

"Co-generation prospects in paper industry cost economics and sources of finance"

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The availability of a reliable and economic form of energy is a pre-requisite for economic and social development. It is clearly demonstrated by the close relationship between energy consumption and economic growth in industrialised countries and between the persistent energy deficiency and the low standard of living in many developing Countries. In spite of annual growth rate of around 10% in the installed Capacity in the last Seven five year Plans, the Country experiences shortages of Power. Huge investments are required to bridge the gap between demand and supply. Therefore the private Sector participation in power generation is now being promoted by the Government of India.

In India, of the 268.4 billion KWH generated in 1989-1990, the utilities distribution was : Thermal-66.5%, Hydro-23%, Nuclear-2% and non-Utilities-8.5%. Fossil and nuclear fuels are the major resources of power generation in today's world. Excessive mining and use of these fuels has had an adverse effect on world's environment and ecological balance. It is estimated that the organised Sector faced a production loss of Rs 15,000 crores in the last financial year. To reduce the growing demand gap, the private power generation of 12,000 MW is targetted by the end of the eighth five year plan.

With this background, it is necessary to explore alternatives for augmenting our energy production. These alternative sources for energy generation should be environmentally friendly, technoeconomically viable, and based on proven technology. Cogeneration in process industries like "paper" offers an attractive option.

Cogeneration in a bagasse based paper mill :

Paper plant capacity ; 60 Tonnes per day (tpd)
 Bagasse required
 (Raw Material) : 230 tpd.

Low pressure steam required. : 15 tph at 4.5 bar.
 (Supply of high pressure steam is through recovery boiler)
 Power required : 4.5 MW (Max. demand)
 Pith generated : 10 tpd.
 Expected fuel to be used. : Coal with GCV of 3800 Kcal/kg.

a) Costs without co-generation for Utilities :

Capital Cost :

Low pressure boiler and accessories : Rs. 8 Million,

Variable Costs :

Coal at boiler efficiency of 60% : Rs. 33 Million per annum (p. a.)
 7000 hr/annum, and coal price of Rs. 1200/tonne
 Electricity at 4000 kwh 7000 hrs/annum,
 @ Rs. 2 2/-kwh : Rs. 61 Million p. a.
 Total energy bill : Rs. 94 Million p. a.

b) Costs with Co-generation for Utilities

Capital Cost :

High pressure spreader stoker boiler (40 kg/cm², 400°C) with pith firing and accessories : Rs 13 Million

Yajna Fuel Services
 R-0 : 427, B/2, Vimal Hans, Kings Circle (E)
 BOMBAY-400 019

Steam turbine, alternator and power evacuation system
(2 MW capacity with isentropic
efficiency of 65%) : Rs. 9.5 Million

Total capital costs for Co-
generation : Rs. 22.5 Million.

Variable Costs :

Coal at boiler efficiency of 60%,
pith at 2000 Kcal/Kg, 7000
hrs /annum and coal price of
Rs. 1200/tonne : Rs.40.5 Million p.a.

Electricity at 2700 KWh from
SEB, 7000 hrs/annum and
Rs. 2 2/kwh : Rs. 41.5 Million p.a.

Total variable costs. : Rs. 82.0 Million p.a.

Conclusions :

- a) With an incremental cost of Rs. 14.5 million for a Co-generation plant the paper mill can save Rs. 12 million p.a. leading to a simple payback period of 1.2 years.
- b) For existing paper plants, the cost of retrofitting existing boilers to generate high pressure superheated steam will vary from case to case. However with spiralling electricity costs, the payback period would not exceed 2.5 years.
- c) For paper plants using furnace oil as fuel, the gain in boiler efficiency from a low pressure boiler to a high pressure boiler with economiser can be 3 to 5%.

FINANCE :

Finance remains a major constraint in implementing various power generation or energy conservation projects. Finance could be through equity, term loans and govt. subsidies. An attractive option is to invite foreign non-utility generating companies to share in the equity.

With an installed capacity of about 7,00,000 MW, The United States (USA) utility industry is the largest of its kind in the world. Over 90% of the capacity is owned by investor owned utilities (IOU's) with remaining distributed among rural electric Co-operations

Municipal Utilities, state and federal government/agencies, and non-utility generating (NUG) Companies.

Typically, IOU's operate as regulated monopolies. They are subject to the public Utility Holding Companies Act which limits their operations to specific service territories. Within these territories, their rate structure is approved by public Utility Commissions (PUC's) which are appointed by local state Governments. A Utility requires an approval from its PUC for any capacity expansion plan. Once approved, a Utility can finance a new generating plant through its rate paying customers.

During the last 10 years, there has been a steady decline in new Utility owned generating plants. On the other hand, during the same time, over 2,500 NUG plants totalling about 30,000 MW of Capacity were built in the USA. During the next 10 years, the NUG Capacity is expected to grow even faster at about 5,000—6,000 MW per year.

In every NUG project, the project developer assumes the total responsibility for all phases such as development, financing, design, Construction, plant operation and maintenance. The project developer attempts to take advantage of potential financial rewards while minimising business risks. From a Utility's perspective, a NUG plant is advantageous, in that the Utility Completely avoids the financing and permitting risks.

Utilities and project, developers have adopted to the NUG market in a mutually beneficial manner as evidenced by the successful history of a large number of projects. One of the Key reasons has been the ability of US project developers to arrange necessary project financing on economic terms.

Recently, the Government of India has decided to allow private Indian or foreign investors to enter into Utility market. Under the revised policies the investors can build and operate independent power plants and sell the entire output to local state electricity board or host industries under long term Contracts. Similarly the manufacturing plants such as paper mills, can now generate on-site electricity to satisfy their power loads and steam needs with foreign equity participation upto 100%.

The various project financing issues fall into the following board Categories.

- Plant Design and expected performance
- Project team and Implementation plan
- Credit worthiness of the Host

—Currency Risks

These issues can be reasonably solved by the non-utility generating (NUG) Company and host industry to usher in foreign or non resident Indian (NRI) equity participation to save/generate energy.