

**FEASIBILITY OF INTEGRATING BITUMINOUS COAL
STEAM PRE-DRYING: CASE OF LAKVIJAYA
COAL POWER PLANT, SRI LANKA**

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Thesis submitted in partial fulfilment of the requirements for the degree

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Declaration

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Professor R.A Attalage

Abstract

Bituminous coal is considered less in inherent moisture. However, significant water quantity is added during handling and dust suppressing activities resulting an elevated total moisture level. This causes various O&M issues in power generation plants that are designed to accept lower coal moisture variations. Although Lignite pre-drying technology has been a popular study, information on integration of steam driven bituminous coal pre-drying system into sub-critical power plant is limited. In this study, Rotary Steam-Tube Dryer is selected as a viable drying technology. Then, potential of utilizing waste heat extracted from Continuous Blow Down (CBD) to operate the Dryer was theoretically modelled and benefits were evaluated. A case analysis was performed on the 3x300MWe coal fired power plant in Sri Lanka. All three identical generation units were combined with minimal physical modifications to the existing system and extractable steam flow within desired parameters was calculated by varying the CBD rate along 1% to 1.5% of BMCR of a single unit. Up to 0.025 kg/kg degree of pre-drying could be achieved in typical operating total coal moisture range from 6% to 15%. By considering only the major contributor, moisture evaporation heat in flue gas, system input energy reduction model was developed. Resultant generation efficiency gain was 0.25% when 1.5% boiler blow down rate is used. Capital Cost analysis is performed with CECPI escalation. 8 months of Payback period was calculated for 1.5% boiler blow down rate. Sensitivity analysis was performed on major parameters. Actual financial benefit would be much higher when considering auxiliary power reduction and reduced unplanned outages due to O&M emergencies that is frequently caused by elevated coal moisture levels.

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List of abbreviations

GCV	Gross Calorific Value
NCV	Net Calorific Value
VM	Volatile Matters
THA	Turbine Heat Acceptance
BMCR	Boiler Maximum Continuous Rating
HHV	Higher Heating Value
LHV	Lower Heating Value
CBD	Continuous Blow Down
DCS	Distributed Control System