

Cost and Quality Competitiveness of Indian Pulp & Paper Industry in the Changed Scenario Due to Globalisation with Particular Reference to Energy, Environment, Sustainability and Economics.

Farooqui, N.A.

ABSTRACT

Technological changes are taking place throughout the world for cost reduction (by adopting energy efficient processes / equipments), quality improvement and clean environment. Various measures to be taken by Indian pulp and paper industry and Government have been highlighted for making Indian paper industry globally competitive.

INTRODUCTION

The Indian pulp & paper industry is more than a century old. There are about 380 paper mills in India with a total installed capacity of around 4.2 million tonnes per annum (mln t/a). There is an idle capacity of about 1.0 mln t/a so that the actual production capacity is about 3.2 mln t/a. Details of production, trade and consumption of Paper and Board (P & B) from 1992 to 1996 are presented in Table - 1.

PRESENT STATUS

The Indian paper mills are of varying capacity ranging from 5 tad to 600 tad. The paper sector in the country can be classified in three ways: by size, by the raw material used and by the end product. A mill with a capacity of 33,000 t/a (or 100 t/d) is considered large in India, compared to 300,000 t/a in Europe. The large paper mills generally use conventional forest based raw materials such as bamboo and hard wood, while the smaller mills largely use non-conventional raw materials such as waste paper or agro inputs (including bagasse, straws, jute, etc.). While over 38% of the domestic paper production is based on forest based raw materials,

around 31% is accounted for waste paper based mills, while the rest is accounted for by the agro based units.

On the basis of end product, mills can be classified on the basis of type of paper produced - industrial and cultural paper. Cultural paper is of two types; writing and printing which include varieties such as bond, cream wove, maplitho, offset and coated papers. Industrial paper comprises of wrapping and packing paper such as kraft, duplex boards, etc.

International paper prices have declined from \$ 1,000/t in end 1994 to \$ 850/t in end 1995 to \$ 650 /t in May 1996 and to a further low level in Jan 1997. Import duties on paper and paper board have declined rapidly from 140% to 25% within a span of 3 to 4 years. Recently it has been raised to 35%. Domestic prices of paper started increasing in the second quarter of 1994 in tune with the international paper prices, peaked during the third and fourth quarter of 1995, started declining from the first quarter of 1996 and were approximately 10-20% lower in the first quarter of 1997. In 1997-98 international prices are more or

Tata Consulting Engineers,
414 V.S. Marg, Prabhadevi Bombay - 400025

PAPER INDUSTRY

Table - 1

| India : Paper and Board Production and Consumption in '000 Tonnes | | | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|-----------------|-------------|
| Items | 1992 | 1993 | 194 | 1995 | 1996 | Annual % change | |
| | | | | | | 91/96 | 95/96 |
| No. of Mills | 327 | 330 | 340 | 380 | 380 | | |
| Installed Capacity | 3300 | 3400 | 3460 | 3800 | 4200 | | |
| Capacity Utilisation | 71.5 | 75.2 | 78.4 | 82.0 | 75.4 | | |
| Production | | | | | | | |
| Newsprint | 209 | 312 | 362 | 402 | 365 | 4.0 | - 9.2 |
| P & W | 1010 | 1125 | 1175 | 1265 | 1310 | 5.8 | 3.6 |
| Packaging P & W | 1050 | 1025 | 1075 | 1330 | 1370 | 6.1 | 3.0 |
| Other P & W | 90 | 95 | 100 | 120 | 124 | 6.6 | 3.3 |
| Total | 2359 | 2557 | 2712 | 3117 | 3169 | 5.7 | 1.7 |
| Consumption | | | | | | | |
| Newsprint | 374 | 582 | 603 | 693 | 714 | 10.2 | 3.0 |
| P & W | 1015 | 1127 | 1181 | 1237 | 1285 | 5.3 | 3.9 |
| Packging P & W | 1051 | 1026 | 1090 | 1334 | 1375 | 6.2 | 3.0 |
| Other P & W | 93 | 99 | 103 | 123 | 127 | 6.1 | 3.4 |
| Total | 2532 | 2833 | 2977 | 3388 | 3501 | 6.6 | 3.3 |
| Imports | | | | | | | |
| Newsprint | 165 | 270 | 241 | 292 | 350 | 20.1 | 19.9 |
| P & W | 9 | 6 | 9 | 10 | 12 | 24.6 | 22.4 |
| Packging P & W | 5 | 3 | 16 | 16 | 16 | 9.9 | 1.1 |
| Other P & W | 3 | 4 | 3 | 4 | 4 | -1.4 | 3.9 |
| Total | 180 | 283 | 269 | 321 | 382 | 19.3 | 18.8 |
| Exports | | | | | | | |
| Packging P & W | 3 | 2 | 2 | 11 | - | - | - |
| Other P & W | - | - | - | 1 | - | - | - |
| Total | 7 | 7 | 5 | 50 | - | - | - |
| Demand/Supply gap | 173 | 276 | 265 | 271 | 332 | | |

