**DRAFT FINAL**

REPORT

ON

# UPDATING OF STATISTICAL DATA FOR THE INDIAN PAPER INDUSTRY

SUBMITTED

TO

CESS GRANT AUTHORITY

BY

CENTRAL PULP & PAPER RESEARCH INSTITUTE
SAHARANPUR/NEW DELHI

# STATISTICS OF INDIAN PAPER INDUSTRY

## VOLUME-I

## REPORT ON PAPER, PAPERBOARD AND NEWSPIRNT

## PROJECT TEAM

| | | |
|---|---|---|
| Principal Investigator | : | Dr. R. K. Jain, ( Former Sc and Officer In Charge , CPPRI Base Office, New Delhi |
| Co –Investigator | : | Dr. K. Singh, Sc C and Officer – In Charge, CPPRI Base office, New Delhi |
| Project Associate | : | Shri Krishna Rawat, SRA |

## PREAMBLE

There has always been a need felt by the industry, institution and policy makers for a compendium of the Statistics of the Indian paper Industry. Therefore, in the past, CPPRI was awarded a project on the collection of statistical data of the Indian paper industry. The project was awarded to CPPRI with a specific aim to consolidate and collect all the relevant statistical data for the Indian pulp and paper industry. At the culmination of the study, the Development Council, in one of its meetings observed that this activity of collection and consolidation of the statistical data is of immense importance should be carried out on a continuous basis so that an up to date picture of the industry could be available to the industry, policy makers, government agencies, research bodies etc. regarding the key statistical parameters. Similar observations were made in the subsequent cess committee meetings by the members. In this background, it was proposed to take up the collection and processing of industrial statistics of the Indian paper industry on a continuous basis.

## OBJECTIVE OF THE PROJECT

The objective of the study is to continually collect and process the Industrial Statistics of the Indian Pulp and Paper Industry.

## INTRODUCTION TO THE REPORT

Sectoral statistical data plays a vital role in monitoring its health and growth indicators. This assumes greater significance for the pulp an paper industry as the sector is fragmented with many small and medium scale players in the field. There has always been a need to find a mechanism to monitor the status of these units, which change their status from time to time. The present study updates the data pertaining to the industry on a continuous basis and provide an up to data on key statistics such as production, imports, exports, total supply and consumption etc.

## TECHNICAL PROGRAM :

The activites of the project were based on the following four points

i) Collection of statistical data from various sources
ii) Verification of the data collected
iii) Data processing and consolidation
iv) Compilation and preparation of report.

## METHODOLOGY ADOPTED

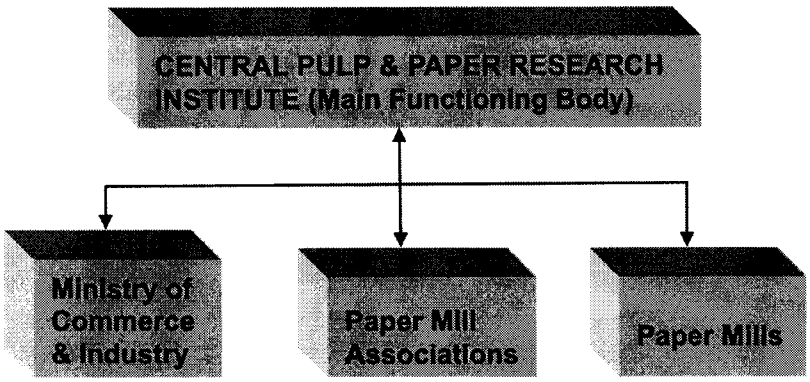
First hand data was collected using a questionnaire containing information pertaining to company site, management, production details (growth & future expansion plans), Industry's health, Industry's views on various Government policies. This short questionnaire was prepared keeping in view of the convenience of the industry which was designed to replace the earlier questionnaire which was quite lengthy. The copy of the present as well as the previous questionnaire is enclosed in annxure – 1

This questionnaire was sent to the pulp, paper, paperboard and newsprint mills in India . The questionnaire was also sent to various industry associations. This information was considered as the Primary information. During the course of the project, scientists from CPPRI carried this questionnaire on their mill visits and got the desired information first hand. This also was classified as primary data.

