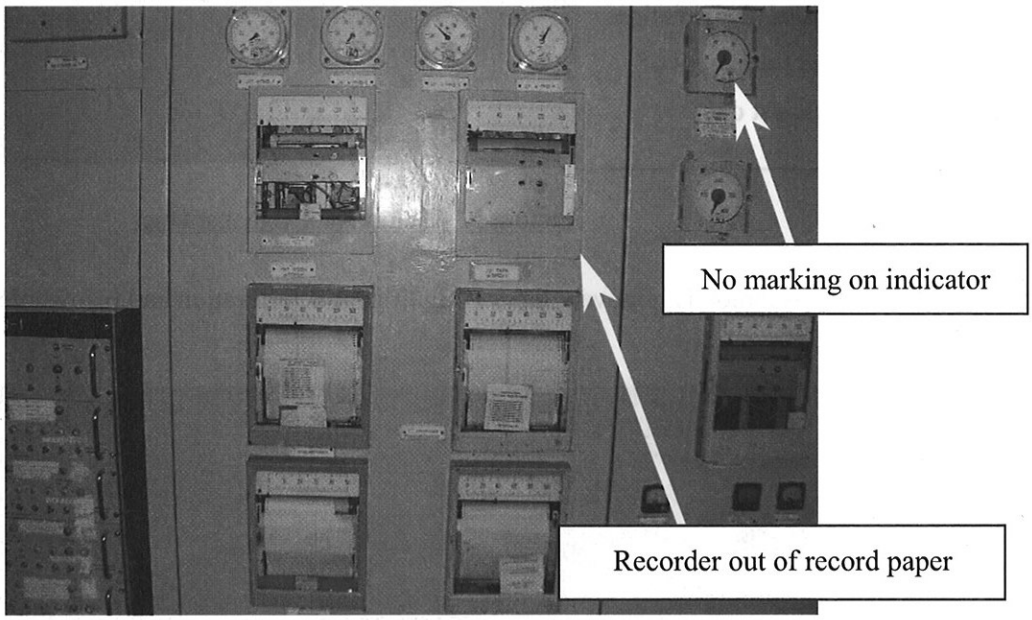
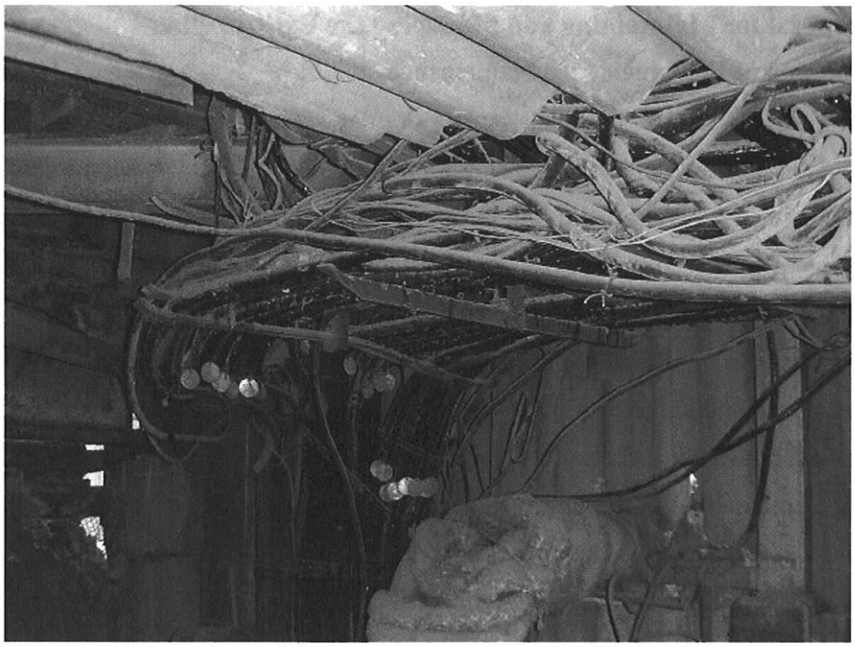
c. Electrical Control Equipment

Like the mechanical equipment, the electrical control equipment is also aging. Although there have been emergency shutdowns due to problems in the mechanical equipment attached to the electrical equipment, there have been no reported cases of a problem developing in the electrical equipment sufficient to affect the power supply.

There are many places in which the control equipment is aging and faulty, and there are few parts of the equipment that actually fulfill their control functions. In actual practice, operation is performed manually. There is serious deterioration of the cable tray, such that it no longer has its original shape. In addition, due to cable deterioration, there is a great possibility of a ground fault or short circuit. If a cable fire occurred due to a ground fault or short circuit, it is likely that the damage would be extensive.



Picture 5.1-9 Unit 6 Central Control Room Indicating and Recording Instruments



Picture 5.1-10 Cables Near Unit 6 Burner

(The cables are dusty and deterioration is evident on the outer covering.)