Source : Paper Maker-July 1997

less stable while domestic prices show a depressed trend.

RECENT UNION BUDGET

Two important announcements in the Union Budget 1998-99 have affected the paper industry. The increase in custom duty on paper and paper boards from 25% to 35% as well as imposition of 4% additional duty is likely to put the paper and board group, which were badly hit by cheap imports, in a comfortable position. On the other hand, lowering of duty from 10% to 5% on newsprint imports has badly affected the already languishing newsprint industry.

BUDGET IMPACT

The paper and board industry has been facing much hardship for the last couple of years because of poor demand, declining international prices and indiscriminate dumping by overseas suppliers. In this prevailing situation, the substantial hike in import duty will offer relief to the integrated paper industry. The landed cost of imported paper and board will increase due to the increase in custom duty and additional 4% duty. As a result, domestic producers will be able to hike their prices to better their contribution. Industries which use imported pulp and waste paper are not likely to benefit, as their raw material input cost will increase due to increase in custom duty and additional duty. The newsprint industry which is already facing a tough challenge from cheap imports from Korea, is likely to be severely affected due to reduction of import duty on newsprint.

INDUSTRY OVERVIEW

The paper industry has been going through a difficult and critical phase for the last few years due to sluggish economy and low demand. The small paper mills are facing more problems due to economic barriers and the shift in demand for better quality products. Domestic paper producers have been forced to offer heavy discounts because of intensive competition in the market and increase in import. Putting newsprint under Open General Licence (OGL) has badly affected the newsprint. Though domestic producers had increased their prices by Rs. 3,500/MT before the imposition of reduction in import duty, the industry is facing a hard task of survival in the present situation.

The international pulp and paper industry including India is passing through a very difficult

phase presently. The problem faced by Indian industries are uncertainty in supply of raw materials, high cost of raw material, high cost of power and abnormality in tariff structure imposed by the Government, due to which all kinds of paper are being imported in the name of newsprint and dumped unfairly.

Domestic paper producers should change their mind-set and think in terms of boundaryless trading in the changed scenario due to globalisation. Not only India but also the entire world is to be considered our market. The Indian industry should adopt measures to face competition in the Indian as well as in the International market.

MEASURES

In order to become globally competitive and successful exporting economy, Indian industries must go in for the following steps:

- a) Cost reduction
- b) Quality improvement and competitiveness
- c) Increased productivity with export surplus
- d) Energy Efficient and Environmental Friendly Technologies.

For achieving the above goal, some concrete steps are required to be taken both by the Government and industries.

RAW MATERIAL SUSTAINABILITY

The most important factor restricting the growth of Indian paper industry and its development into a globally competitive industry is the acute shortage and high cost of wood based raw materials. It needs attention of the Government and adoption of a clear policy towards forestation. By not allowing industrial plantation, the Government is inhibiting the growth of the paper industry. Hence proper measures relating to paper industry's specific problems have to be taken up to achieve the desired results. Industrial plantation is required for survival and for achieving global competitiveness of domestic pulp and paper industry. Government should consider the involvement of corporate sector in afforestation of available degraded forest land as suggested by the domestic pulp and paper industry.

CUSTOM DUTY REGULATION

Government should regulate the import duty from time to time so as to allow the domestic pulp and paper industry to survive.