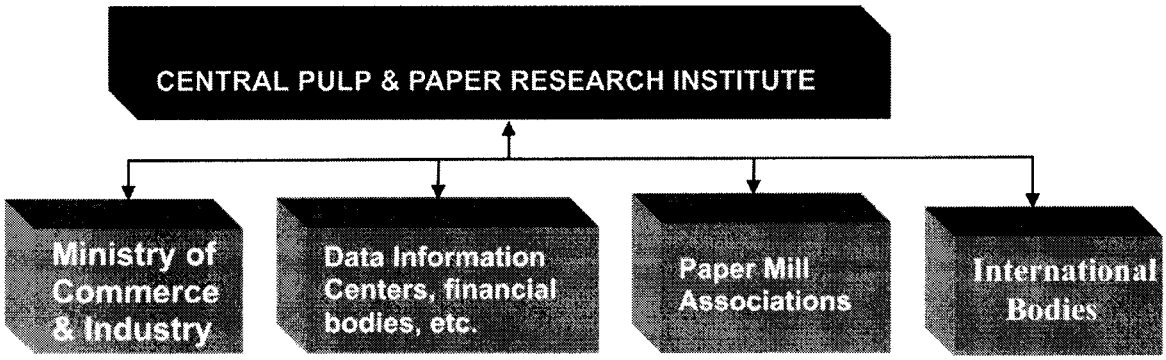
Secondary statistical information was collected from other sources like CMIE, IDBI, CSO, Paper Mill Associations, etc. International statistics have been collected from the data provided by RISI.

The following sections present a report on the updating of the statistics project.

### PRIMARY INFORMATION SOURCES REFERRED BY CPPRI




### SECONDARY INFORMATION SOURCES REFERRED BY CPPRI



## PREFACE

The outcome of the study by CPPRI on the "Collection of Industrial Statistics – Indian Pulp and Paper Industry" in the form of report and directory of Indian paper industry had received overwhelming response from various interest groups and therefore, the Development Council for Pulp, Paper & Allied Industries observed that this activity of collection and consolidation of the statistical data is of immense importance should be carried out on a continuous basis so that an up to date picture of the industry could be available to the all concerned.

Therefore, the present study was taken up by CPPRI and this report contained in two volumes presents the updation, compilation and interpretation of statistical data of the Indian paper industry. The statistical data was collected from various sources such as Ministry of Statistics and Program Implementation, Central Statistical Organization, Ministry of Commerce and Industry, Center for Monitoring of Indian Economy and various other government and non government organizations In addition, this time, effort was also made to increase the sample size of the primary data, for which very encouraging response was given by various industry associations.

Likewise, data for the directory was collected from the primary and secondary sources, including main associations and regional paper associations of the country, whereas the main effort was concentrated on collection of the data from the primary sources. Like previous directory, the mills in the Directory have been placed in the alphabetical order with latest addresses and contact details, updated installed capacities, products and production for the last three years.

It is hoped that the report on Updation of Statistics of the Indian Paper Industry (Volume – I) and Directory of the Indian Paper Industry (Volume – II) will add to the previous knowledge and will also present the realistic picture of all the units of the Indian paper industry thereby providing an up to date resource material for the Indian paper and newsprint industry for all the concerned groups.

Dr. T. K. Roy
Director (offtg.)

ACKNOWLEDGEMENT

The present study was taken up as a sequel to the first study which for the first time made an effort to compile the statistics data on the pulp and paper industry in India. This present study extends the effort of collection of statistical data on the Indian paper industry so as to have an on going up to date data collection, which could be used by various target groups.

The investigators would like to place on record their heartfelt acknowledgements to the Members of the Development Council for Pulp, paper and Allied Industries, to have reposed the confidence by authoring the present project through the Cess committee.

The investigating team got whole hearted support from various associations of the paper industry. The good offices of the associations were instrumental in providing data about their member mills. To this effect, the contributions by the following individuals/organizations is gratefully acknowledged

- Indian Paper Makers Association (Shri R. Naryan Murthy, Secretary General)
-
- Shri R. C. Rastogi, President, Indian Recycled Paper Makers Association
- Shri S.K. Jain, former Secretary General, Indian Agro and Recycled Paper Makers Association ( Shri R. K. Bhargav, Secretary General and Shri S.K. Jain, former Secretary General)
- Kraft Paper Manufacturers Association of South India (Shri S.R. Rabinder, President),
- Shri Joshi, Secretary, Uttranchal Paper Mills Association
- The President and Secretary, Gujarat Paper Mills Association
- The President and Secretary, Gujarat Paper Makers Association

The contribution and guidance of Director, CPPRI during the course of the project is gratefully acknowledged. The guidance and suggestions provided vital mid term course corrections to the project for which the investigating team places on record its heart felt thanks.

The project received valuable inputs from the captains of the paper industry who, spared valuable time of their offices to fill up the questionnaires sent by us to their respective units.

