

Pre-Feasibility Study of Cogeneration in a Paper Recycling Mill in Bangladesh

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ABSTRACT

Pre-feasibility study of cogeneration in a paper recycling mill in Bangladesh was carried out. Information on steam and electricity consumption in the mill were collected through site visits and surveys via questionnaire. Historical energy consumption data show that the power to heat ratio of the plant was 0.35. To achieve an average power to heat ratio of 0.35, three types of the prime movers, i.e., steam turbine, reciprocating engine and gas turbine cogeneration system were considered. From the sensitivity analysis of the potential cogeneration alternatives of the mill, the reciprocating engine power match option, meeting the power requirement of 525 kW was found to be the most suitable cogeneration system. It represents an initial investment of 0.034 billion Taka (1 US \$ = Tk 58) and leads to an internal rate of return of 41.8%.

Key words: Cogeneration, Energy consumption, Sensitivity analysis, Internal rate of return

INTRODUCTION

Pulp and paper mills are often large and complex facilities that may produce several pulp and paper qualities from both softwood and hardwood feedstock. However, it is possible to get an idea of relative energy performance across the industry by focussing on single-product facilities. Bleached and unbleached kraft pulping processes are essentially the same except bleached pulps are cooked to achieve a higher level of delignification in the digester, after which the pulp is bleached. As in most industries, new or modernized plants typically use less energy than old plants. Also, the industry has been more effective in reducing steam demand than electricity demand in new and retrofitted mills. State-of-the-art bleached kraft pulp mills use about 40% less steam and 5% less electricity than typical mills installed in the 1980s.

Bangladesh has acute shortage of primary energy resources which is hindering the growth of the energy sector. Energy conservation in particular and cogeneration is considered to be an attractive proposition in this context. Apart from the benefits in terms of incremental energy supply, cogeneration offers prospects for improving capacity utilization of industrial equipment and economic advantages. The major energy source of Bangladesh is natural gas. Its reserve is about 15 trillion cubic feet. In addition to this, a reserve of 2.5 trillion cubic feet of gas and oil in shallow waters of the Bay of Bengal is expected to be available for exploitation, (Centre for Energy Studies and Mechanical Engineering Department, 1998). The present gas production is about 715 million cubic feet per day. Coal