CHAPTER 5 IMPROVEMENT PLAN FOR THE TASHKENT THERMAL POWER PLANT (DC "TASHTPP")

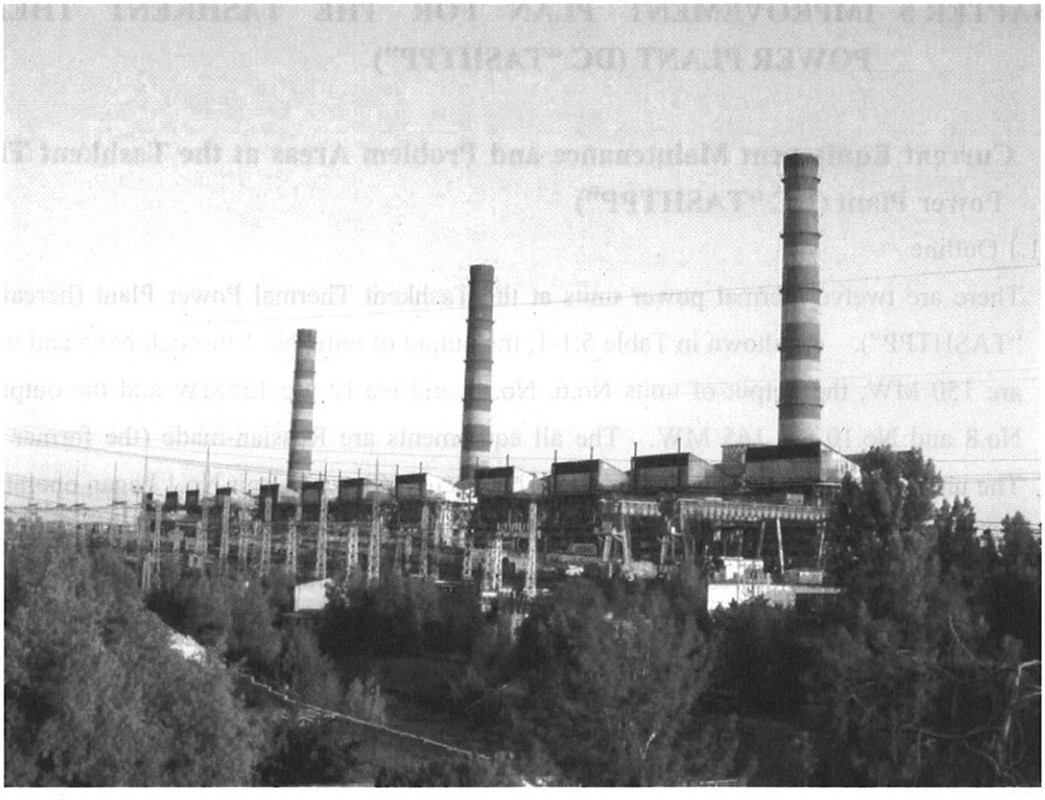
5.1 Current Equipment Maintenance and Problem Areas at the Tashkent Thermal Power Plant (DC "TASHTPP")

5.1.1 Outline

There are twelve thermal power units at the Tashkent Thermal Power Plant (hereafter, DC "TASHTPP"). As shown in Table 5.1-1, the output of units No.1 through No.5 and unit No.9 are 150 MW, the output of units No.6, No.11 and No.12 are 155MW and the output No.7, No.8 and No.10 are 165 MW. The all equipments are Russian-made (the former USSR). The units were commissioned at intervals between 1963, when unit No.1 began operation, and 1971, when unit No.12 began operation. Unit No.1 has already been in operation for forty years, and even the newest unit, unit No.12, has been operating for over 30 years, so all the equipment is aging. Picture 5.1-1 shows an overhead view of the existing plants of DC "TASHTPP" and the outline figure of a thermal power plant general to Figure 5.1-1 is shown.