The project received valuable inputs from Dr. Y. V. Sood, Sc E- II and Head, SPPMC, in connection with the information related to the coated segment of paper and newsprint sector. The help and support rendered by Dr. R. M. Mathur, Sc E- II and Head, CR and EMD, Mrs Rita Tandon, Sc E- II, Dr. S. Pawar, Sc – I, Dr. B.P. Thapliyal, Sc E-I and Dr. A. K. Dixit, Sc C is greatefully acknowledged.

In the end, the support provided by the other colleagues during the course of the project at various stages is gratefully acknowledged.

Dr. T.K. Roy
Officiating P.I.
And Director (offtg.)

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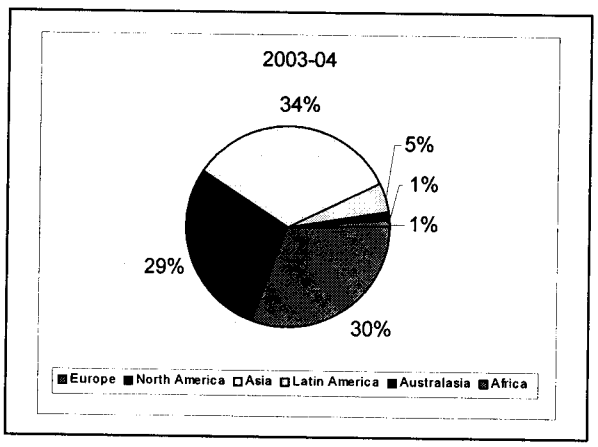
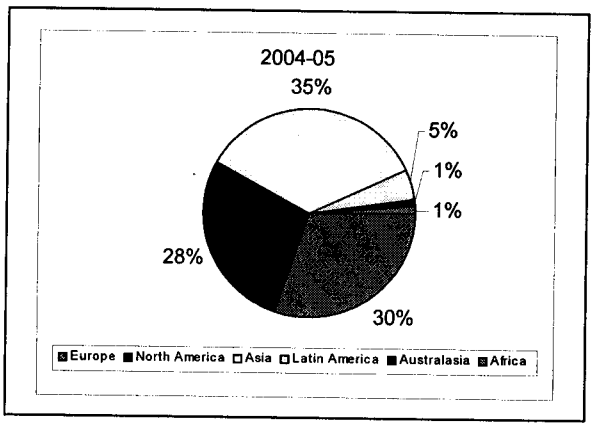
*STUDIES ON UPDATING OF STATISTICS OF THE INDIAN PAPER INDUSTRY*

# INTERNATIONAL PAPER INDUSTRY – AN OVERVIEW

PAPER AND PAPER BOARD

The figures hereunder give the regional trends in production of paper and paper board at the global level for the last two years.




One significant observation from the above figures is the decrease in the production resulting from USA and Canada to the advantage of Asia, where the production was bettered by 1%. This shift of production to the Asian markets is an expected phenomena with many international players moving manufacturing base in to China. This may also be furthered by the planned capacity expansions of the region, which may come in to operation by the next three years, particularly in China, Indonesia and India.

WORLD PRODUCTION OF PAPER AND PAPER BOARD – TIME SERIES DATA

| WORLD PRODUCTION OF PAPER AND BOARD (MILLION TONS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2002 | 2005 |
| EUROPE | | 13.2 | 25.8 | 45.4 | 59.5 | 65.9 | 100.1 | 101.3 | 109.8 |
| | EAST | 2.8 | 5.8 | 10.6 | 14.1 | 3.5 | 11.3 | 12.8 | |
| | WEST | 10.4 | 20.1 | 34.8 | 45.4 | 62.3 | 88.8 | 88.5 | |
| NORTH AMERICA | | 28.3 | 39.4 | 56.3 | 71.2 | 88 | 106.6 | 100.9 | 102.1 |
| | USA | 22.1 | 31.3 | 45.2 | 57.8 | 71.5 | 85.6 | 80.9 | 82.6 |
| | CANADA | 6.2 | 8.1 | 11.1 | 13.4 | 16.5 | 20.8 | 20.1 | 19.5 |
| JAPAN | | 0.9 | 4.5 | 13 | 18.1 | 28.1 | 31.8 | 30 | 30.9 |
| CHINA | | 0.5 | 1.9 | 3.8 | 5.1 | 13.7 | 30.9 | 37.8 | 56 |
| OTHERS | | 0.9 | 3.3 | 11.3 | 18.3 | 43.1 | 54.6 | 60.6 | 68.2 |
| WORLD | | 43.7 | 74.9 | 129.7 | 172.1 | 238.8 | 324 | 330.7 | 367 |

