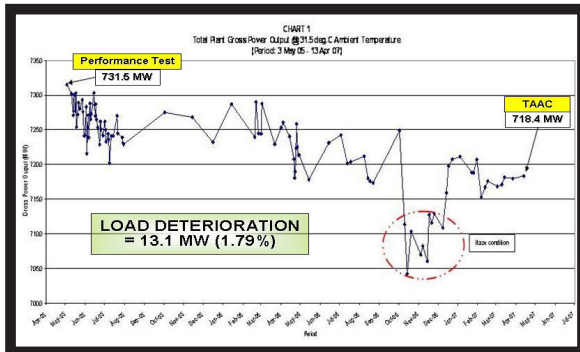
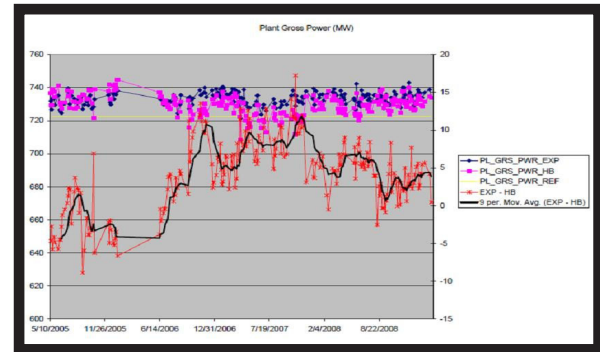


R&D Fund Project

Analysis of Capacity Degradation for Combined Cycle Power Plant at PD1



PD1's gross power output (3 May 05 - 13 April 07)



PD1's capacity degradation (May 05 – Feb 09)

Project Overview

Phase 1 of Tuanku Jaafar Power Station, Port Dickson (PD1) indicated a significant capacity degradation of 13.1 MW (1.79%) in less than two years of commercial operation from May 2005 to April 2007 [1]. TNB Research (TNBR) was commissioned to embark on the analysis from the thermodynamic or heat balance standpoint.

In order to perform the analysis, thermodynamic models were developed for PD1 using GateCycle software. Two types of model, namely Heat Balance and Performance models were developed for the major components of the plant, i.e. gas turbines (GTs), heat recovery steam generators (HRSGs) and steam turbine (ST).

From the Performance model, the expected (also referred to as “new and clean”) performance was calculated, whereas from the Heat Balance model, the current performance was determined. Subsequently, capacity degradation was quantified as the difference between these two types of performance.

Deliverables

The deliverable of this R&D project is a final report that contains:

- Comparison of thermodynamic performance between benchmark (combined cycle performance test) and current conditions
- Performance analysis of power plant's major components
- Verification of the existence of capacity degradation
- Root causes of capacity degradation (if any)
- Recommendation of measures for capacity improvement

Benefits

- Determination of the performance for the overall plant and the major components (i.e. GTs, HRSGs and ST) from the thermodynamic standpoint for performance trending and analysis throughout the study period, i.e. from combined cycle performance test (May 2005) to the end of the study (February 2009).
- Thermodynamic model and performance monitoring template for continuous monitoring and analysis purposes.