Utility Management

1. Introduction

The Facility Management Division is primarily responsible for the management of the utilities, industrial waste, facility operations, and maintenance of SPring-8. The utilities include electricity, town gas, water, site broadcasting, telephone, and a computer network. This division also handles operation and maintenance work on machine cooling systems, air-conditioning systems, drainage processing facilities, fire extinguish systems, *etc*. It further conducts operation and maintenance work for the structural biology facility and New SUBARU under contract with RIKEN, Hyogo Prefecture, and JASRI.

The topics this year were to strengthen our procedures on industrial waste management, to develop operation management program systems, and to introduce the crisis management software INFOTABS. The aim of these works was the achievement of practical management in the near future in this Division. In addition, construction began in autumn on the support for a front end cooling system.

2. Management of Industrial Waste and Chemical Substances

2.1 Establishment of Industrial Waste Management

A partially amended Waste Disposal and Public Cleaning Law went into effect on December 1, 1998. The law now requires us to manage industrial waste appropriately, *i.e.*, obligates us to issue a manifest for every type of industrial waste we produce, whenever we dispose of them.

Industrial waste in SPring-8 includes miscellaneous plastics (used for packing), chemicals, useless articles, *etc*. We have also been managing special controlled waste strictly, like chemical substances. Furthermore, we have started a new waste management system related to the collection, classification, and delivery of general waste to a waste service company based on wide-raging studies to conform to the law; but general waste disposal had been entrusted to a waste service company without manifest until the end of November.

In the near future, we expect other types of wastes that are more serious, like examined animals and biological waste. Hence, we must prepare the following items to be able to quickly establish new management schemes.

1) The assignment of capable staff
2) Improvement of the waste collection warehouse
3) Further studies on other precedents

2.2 Computer Program System Design for Chemical Reagent Management

SPring-8 prepares and makes available several chemical reagents for research work. In addition, scholars freely bring many other types of chemical reagents into the site. It is therefore necessary to set up a system to manage such chemicals appropriately. Accordingly, we are designing a computer program system to manage all chemicals used at the site. The system will apply a bar-code registration system, and will manage the transfer of registered chemicals. It will also be used to support the work done in the sample preparation laboratory. Its application is scheduled for 1999.

2.3 Study on Supercritical Water Oxidation Technology

Drained chemical waste derived from research activities has been treated as special controlled industrial waste and disposed of through a waste service company. We have been involved in a lot of research on technologies to be able to turn the waste into harmless matter to minimize its environmental impact. We have already achieved a supercritical water oxidation technology with a lot of possibility to resolve a drainage problem. The technology decomposes organic compounds into harmless matter under a high temperature and high pressure. We are planning to introduce small-sized equipment at the site to process drained waste and to obtain detailed data for the functional improvement of the equipment.

2.4 Study of ISO14001

Many companies and organizations have already established an Environmental Management System based on ISO14001 standard. Accordingly, we have to consider the possible environmental impact capable of appearing in our research work. From this point of view, the Facility Management Division sent 10 staff members to audit lectures. Studies are continuing on the standard and on other precedents.

3. Electricity, Water, and Town Gas

The consumption of electricity in 1997 was 115 GW•h and in 1998 was 135 GW•h (17 % increase). This difference derived from an increment in the beam operation time. Figure 1 shows SPring-8 monthly electric power consumption and the maximum electric power. The power contract cost with the local electric company depends on these amounts. We have been able to decrease the contract cost by changing maximum power from 30 MW to 27 MW. As you can see, the curve drops in summer, allowing us to further save on cost by a maximum power cut off contract in the summer time. As a result of the summer cut off contract, 126 MW•h is saved.

Figure 2 and Figure 3 show the monthly

consumption of water and town gas, respectively. The water consumption in 1997 was 197 km^3 and that in 1998 was 234 km^3 (19 % increase). At SPring-8, water is mainly used for machine cooling systems and air conditioners. The consumption of town gas in 1997 was 1,005 km^3 and that in 1998 was 2,007 km^3 (200 % increase). At SPring-8, town gas is mainly used for air conditioning facilities. Although the water and town gas contract systems are different from the electricity contract system, we continue to consider ways on how to save on finite resources effectively.

4. Management of Operations and Maintenance

4.1 Operations and Daily Maintenance

The operations and maintenance of our machine cooling systems, air conditioning systems, and utilities were carried out steadily, according to the corresponding facility operating schedules. The operating conditions of these systems and system components are being monitored at the facility monitoring center. At this center, operations and daily maintenance are performed in three shifts through out the year. As minor problems can happen every day, we have recognized that it is important not to develop system larger one and to try to maintain stable machine operations. We believe this objective was achieved successfully with the support of SPring-8 members in 1998.

4.2 Computerization for Facility Management

The construction of a computer program system is being planned to utilize the operations and maintenance data in facility management. This program system will collect equipment and facilities monitoring data, maintenance data, and inspection data. The system will then provide facility management information after processing the collected data. A comprehensive study was done and the structural design of the program system was carried out in 1998. The programming and customization of the system will take place at the beginning of 1999. Its operation and investigation for further function to be furnished will start at the beginning of next fiscal year.

5. Inspection and Improvement

Periodic inspections, major repair work, and various improvements of the facilities were performed to keep all equipment in normal working order.

5.1 Inspections and Repairs

Inspections and repairs were carried out on accelerator supporting facilities like cooling systems according to the corresponding schedules.