COST AND QUALITY IMPROVEMENT

The cost of production for various material inputs in an efficient Indian pulp and paper mill in year 1990 is given in Table-2

Table - 2

| Various inputs of production cost | |
|------------------------------------|----------------------------------|
| Sl. No. Material Inputs | Cost of production % of Total |
| 1. Raw Material | 31.3 |
| 2. Chemicals | 13.8 |
| 3. Stores and Spares | 5.9 |
| 4. Power and Fuel | 16.4 |
| 5. Repair and Maintenance | 1.3 |
| 6. Handling | 2.2 |
| 7. Salaries and Wages | 8.0 |
| 8. Admn. Selling & Other expenses | 6.2 |
| 9. Depreciation | 7.6 |
| 10. Interest and Financial charges | 7.3 |
| Total | 100.00 |

Source: IPPTA vol 2, June 1990

The table shows that the cost of raw material input is the highest (31.3%) of all the input costs determining the cost of production, the second major input is power and fuel cost (16.4) and the third major input is the cost of chemicals (13.8%). Hence, as stated earlier, the raw material cost must be lowered which can be achieved if Government allows plantation of deforested lands.

Production of quality papers requires bamboo and wood pulps. We can produce speciality and good quality papers from recycled fibre/waste paper only if it is blended with bamboo or wood pulp. While developments have already taken place in all the areas of paper making (Pulping, Paper making, Chemical recovery and power/steam generation), we are still working with the old technologies. So the domestic paper industry will have to adopt new Energy Efficient Technologies/Equipments for improvement in cost, quality, energy savings and environmental cleanliness. Table-3 gives consumption of Steam, Electricity, Water, Chemicals and Raw material in paper mills in India and abroad.

ENERGY CONSUMPTION

The pulp and paper industry is highly energy intensive. Energy in the form of steam and power is mainly utilised in the paper industry. The generation cost of steam and power should be lowered and they should be utilised in an efficient way in energy efficient processes. The energy cost as a percentage of manufacturing cost which was around 15% earlier is presently 24.5%. This is mainly due to increase in energy prices. With high level of energy usage, Indian paper industry can hardly be competitive in its prices. The Indian paper industry, it is said, can

Table -3

| Energy/chemicals/raw material consumption of paper mills in India and abroad | | | |
|--|--|----------------|--------------|
| Sl. No | Performance/Performance Norms | Mills in India | Mills Abroad |
| 1. | Steam consumption/tonne of paper (tonnes) | 11 to 14 | 6.5 to 8.5 |
| 2. | Electrical energy/tonne of paper (kwh) | 1500 to 1700 | 1150 to 1250 |
| 3. | Water consumption/tonne of paper (kl) | 270 to 350 | 130 to 140 |
| 4. | Chemical consumption/tonne of paper | 0.56 to 1.05 | 0.36 to 0.70 |
| 5. | Chemical Recovery % | 80 to 88 | 95 to 98 |
| 6. | Raw Material consumption/tonne of paper (Tonnes) | 2.0 to 2.4 | 1.8 to 2.0 |

Source: IPPTA Convention Issue 1996

comfortably save energy to the extent of 20-25%. Without a 25% reduction in energy cost, the Indian paper industry is unlikely to be competitive in the years to come. The World Energy Council has found that the present energy consumption in Indian pulp & paper Industry ranges from 31 to 55 GJ per tonne of product, which is roughly twice as much as what is consumed by the industrialised nations in the world.

After a detailed study of pulp and paper industries in India, CII-EMC has come up with the following norms:

A. For integrated Paper Mills (Writing & Printing)

- Specific steam consumption, tons/ton of finished paper 9.0
- Specific power consumption, kwh/ton of finished paper 1400.

B. For small & Medium Mills (Writing & Printing), Agro Based

- Specific steam consumption, tons/ton of finished paper 5.75
- Specific power consumption, kwh/ton of finished paper 1200

ENVIRONMENT

The pulp and paper industry is said to be highly polluting. The three types of emissions from a pulp and paper plant are Gaseous Emissions, Particulate

Emissions and Liquid Effluents. The main pollutants and their source are given in Table-4.

Pulp and Paper mills abroad are continuously upgrading their technology for clean environment. Pollution control norms are also tightening day by day. Today, the challenging task is the control of bleach plant effluent norms. Though a few mills in India have started ClO₂ bleaching, most of them still follow CEH/CEHH sequence. The time has come to adopt ECF (Elemental Chlorine Free) and TCF (Total Chlorine Free) Bleaching. But before changing over to the latest bleaching technology, it is essential to adopt the new pulping techniques e.g. Extended delignification processes so as to reduce the kappa no. to a low value. It is a challenging assignment to comply with bleach plant effluent norms without changing the pulping process. The right choice of the pulping technology will reduce the BOD, Colour, COD, and AOX in the effluents.

