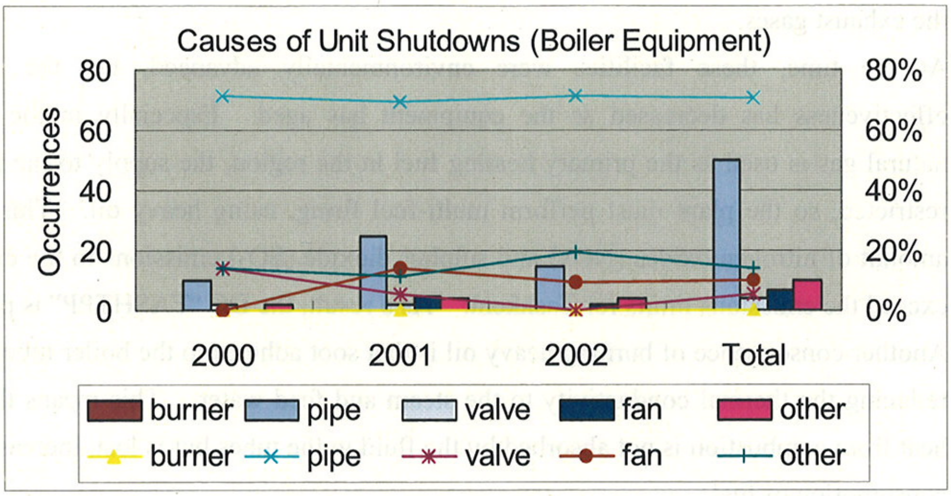
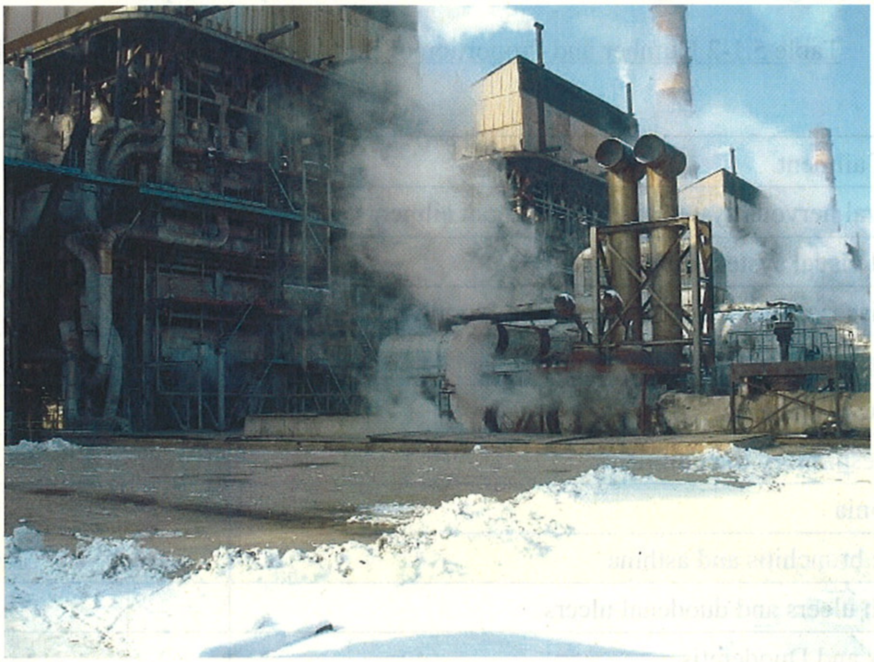


Figure 5.1-4 Boiler Equipment Causes of Unit Shutdowns

As a means of preventing these failures, a highly accurate inspection should be implemented at the time of periodic maintenance, in order to detect any problems in the early stages. All problems detected should be repaired during the periodic maintenance work, and places where tube breakage is likely to occur should be tracked, so that planned reinforcement and updating of equipment can be performed. Picture 5.1-2shows a view of the boiler.



Picture 5.1-2 View of Boiler from Turbine Side

The oldest facilities at the DC "TASHTPP" were constructed more than 40 years ago. The boilers employ two-stage combustion, and gas recirculation to reduce the nitrogen oxides in the exhaust gases.