Table 5.1-1 Tashkent Thermal Power Plant Main Facilities

1. Output	Units 1-5, 9	150 MW
	Units 6, 11, 12	155 MW
	Units 7, 8, 10	165 MW
2. Boilers	Type: Balanced draft drum natural circulation boiler	
	Steam generation	500 t/h
	Main steam temperature	545°C
	Main steam pressure	130 kg/cm^2
	Reheat steam temperature	545°C
	Reheat steam pressure	31.5 kg/cm^2
	Fuel	Natural gas (From Bukhara and Shurtan)
		Heavy oil (only for peak winter season)
3. Turbines	Type: Reheat condensing turbine	
	Output	150 - 165 MW
	Rotation speed	3,000 rpm
4. Generators	Voltage	18 kV
	Generator cooling method	Hydrogen cooling
	Frequency	50 Hz



Picture 5.1-1 Existing Tashkent Thermal Power Plant

In the beginning, the plant was operated and maintained by Soviet engineers. However, with the break-up of the Soviet Union in 1990, the responsibility for operating and maintaining the power plant was left to the staff of the power plant itself. Due to insufficient maintenance funding and the difficulty of obtaining repair and spare parts for Russian-made equipment, the staff of the power plant has been making and repairing the parts used in the power plant. As a result, the level of technical expertise of the power plant staff involved in maintenance work is high, but it is necessary for the plant to employ a rather large number of people.

Most of the maintenance work carried out at the plant is remedial work to fix a problem that has occurred; there is no policy of performing preventive maintenance or planning ways to extend the life of the equipment.

The following equipment failures were among the main causes of DC "TASHTPP" unit shutdowns in 2002:

- Broken boiler tubes and broken welds
- Clogged air heaters
- Damaged bearings in turbines, pumps, and fans
- Excessive bearing temperatures
- Excessive vibration in turbines, pumps and fans

- Malfunctioning turbine main stop valve
- Hydrogen leaks from generator bearings
- Deteriorated generator rotors
- Damaged motor rotors

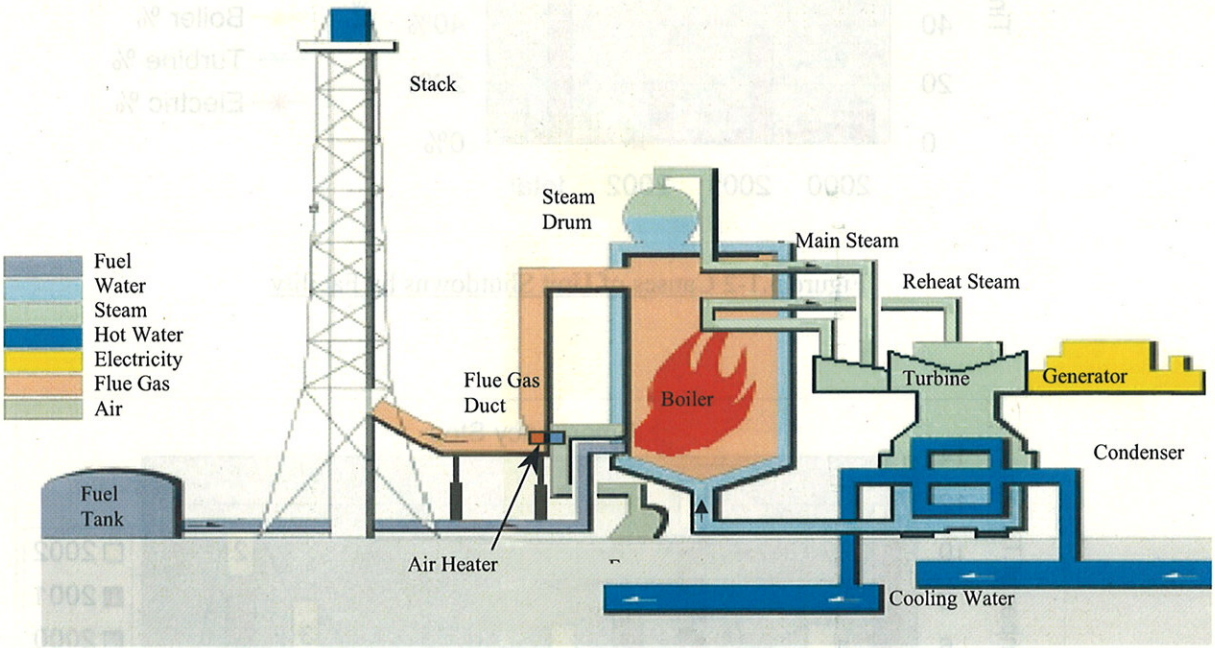


Figure 5.1-1 Outline of General Tashkent Thermal Power Plant

Figure 5.1-2 shows the causes of unit shutdowns for each facility between 2000 and 2002. In particular, it must be noted that over 75% of the problems leading to unit shutdowns are related to boiler equipment. Figure 5.1-3shows that there were slightly more emergency shutdowns of units 1, 4, and 11 than other units, but in general it must be emphasized that every effort should be made to reduce the occurrence of all such shutdowns, as they place a heavy burden on the facilities.