ENERGY EFFICIENT AND ENVIRONMENT FRIENDLY PROCESSES

Some of the energy efficient and environmental friendly processes with their advantages are described here after. Indian paper mills should adopt them gradually in near future depending upon their capability to invest.

LIQUOR DISPLACEMENT TECHNOLOGY

The kraft or sulphate batch process is defined as a cooking process in which the cooking chemicals, white liquor and spent black liquor are charged to

Table - 4

| Sl. No. | Type of Emissions | Source | Main Pollutants |
|---------|-----------------------|--|--|
| 1. | Gaseous Emissions | Pulp Mill Boilers Soda Recovery Boiler | Mercaptans, H ₂ S, Cl ₂ , ClO ₂ NOx, CO, SOx |
| 2. | Particulate Emissions | Boilers Soda Recovery Boiler | SPM |
| 3. | Liquid Effluents | Pulp Mill and Paper Machine | BOD, COD, AOX, Colour, Fibres and Chemicals |

the digester at the beginning of the cooking process. The digester contents are heated to 165-170 C by direct steaming or indirectly by heat exchanger to the required cooking temperature, generally 165-170 C. On achieving the desired degree of delignification the digester content is blown to a blow tank. This cycle is repeated in a batch process.

Due to high energy cost, high cost of chemicals and continuous pressure from environmental authorities to minimise impact, process technology suppliers are in continuous search of new technology for energy efficient and environmental friendly processes. This has led to the development of highly energy efficient kraft batch processes using various kinds of liquor displacement technology. In the displacement batch cooking process, the heat and residual chemicals in the black liquor at the end of cook are stored by displacing the spent black liquor into separate pressure accumulators from where it is used to heat chips and white liquor for the next cook and so on.

Following liquor displacement batch cooking technology are in use these days. the common feature of all these processes is that heat needed in cooking is transferred from cook to cook by displacement.

1. RDH Cooking System: Offered by Beloit, England/USA.

Heat is recovered from hot black liquor at the end of cooking and reused in the subsequent cooks. The impregnation temperature is generally 100-130 C.

2. Enerbatch Cooking System: Offered by Impco, Austria.

The principle is basically the same as the RDH except the impregnation temperature is low, around 80-90 C.

3. Superbatch Cooking System: Offered by Sunds Defibrator, Sweden.

The principle is the same as RDH. The impregnation temperature is around 70-90 C.

Enerbatch differs significantly from RDH and Super Batch in that down-flow liquor displacement is used instead of up-flow displacement.

ADVANTAGES

The following benefits have been reported:

Energy saving and reduction of steam consumption by 60-70%.

Reduction of chemical consumption in cooking, washing and bleaching.

The Tear strength is higher by 15 to 20 % than conventional cook. Due to higher strength, paper machine runability improves.

Pulp of low kappa no. can be produced without loss of strength. Strength of pulp is better than conventional cook.

Pulp of higher Brightness can be produced.

Alkali losses in washing are minimised.

Viscosity of Black liquor is low. Hence firing in the recovery furnace can be done at 75-80% solids.

Percentage solids in black liquor is higher than conventional cook which saves steam in subsequent evaporation plant.

Due to higher yield percentage, considerable amount of costly and scarce raw material is saved.

Technology is environmental friendly with following advantages:

I. Reduction in BOD, COD, AOX and Colour.

II. No emission of obnoxious gases like Marcaptans.

III. Reduction in TRS emissions.

WASHING TECHNOLOGY

Twin Roll Press offered by Sunds Defibrator, Sweden.

ADVANTAGES

The following advantage have been reported:

Much more effective in washing out COD and minimises carry-over of dissolved organic material (COD)

Reduces washing loss as Na_2SO_4 .

Controlled outlet pulp consistency of about 32-35%.

SCREENING TECHNOLOGY

Delta Screen: offered by Sunds Defibrator, Sweden.

ADVANTAGES:

The following advantages have been reported:

Allows operation at high pulp consistency of 3-5% thereby reducing power consumption due to less amount of circulating water.

Higher operating consistency means higher capacity and a substantial reduction of the investment and operation cost.

High pulp cleanliness.

OXYGEN DELIGNIFICATION

Oxygen delignification is today a well established bleaching technique. More than 50% of the world's sulphate pulp production uses this technique before start of bleaching process.

1. Stat Ox: offered by Black Clawson, USA.

2. Medium consistency oxygen delignification: offered by Sunds Defibrator, Sweden.

ADVANTAGES:

The process offers the following benefits.