At the time, these facilities were environmentally advanced, but the environmental effectiveness has decreased as the equipment has aged. Especially in the winter, when natural gas is used as the primary heating fuel in the region, the supply to the power plant is restricted, so the plant must perform multi-fuel firing, using heavy oil. This increases the amount of nitrogen oxides (NOx) and sulphur dioxide (SO_2) emissions to the extent that they exceed the emissions limits for Tashkent. As a result, the DC "TASHTPP" is paying fines.

Another consequence of burning heavy oil is that soot adheres to the boiler tubes in the boiler, reducing the thermal conductivity to the steam and feed water. This means that the radiant heat from combustion is not absorbed by the fluid in the tubes but is lost, increasing the plant's consumption of fuel.

Moreover, there is a bad odour in the area around the boiler in some units. This would seem to originate in gas leaks from the boiler or the flue. Even briefly inhaling these gases brings a feeling of strong irritation to the throat that remains for some time thereafter. Although it is impossible to measure these gas leaks quantitatively, it appears that auxiliary fans to the boilers are forced to consume more power due to the increased leaks. (This increased consumption is impossible to confirm, as there are no records of the current to the auxiliary equipment.) As a result of this increase, the house consumption (rate) of the plant is also increasing, which is one cause of the reduced efficiency of the plant.

Table 5.1-2 Number and Proportion of Sufferers per 1,000 at DC "TASHTPP"

Type of ailment	Number of people	Proportion
Peripheral nervous system and sense organ ailments	66.0	8.04%
Eye and visual system ailments	16.9	2.06%
Heart disease, high blood pressure, and blood vessel ailments	44.6	5.43%
Pharyngitis and tonsillitis	46.2	5.63%
Respiratory ailments	383.1	46.67%
Upper respiratory tract ailments	69.2	8.43%
Pneumonia	5.0	0.61%
Chronic bronchitis and asthma	20.0	2.44%
Stomach ulcers and duodenal ulcers	32.3	3.93%
Gastritis and Duodenitis	53.8	6.55%
Liver, gall bladder and pancreas ailments,	26.1	3.18%
Kidney, urine tract and reproductive organ ailments	20.0	2.44%
Bone, muscle tissue and connective tissue ailments	37.7	4.59%
Total	820.9	100%

As shown in Figure 5.1-2, respiratory ailments represent over 55% of all ailments suffered by the staff of the power plant. The relationship between the gases and the respiratory ailments is not clear, but these figures would indicate that the problem is too serious to be ignored.

Source: Report on EIA made by TEPLOELKTROPROEKT in 2003

From the above, it would seem that there is an urgent necessity to urgently implement measures to prevent leaks from the boilers and flues, not only to maintain the equipment and improve its reliability, but also to improve industrial health.

5.1.3 Turbine Equipment

In the turbine equipment, problems that have been major causes of unit shutdowns are damage and vibration in the bearings of the turbine itself and in the pumps. As with the boiler equipment, it is necessary to conduct thorough inspections when periodic maintenance is carried out, and to implement measures such as planned reinforcement and updating of equipment.

Data obtained from the DC "TASHTPP" did not include recent efficiency data for the turbine units, so we calculated turbine efficiency from the unit efficiency and boiler efficiency data. The results are shown in Figure 5.1-5. These results show that turbine efficiency has been declining in recent years.

Further, Figure 5.1-5 also shows that there has been a recent severe decline in the condenser vacuum. Presentations from the DC "TASHTPP" representatives indicate that they are fully aware of this problem. They also agreed with us that the probable cause was air inflow to the condenser. During the periodic maintenance conducted at the power plant, the staff always inspects and repairs the vacuum ejector, and the vacuum level is restored as a result immediately following the maintenance. However, it seems that the vacuum decreases again during operation shortly thereafter. This loss of condenser vacuum diminishes turbine efficiency, which in turn has the direct effect of reducing unit efficiency. Therefore, urgent measures such as those described below are required.

