

CHAPTER 5

MAINTENANCE AND REHABILITATION PLAN

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5.1 Selection of Rehabilitation Equipment

No.1 unit of TES4 began to supply heat and electric power in 1983 and operation is continued by the present system (eight boilers, six turbines and generators) from 1991.

The failure rate of boiler equipment increased and difficulty arose in stable operation. Two grant aids by the Japanese government (the counter measure for ashes processing system blockage, the countermeasure for wear-proof coal pulverizer system, and rehabilitation of the hot water supply system) were performed over 1992 - 1998.

Further, in the Japanese government loans (Phase-I) over 1996 - 1999, replacement of the direct combustion system of No.1- No. 4 boiler coal combustion equipment, replacement of the control and instrumentation equipment of No.1 - No. 4 boiler, and exchange of furnace tubes and super heater tubes (high pressure part) were implemented. The stability of the rehabilitated boiler and boiler efficiency improved as a result of this rehabilitation work.

In the Japanese government loans of the scheduled for 2001 - 2005 (Phase-II), same rehabilitation for No.5 - No. 8 boiler as Phase-I and replacement of No.1-No.4 exciters of generator system for No.1 - No.4 are due to be carried out.

Beside the above large-scale rehabilitation, in daily repair work, middle overhaul or major overhaul, the power plant itself has planned various updating and rehabilitation and has carried out maintenance and repair work.

However, because of a shortage of repair cost, there is a lot of equipment that is not repaired as planned and is of concern for future stable operation because of superannuated equipment.

Based on the hearing from the members of the power plant and result of site survey, we selected the equipment for rehabilitation and classified it into the following three ranks according to the current status. The selected equipment for rehabilitation is shown in Table 5.1-1. Please refer to the attached photograph (Fig.5.1-1 to Fig. 5.1-37) for the current status of each equipment.

- Rank A: Selected is turbine equipment that has not yet been rehabilitated, and equipment that has recently had an accident or failure and equipment of which large rehabilitation effects can be expected. Rehabilitation of this equipment is planned to be carried out from 2006 to 2010 after the rehabilitation project (Phase-II) has been completed.
- Rank B: Selected is equipment of which failure rate increases by superannuation, and rehabilitation is needed by 2010. This equipment for rehabilitation is planned to be carried out in the rehabilitation work from 2011 to 2015 after carrying out the rehabilitation work of Rank A.

- Rank C: Equipment for rehabilitation by the power plant is considered as Rank C. The improvement has been made gradually for repair of structure equipment such as replacement of damaged windowpanes, leaking powerhouse roof repair, and lighting equipment etc. for improvement of the work place environment. These are considered as equipment that the repair can be planned by the power plant.

Table 5.1-1 Equipment to be Rehabilitated

(*: Equipment contributed to the improvement in the condenser vacuum.)

(1) Boiler Equipment	Rank	Status
Repair work for leakage from ESP	B	Fig.5.1-1
Installation of sootblowers	B	Fig.5.1-2
Replacement of boiler tubes (high press portion)	C	
Replacement of screw conveyor	C	
Repair work for steam and water leakages	C	
Repair work for sand expansion at economizer	C	
Gas duct expansion replacing work	C	

(2) Turbine Equipment	Rank	Status
Replacement of auxiliary steam temp and press reducing control valves for plant start-up	A	Fig.5.1-3
Replacement of auxiliary steam temp and press reducing control valves for normal conditions	B	Fig.5.1-4
Replacement of auxiliary press reducing valve	C	
* Replacement of feedwater pumps and motors	A	Fig.5.1-5
* Replacement of condenser pumps and motors	A	Fig.5.1-6
* Replacement of expansion joint of condenser and extraction pipes	A	Fig.5.1-7
* Replacement of valves for vacuum equipment	A	Fig.5.1-8
* Replacement of ejectors	A	Fig.5.1-9
* Replacement of HP/LP feed water heaters	A	Fig.5.1-10
* Turbine No.1, 5, 6 (each 80 MW) modification	C	
* Installation of mechanical filters at cooling tower outlet	A	Fig.5.1-11
* Repair work for cooling tower (Study of alternate equipment)	C	Fig.5.1-12
* Condenser tube cleaning devices (Study of pipe cleaning equipment)	C	Fig.5.1-13
* Replacement of circulating water pumps	C	
Repair work for steam and water leakages	C	

(3) Control and Instrumentation Equipment	Rank	Status
Replacement of turbine and auxiliary transmitters	A	Fig.5.1-14
* Optimize condenser hotwell level control equipment	A	Fig.5.1-15
Replacement of No.1 to No.6 T/G supervisory instruments	A	Fig.5.1-16
Replacement of No.1 to No.6 LP HTR level transmitters and controllers	A	Fig.5.1-17
* Replacement of turbine control and instrumentation	A	Fig.5.1-18
Installation of No.5 to No.8 chemical dosing equipment supplied on Phase-I	C	
Automate No. 2 evaporator equipment operation	C	

(4) Electrical Equipment	Rank	Status
Replacement of 6 kV electric motors for FDF and IDF (No.1B to No.8B) including appropriate interlock systems	A	Fig.5.1-19
Replacement of H.V. (6.6 kV) switchgears (OCB type) to VCB type switchgears	A	Fig.5.1-20
Replacement of L.V. (0.4 kV) switchgears	A	Fig.5.1-21
Replacement of generator protection system	A	Fig.5.1-22
Replacement of 10.5 kV switchgears (OCB type) for generators to VCB type switchgears	A	Fig.5.1-23
Replacement of 220 kV / 110kV switchgears (OCB type) to GCB or VCB type switchgears only for generator transformer	A	Fig.5.1-24
Rehabilitation of various motors	C	Fig.5.1-25
Improvement based on cause analysis of burned motors	C	Fig.5.1-26

(5) Fuel Handling Equipment	Rank	Status
Installation of coal amount measurement for coal conveyers	A	Fig.5.1-27
Adoption of coal analyzer	A	Fig.5.1-28
Installation of TV monitoring system for fire, leak and safety for conveyer No.3 and No.4 lines	A	Fig.5.1-29
Replacement of firefighting system	A	Fig.5.1-30
Replacement of wet dust collector	B	Fig.5.1-31
Replacement of bulldozer	B	Fig.5.1-32
Supply of spare parts for coal crushers	C	
Replacement of steam heating system at coal handling area	C	

(6) Chemical Equipment	Rank	Status
Installation of dissolved oxygen monitoring system for condenser	A	Fig.5.1-33
Installation of automatic control and supervisory instruments for water treatment equipment	A	Fig.5.1-34
Installation of spot cooler at water sampling room	A	Fig.5.1-35
Substitute chemicals for ammonia and hydrazine (Introduction)	C	Fig.5.1-36
Chemical lining and coating of tubes and tanks (Introduction)	C	Fig.5.1-37
Replacement of ventilation devices in water treatment and analysis rooms	C	

(7) Other Facilities	Rank	Status
Repair of window glasses	C	
Repair of rain water leak in the power house roof	C	
Repair of lighting equipment	C	