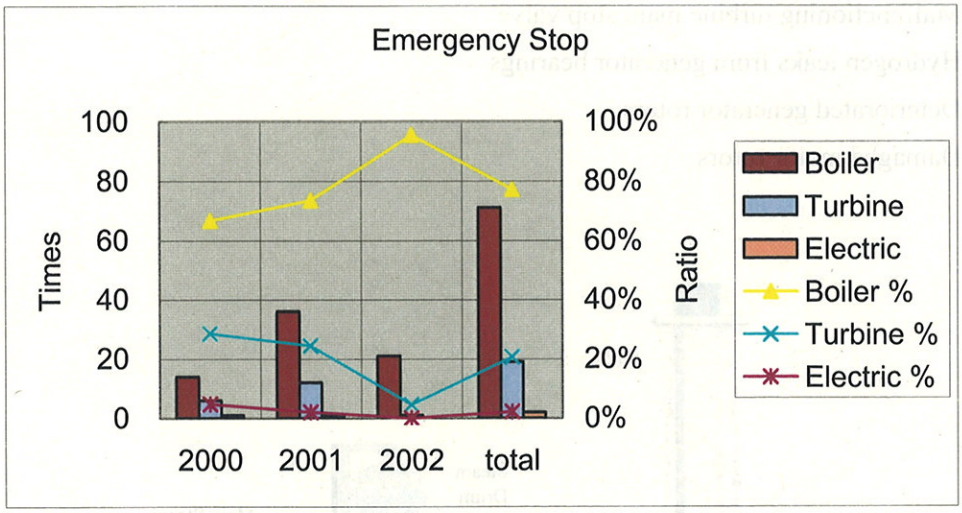


Figure 5.1-2 Causes of Unit Shutdowns by Facility

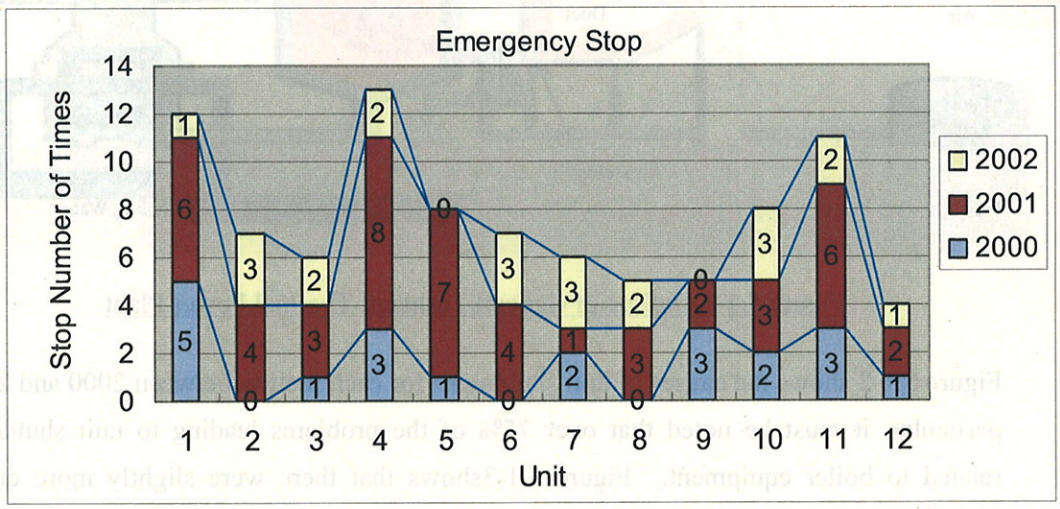


Figure 5.1-3 Number of Shutdowns by Unit

5.1.2 Boiler Equipment

As shown in Figure 5.1-4, broken tubes are the biggest boiler problem related to unit shutdowns, at 70%. The problems with the next highest significance are damaged bearings and vibration in pumps and fans. This indicates that broken boiler tubes are the biggest cause of unit shutdowns, at over 50%. It also indicates that if the occurrence of sudden failures in this area can be reduced, emergency unit shutdowns can also be reduced, which would in turn reduce the load on the facilities and increase reliability.