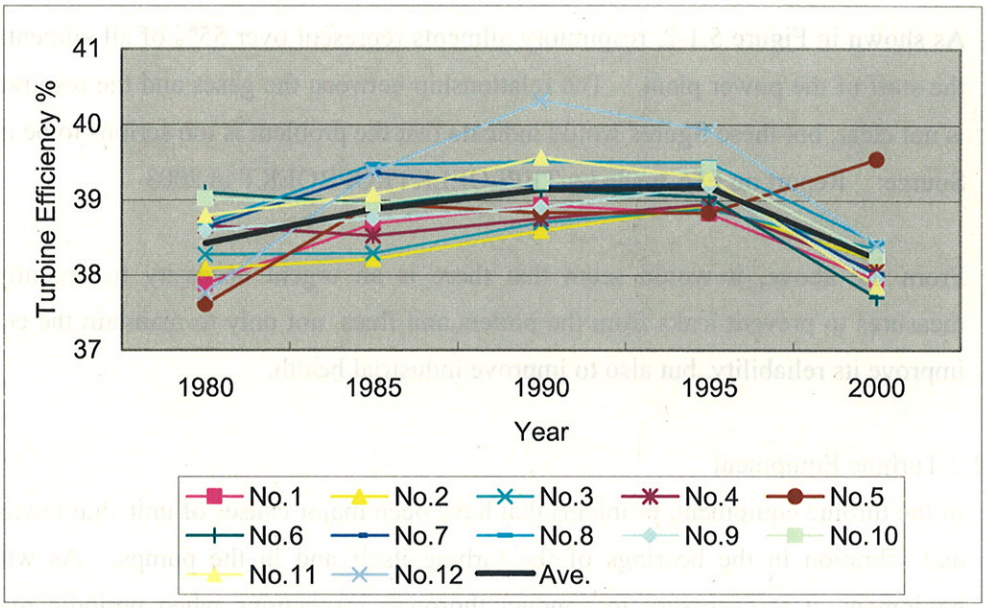


Figure 5.1-5 Turbine Efficiency over Time

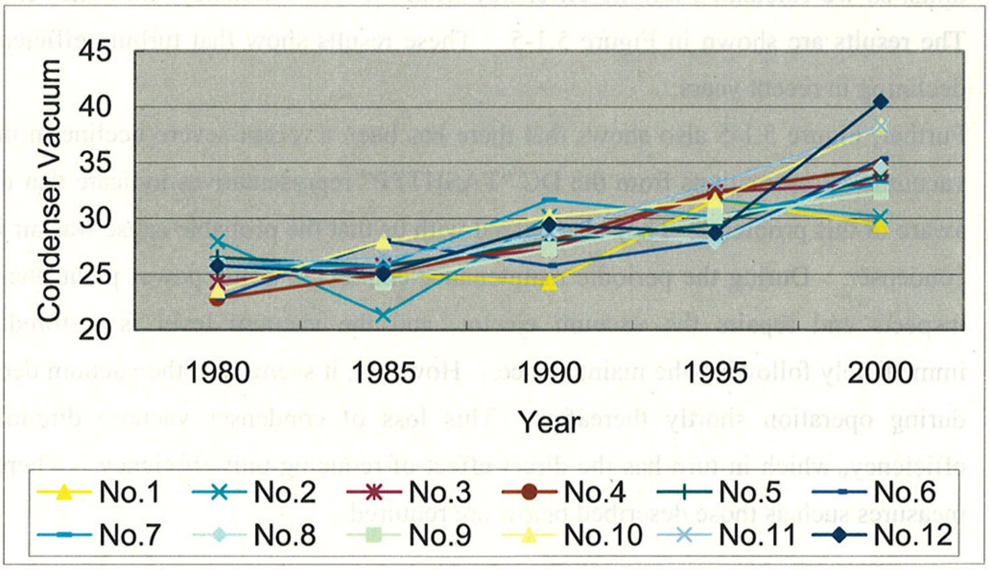


Figure 5.1-6 Condenser Vacuum Level over Time

The condenser vacuum device shown in Picture 5.1-3is of the steam ejector type, and when the outside temperature is low, the steam can be checked visually, as in the photo. This is a normal feature of this equipment, and the appearance of steam does not indicate a problem. However, it is undeniable that the efficiency of the equipment is declining with age. By updating this equipment, its efficiency can be improved.