Analysis of Energy Cost Savings by Substituting Heavy Fuel Oil with Biomass for a Pozzolana Dryer - Case Study of Bamburi Cement

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Abstract

The research study was carried out with the aim of analyzing the energy cost saving achieved by substituting heavy fuel oil with alternative fuel for a pozzolana dryer. This was carried out on an existing dryer where data from reports for previous years on energy requirements, that is, heavy fuel oil cost and usage was collected. An auxiliary system to handle biomass was designed and fabricated. Further a projected substitution scenario was determined through the use of excel worksheet which was set as the benchmark of evaluation on the expectations of the actual substitution. Comparison of fuel composition and cost of both actual and projected substitution scenarios was carried out. Further an economic analysis was carried out to establish the viability of the project. From the study findings of both the projected and actual substitution, the cost of energy was reducing with an increase in alternative fuel substitution with coefficients of correlation (R^2) of 1 and 0.5422 respectively. Again the projected and actual savings were increasing with an increase in alternative fuel substitution with coefficients of correlation (R^2) of 1 and 0.6288 respectively. From the economic analysis, the cost benefit analysis gave a positive net present value of 67,409,041. IRR was 4.10 %, simple payback period was 12 days and return on investment was 29.72%. Using these four techniques of capital budgeting, the investment was worthwhile to undertake. Further on economic analysis substitution effect was carried out. On the substitution effect, there was gradual cost drop of the energy used to dry pozzolana from 357,491,491 Kenya shillings with increasing percentage alternative fuel substituted to 106,269,975 Kenya shillings when heavy fuel oil is completely substituted by alternative fuel. From the study, the high and fluctuating cost of heavy fuel oil used in pozzolana drying can be achieved through substitution with alternative fuel.

Keywords
Heavy Fuel Oil, Alternative Fuel, Projected Substitution, Actual Substitution, Existing Dryer, Auxiliary System