±)	-25.3	-22.9	11.9	10.2	-5.1

[Unit: km³]

2-4. Energy conservation

The following measures were implemented in FY2022 to reduce CO_2 emissions and save energy.

(1) Existing air conditioners were updated to “top runner” packaged air conditioners (a set of energy efficiency standards for the energy initiative) at the following facilities: Main Building, Stockroom for Instruments, and Utility Management Building. These efforts eliminated 15 tons of CO_2 per year.

(2) The hot-water boiler was updated at the Synchrotron Radiation Physics Facility. This effort eliminated 3 tons of CO_2 per year.

(3) All the lighting in the following facilities was updated with LEDs: Stockroom for Instruments and Utility Management Building, 1-km-long Beamline Facility, and exterior lights around certain areas of the premises. These efforts

eliminated 16 tons of CO_2 per year.

(4) The SACLA Accelerator Building, the North Building, and the Vacuum and Drainage System Facility were equipped with their own solar power generation systems. These efforts eliminated 15 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 1,223 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. These efforts eliminated 116 tons of CO_2 per year.

(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 527 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 35 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 17 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 17 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 62 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 as 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 generated over the past five years.

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

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Sludge	6,029	2,337	4,405	2,165	3,273
Waste oil/slush	3,390	7,892	3,560	5,024	1,999
Waste alkali	231	123	44	90	485
Waste acid	86	81	92	14	57
Waste plastic	12,211	11,141	8,898	9,454	8,733
Waste wood	3,937	2,886	1,949	1,653	1,674
Waste/scrap metal	110,199	93,505	60,779	113,255	65,443
Waste/cullet glass	1,079	710	628	511	403
Wastes other than above (concrete, stone, etc.)	212	75	44	925	810
Biochemically stable waste mixture	2,427	9,560	2,797	3,156	1,980
Biochemically unstable waste mixture	33,558	8,376	3,062	4,458	2,823
Waste plastic (containing asbestos)	220	0	0	0	0
Mercury-containing product industrial waste	934	1,074	710	711	1,035
Dry batteries	130	301	210	50	30

[Unit: kg]

Table 6. Amount of specially controlled industrial waste.

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Waste acid	183	2,694	489	250	375
Waste alkali	423	428	430	475	49
Waste oil	279	237	305	187	50
Sludge	173	134	93	174	14
Infectious waste	12	7	10	10	10
PCB	—	—	—	—	—

[Unit: kg]

Table 7. Amount of general waste.

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Laboratory animals	566	444	36	158	214

[Unit: kg]

Harima Administrative Division, RIKEN
Harima Safety Center, RIKEN