The equipment inspections involved voluntary inspections and mandatory ones. The voluntary inspections included inspections on components of the cooling systems, air conditioning equipment, *etc*. The mandatory inspections (under law) consisted of inspections on fire fighting systems, electric power systems, *etc*. Every inspection schedule was adjusted so as not to disturb the research activities of users. All inspection work was completed as planned.

Because SPring-8 just started in-service operations one year ago, the amount of maintenance data accumulated remains insufficient. Nonetheless, we plan on amassing more maintenance data to build long- term inspection plans.

5.2 Construction Support for New Front End Cooling System

In the Beamline Division, a new cooling water supply system for the front end channel is designed to provide with enough cooling capacity. The Facility Management Division is supporting the construction of the system. The support work involves management of the detailed design, fabrication, installation and test operations. In 1998, work began on an on-site survey and the detailed design of the system. The system is scheduled to be completed at the end of August 2000. Its construction has been divided into two phases; the first phase is scheduled to be finished at the end of August 1999.

5.3 Extension and Improvement of the Site Communication Systems

PHS antennas, telephone circuits and the site broadcasting system were extended and improved. These systems have been important for everyday communications, information exchanging, and crisis management. The SPring-8 campus is situated on a very large area (141 ha). Buildings are spread out in this extensive area.

The PHS system was introduced to supplement the site telephone circuit. An essential improvement was carried out to make inaudible areas audible for the effective application of PHS devices. Inaudible areas were surveyed and advanced antennas were installed.

Concerning the campus broadcasting system, the numbers of speakers and amplifiers were increased based on requests from site residents. Site broadcasting is used to frequently announce the beam operating conditions every day.

These improvements were completed as scheduled.

5.4 Improvement of the Fire Fighting Facilities

Requests were received to have water be supplied to the fire hydrant system automatically by an emergency generator in the case of commercial electric power outage. It was therefore made for emergency electric power to be supplied to important

equipment such as fire pumps by a large-scale gas turbo generator installed adjacent to the extra-high-voltage No.1 substation. At every mandatory inspection of the fire hydrant system, the electric power of the No. 1 substation must be cut to confirm the automatic run of the generator. When the emergency generator is running, however the electron beam of the storage ring has to be stopped. In order to prevent this situation, we are planning to install a small-scale emergency generator for the fire pumps at the water supply building in 1999.

5.5. Improvement of Machine Cooling Systems

Machine cooling systems cool the RF-systems and electromagnets. The RF-systems in particular require extremely fine temperature control within ± 0.1 ˚C. The coolant temperature is controlled precisely in accordance with the machine and atmosphere conditions. Secondary cooling systems of the storage ring have two operating modes: summer mode and winter mode. The mode is changed at the beginning of May and at the beginning of October for rough temperature control within ± 1 ˚C. Heater equipment have been installed in the primary coolant circuits to adjust the temperature of each system precisely.

To control the machine cooling temperatures more precisely, improvements to the systems were studied. In the cooling towers of the secondary cooling systems, the air flow from the cooling fans had been controlled by individual dampers with full close or full open motion. This method, however, had not been enough to get stable primary coolant temperatures. We therefore started to employ a new method for air flow control, which regulates the dampers' open rate corresponding to the temperature of the return water to each tower. This improvement was completed in November.

Another improvement was studied to minimize primary coolant temperature deflection. The three-way butterfly valves of the secondary cooling systems will be replaced by two-way flow control valves at the beginning of 1999. This improvement is expected to decrease the control range of the coolant temperature from ± 1 ˚C to ± 0.3 ˚C.

Fig. 1. The electric consumption in 1998.

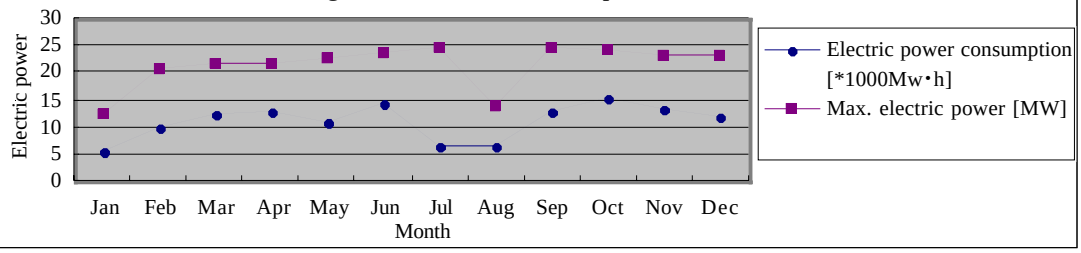

Fig. 2. The water consumption in 1998.

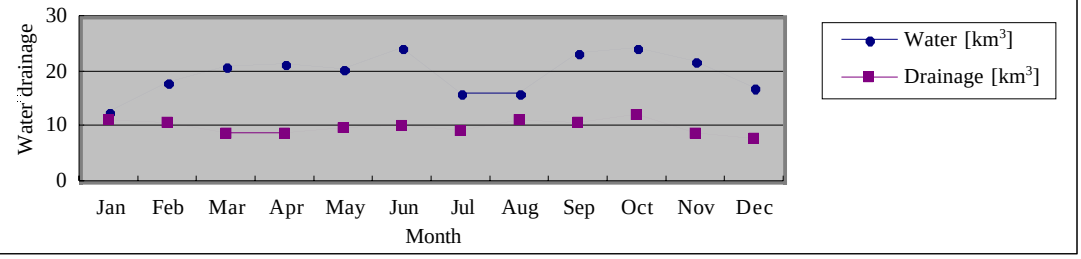

Fig. 3. The town gas consumption in 1998.