Reduced AOX formation. A high degree of delignification before bleaching plant, followed by good washing, reduces the amount of organic material carried to the bleach plant, thereby reducing the formation of AOX.

ECF BLEACHING

This process refers to elemental chlorine free bleaching. In this process use of elemental chlorine is avoided. In the Chlorinating stage, elemental chlorine reacts with the pulp and with the organic material carried over from the Brown stock and Post Oxygen washers producing AOX. In order to reduce the formation of AOX, higher ClO_2 substitution is one viable way.

ADVANTAGES:

A modern Sunds Defibrator ECF-Plant can produce a pulp of kappa no. as low as 6 out of the Oxygen stage.

The AOX level in the bleach plant effluents is thus below 0.3 kg AOX/ODT before external

treatment.

TCF BLEACHING

In Total Chlorine Free bleaching process, chlorine is not used at all either as Cl_2 or ClO_2 . Thus it avoids the creation of AOX as Chlorine compounds are completely eliminated from the process. Sunds Defibrator pressurised peroxide stage uses hydrogen peroxide in combination with oxygen at high pressure and high temperature.

ADVANTAGES:

No production of AOX in bleach plant effluent.

The pressurised peroxide stage can also be used in a conventional bleach plant if a high brightness is required and the pulp is close to brightness ceiling.

SAVING ENERGY & ENVIRONMENT WITH PAPER RECYCLING

Unfortunately, the manufacture of paper from bamboo and wood pulp is highly energy-intensive, and produces vast quantities of waste solids and water which require disposal. Using recycled paper as an alternative is environmentally beneficial, as it reduces the volume of waste and reduces energy consumption.

We in India feel that recycling paper only helps to avoid the destruction of irreplaceable natural forests. However, it is not true for European countries where much of today's virgin wood pulp comes from managed and sustainable forests, most of them planted specifically for paper manufacture. In Europe, it is generally accepted, that for every tree that is removed to turn into paper, two new ones are planted.

Production of paper products from recycled paper can generally save 40-60% of the primary energy per tonne consumed in production, in comparison to paper from virgin wood. The difference is prominent at the sluicing stage as recycled fibres often break down readily and dissolve easily into a pulp suspension in water.

In Switzerland, production of top quality papers from virgin pulp can require a total of 25 GJ/Tonne. In comparison, energy requirements for paper made from recycled materials with de-inking and bleaching are around 13GJ/tonne. However if, recycling is done without deinking or bleaching and in a closed water system, requirements are just 6 GJ/tonne.

Recycling of old paper and cardboard is important both from energy, cost and environmental point of view. There is a general feeling that products produced from recycled materials are of inferior quality to those produced from virgin pulp. This problem can be overcome by improving process efficiency through introduction of new technologies.

ECONOMICS

A change in technology/equipments requires investment depending on the size of the project. Before taking any investment decision, the feasibility of the project is done at the preliminary stage before going for a detailed feasibility study. Two simple methods are generally used for justification of an expenditure. One is called rate of return on investment, the other is termed payout. The two methods should be reciprocally equivalent, but because of differences in definition this is not always so.

Return on investment is defined by Osburn and Kammermeyer as net profit after taxes plus depreciation, and rate or return as the annual return divided by the investment. Payout is defined as the true reciprocal:

$$\text{Payout} = \text{investment} / \text{return}$$

The payout time for any investment should be as low as possible, say 2 to 3 years. Projects having 5 to 6 years payout time may also be recommended if there are exceptional environmental benefits. Projects of large payout time, say greater than 6 years, are not generally recommended.

Any large investment requires some borrowed capital from banks and financial institutions. Interest rate on the borrowed capital is very high. The government should give soft loan/subsidy for the implementation of energy efficient and environmental friendly technologies so that Indian industries can go for a change. This will benefit the domestic industries and lead the way to grow and face global competition.

CONCLUSION AND RECOMMENDATION

Various measures to be taken by the Indian Government and industries for cost and quality competitiveness of pulp and paper industry have been discussed. The government should finalise immediately appropriate policy on plantation of deforested land and regulate the tariff of imported paper, paper board and newsprint. The paper industry should modernise, adopt new energy efficient and environment friendly technologies and a total quality management system, to compete in the global market. Soft loan/subsidy should be given by the Government to encourage the industry to adopt new energy efficient and environment friendly technologies.

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