5.2 Proposal for Maintaining and Managing the Existing Plants

5.2.1 Selection of Equipments for Maintenance

Figure 5.2-1 show, there has been a dramatic increase in the cost of generating electricity and the accompanying unit generation cost since 1995. It seems that the reason for the increase is not a dramatic rise in the particular costs associated with power generation, but rather a general rise in prices due to inflation. As Figure 5.2-2 shows, there has not been a significant change in the proportion of generating costs represented by various inputs from year to year. This suggests that the increase in the unit generation cost is not due to increased maintenance costs required by equipment problems, nor a decline in operating hours, but rather inflation.

The cost of fuel is the largest factor in the unit generation cost. Its proportionate weight has decreased somewhat in recent years, but it is still around 85%. The proportionate weight of personnel costs is gradually increasing, and this trend is expected to get stronger. In contrast, the proportionate weight of maintenance costs is decreasing slightly, although the costs themselves are increasing significantly like the other costs. This decrease shows that insufficient funds are being allocated to equipment maintenance, which presents a problem in terms of keeping the equipment in sound condition.

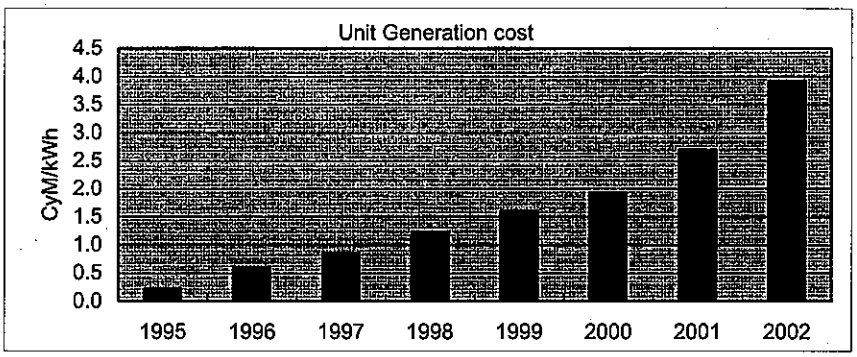


Figure 5.2-1 Unit Generation Costs over Time

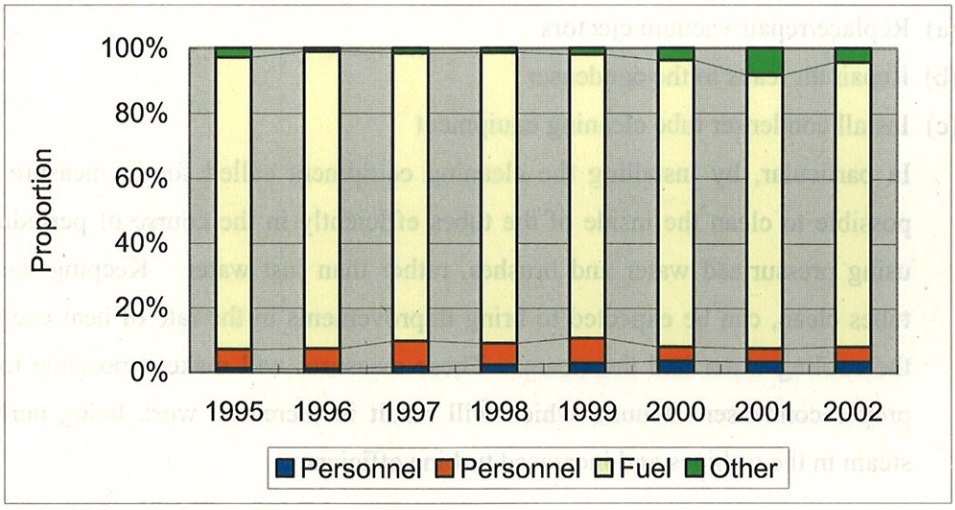


Figure 5.2-2 Proportionate Breakdown of Unit Generating Costs

A particularly significant cause of decreased unit efficiency at the DC "TASHTPP" is the decrease in condenser vacuum levels. To address these problems of decreased efficiency, it is necessary to improve the efficiency of the units as a whole, allocating the savings on fuel achieved by the efficiency improvements to equipment maintenance.

5.2.2 Results of Repairs and Improvements

The following is a summary of the most effective of the improvements.

(1) Restoration of Condenser Vacuum

The designed vacuum of the DC "TASHTPP" condenser is 25.7 mmHg (the value read from an absolute vacuum 0 mmHg at atmospheric pressure of 1 atm = 760 mmHg). As Figure 5.1-4 shows, there is now quite a large deviation between the condenser vacuum and the designed value of 25.7 mmHg, due to the reduced vacuum.

The following causes of the problem were identified in discussions between the study team and the DC "TASHTPP" staff.

(a) Distortions in pipe joints leading to the condenser hot well and air inflow due to corrosion in the condenser and the low pressure heater

(b) Decreased ability to eject incoming air due to deteriorated performance of the steam vacuum ejector (vacuum device)

(c) Soil on the inside of the condenser tubes

We have concluded that the following measures would be most effective in addressing these problems: