

Chapter 01

Introduction

1.1 Background

Lakvijaya Power Station (LVPS) is the very first coal power plant built on Sri Lankan soil. It is 3×300 MW units with sub-critical pressure, one-stage reheat, semi-out door and natural circulation drum boiler, which adopts balance draft and tangential firing of bituminous coal. The maximum continuous steam output of the boiler is 1025t/h.

The construction work commenced on 23rd July 2007 as the 1st phase of 3×300 MW units. The main objective of the project was to cater the increasing demand for electricity and also to supply steady and low cost electricity to the national grid. The expectation of first phase was to generate nearly 2.2TWh of energy annually with an overall availability of not less than 85% [01]. Due to problems that arose in the power plant in the first two years of its operation, it is nationally important to analyze the past data to study whether improvements to the power plant performance can be made.



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1.2 Present Situation of LVPS

1st synchronization of LVPS was done on 13th February, 2011 and the reliability test run commenced on 1st of April 2011. Since then LVPS is considered as a major power source to the national grid. From the start of reliability test run to plant shut down for the 1st overhaul on 23rd of November 2012, the LVPS has generated approximately 2.27TWh. The average annual energy generation is approximately 1.37TWh and the calculated plant availability during this period is about 74.5%. Table 1.1 indicates the electricity generation during that period.

According to the calculated results the average annual energy generation and the plant availability of the power plant are behind the expected values. Therefore, it is important to study the reliability of LVPS by analyzing the past data. It would help to

identify the design faults, short comings and possibilities to improve the reliability with suitable design improvements.

Table 1.1: Monthly electricity generation of LVPS

| Month | Electricity Generation (MWh) |
|----------------|------------------------------|
| April 2011 | 75,816 |
| May 2011 | 82,724 |
| June 2011 | 12,914 |
| July 2011 | 105,486 |
| August 2011 | 156,282 |
| September 2011 | 125,570 |
| October 2011 | 36,892 |
| November 2011 | 117,428 |
| December 2011 | 149,646 |
| January 2012 | 68,526 |
| February 2012 | 56,314 |
| March 2012 | 177,155 |
| April 2012 | 145,796 |
| May 2012 | 170,916 |
| June 2012 | 166,716 |
| July 2012 | 142,897 |
| August 2012 | 39,370 |
| September 2012 | 136,446 |
| October 2012 | 179,436 |
| November 2012 | 120,162 |
| Total | 2,266,493 |

1.3 Contribution of Boiler Side to Plant Reliability

Mainly LVPS can be divided in to four sections called Turbine and Generator Section, Boiler Section, Coal Handling Section and the Balance of Plant (BOP) section. Due to the various technical problems in those sections, the total outage of the power plant is 3650.6 hours during twenty month period from April 2011 to November 2012.

Table 1.2: Outages of the power plant

| Month | Total Outages (hours) | Outages due to boiler side faults (hours) |
|----------------|-----------------------|---|
| April 2011 | 98.8 | 3.4 |
| May 2011 | 252 | 250 |
| June 2011 | 634.6 | 70.7 |
| July 2011 | 218 | - |
| August 2011 | - | - |
| September 2011 | 64.9 | - |
| October 2011 | 528.4 | - |
| November 2011 | 63.5 | 19.8 |
| December 2011 | - | - |
| January 2012 | 436.1 | 114.8 |
| February 2012 | 438.0 | - |
| March 2012 | - | - |
| April 2012 | 39.7 | 1.4 |
| May 2012 | - | - |
| June 2012 | - | - |
| July 2012 | 119.0 | 59.5 |
| August 2012 | 570.0 | - |
| September 2012 | 150.0 | - |
| October 2012 | - | - |
| November 2012 | 39.4 | - |
| Total | 3652.4 | 519.6 |

As shown in the table 1.2, 519.6 hours out of the total outages of the power plant are due to boiler side failures. It is approximately 14.3% out of the total outage period.

Furthermore, failures in some parts of the boiler side systems do not cause to total outage of the power plant. But it reduces the energy generation of the power plant. Because, the power plant should be de-loaded and run in partial loads due to such failures.

1.4 Objective of the Research

Analyzing past data, shows the reliability of the power plant is behind the expected results. Boiler side equipment failure is a main cause of low reliability of the power plant.

Therefore, the purpose of this research is to study the reliability of LVPS while identifying the design faults and shortcomings related to the boiler side. Furthermore, it will provide recommendations and suitable designs to improve the reliability of power plant.



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