MINIMIZING PLANT DOWNTIME OF KELANITISSA POWER STATION

BY

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ABSTRACT

The Ceylon Electricity Board, established by act No. 17 of parliament in 1969, is the sole authority for generation, transmission and distribution of electricity in Sri Lanka. The Ceylon Electricity Board (CEB) has an installed capacity of 1,828 MW of generation, 1,859 km of high voltage transmission lines, and 95,507 km of both high and low voltage distribution lines. The ever - increasing demand for electricity in the country has been making the CEB expand its generation, transmission and distribution from time to time. However, from recent times the CEB has been facing a shortage of generation, and has had to purchase power to make up for the shortfall. Therefore a mention must be made about the Independent Power Producers (IPPs) in the country, from which the Ceylon Electricity Board has been purchasing power from recent times.

Kelanitissa Power Station, which belongs to the Ceylon Electricity Board, is its largest power station in terms of installed generation capacity. In addition to its size in generation capability, this power station also plays an imminent role in the electric system in the country by being situated in a very important transmission point.

At the end of 2003, Kelanitissa Power Station had a total installed capacity of 215 MW, which was about 8.7 % of the total installed generation capacity in the country, and 12 % of the total installed capacity in the Ceylon Electricity Board. The figure as a percentage of the installed thermal power capacity in the Ceylon Electricity Board was about 35 %. The power station consists of five diesel fired gas turbines, each with an installed capacity of 20 MW, and one diesel fired gas turbine with an installed capacity of 115 MW.

Being situated in Colombo, the most important load centre in the country, the power station occupies a very important place in the national grid. It is connected to substations in Colombo through eight 33 kV distribution circuit lines one 132 kV transmission circuit line, and is also connected to two major grid substations in the suburbs of Colombo through 220 kV and 132 kV transmission lines.

The power station is used for the peak load operation (generation of electric power during the hours of peak consumption), base load operation (generation of electric power during the hours of non - peak consumption), and emergency operation (fast restoration of the electric system in case of total system failures). One significant characteristic of the gas turbines at Kelanitissa Power Station is their high cost of operation, especially gas turbines No. 1, 2, 3, 4 and 5. The cost of generation of these gas turbines was approximately Rs. 12.00 per unit (kWhr) in 2003. This has reflected in their seldom use for base load operations. It is during the times of drought when the hydro reservoirs run dry, are these small gas turbines mainly used for base load operations. However, peak load operation and emergency operation are the two main tasks of Gas Turbines No. 1, 2, 3, 4 and 5 in Kelanitissa Power Station. Fulfilment of these requirements calls for these gas turbines and the associated transmission equipment to be as much reliable as possible. This, in turn, calls for minimum equipment downtime.

The objective of this project is to minimise the downtime of the equipment by properly planning their maintenance activities. To attain this objective, work studies were carried out as how best to attend to maintenance work of selected equipment. These work studies proved helpful in the selection of optimum methods of doing work, assigning necessary human resources and time measurements. Past data available pertaining to repair times, overhaul times and inspection and testing times were also used to estimate equipment downtimes caused by such maintenance. At the same time, lists of tools required to carry out each of these maintenance activities, and lists of spare parts and materials consumed by each of them were also prepared.

Then, using the data gathered, a computer based model was developed for planning maintenance programmes. The computer based models can be applied to plan equipment maintenance activities so as to obtain minimum equipment downtime under the existing conditions of human resources available.

Because of the need of sufficiently long periods of times, work studies can only be conducted for a limited number of systems within a given period of time. Therefore the computer based maintenance models so far constructed cover only a certain number of equipment and systems. However, they will be expanded to cover all the other equipment in the power station in future.