The data goes to indicate that the world paper production has increased eight folds, from 43.7 million tons in 1950 to over 360 million tons in 2005. During the period, China, which did not belong to the classical paper producing countries has shown significant growth increasing its share from 1.1% (1950) to about 15% (2005). Likewise, Japan also has exhibited appreciable growth from 2.1% in 1950 to 8.4% in 2005. Contradictory to the above trend, the share of major paper producing companies like North America showed a decline in its share from 64.2% in 1950 to only about 28% in 2005. However, the European subcontinent has more or less been a stable contributor, maintaining a share of about 30% of the world production.

**WORLD PRODUCTION OF PAPER AND BOARD (%)**

| | | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2002 | 2005 |
|---|---|---|---|---|---|---|---|---|---|
| EUROPE | | 30.2 | 34.4 | 35.0 | 34.6 | 27.6 | 30.9 | 30.6 | 29.9 |
| | EAST | 6.4 | 7.7 | 8.2 | 8.2 | 1.5 | 3.5 | 3.9 | |
| | WEST | 23.8 | 26.8 | 26.8 | 26.4 | 26.1 | 27.4 | 26.8 | |
| NORTH AMERICA | | 64.8 | 52.6 | 43.4 | 41.4 | 36.9 | 32.9 | 30.5 | 27.8 |
| | USA | 50.6 | 41.8 | 34.8 | 33.6 | 29.9 | 26.4 | 24.5 | 22.5 |
| | CANADA | 14.2 | 10.8 | 8.6 | 7.8 | 6.9 | 6.4 | 6.1 | 5.3 |
| JAPAN | | 2.1 | 6.0 | 10.0 | 10.5 | 11.8 | 9.8 | 9.1 | 8.4 |
| CHINA | | 1.1 | 2.5 | 2.9 | 3.0 | 5.7 | 9.5 | 11.4 | 15.3 |
| OTHERS | | 2.1 | 4.4 | 8.7 | 10.6 | 18.0 | 16.9 | 18.3 | 18.6 |
| WORLD | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

WORLD CONSUMPTION – GEOGRAPHICAL DISTRIBUTION

| WORLD PAPER AND BOARD CONSUMPTION BY REGION, (%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2002 | 2005 |
| EUROPE | 27.3 | 33.6 | 34.7 | 33.9 | 26.4 | 28.3 | 27.5 | 26.6 |
| NORTH AMERICA | 64.2 | 50.9 | 43.4 | 38.4 | 35.2 | 31 | 29 | 26.7 |
| JAPAN | 2 | 5.8 | 9.8 | 10.5 | 11.9 | 9.8 | 9.1 | 9 |
| CHINA | 1.1 | 2.4 | 2.6 | 2.9 | 6.1 | 11.4 | 12.9 | 16 |
| OTHERS | 5.4 | 7.3 | 9.5 | 14.3 | 20.4 | 19.5 | 21.5 | 21.7 |
| WORLD | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

If we look at the data of the world consumption with a view point of geographical distribution, it is observed that industrialized countries of Europe, North America, Japan, not only produce but also consumes bulk of the paper and paper board produced. Further, consumption in the Asian countries like China. Korea and Taiwan has been rapidly increasing and therefore these countries are becoming important international markets from the point of view of trade.

| POPULATION AND PAPER CONSUMPTION BY REGION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2002 | | | | 2005 | | | |
| | POPULATION (MILLION) | SHARE, % | PAPER CONSUMPTION (MILLION TON) | SHARE, % | POPULATION (MILLION) | SHARE, % | PAPER CONSUMPTION (MILLION TON) | SHARE, % |
| EUROPE | 729 | 12 | 91 | 28 | 734 | 11.3 | 97 | 27 |
| AFRICA | 878 | 14 | 6 | 2 | 904 | 13.9 | 6 | 2 |
| NORTH AMERICA | 312 | 5 | 96 | 29 | 331 | 5.1 | 97 | 27 |
| LATIN AMERICA | 529 | 8 | 19 | 6 | 556 | 8.5 | 21 | 6 |
| ASIA | 3706 | 60 | 114 | 35 | 3948 | 60.7 | 139 | 38 |
| AUSTRALIA/OCEANA | 30 | 1 | 4 | 1 | 32 | 0.5 | 5 | 1 |
| WORLD | 6184 | 100 | 330 | 100 | 6505 | 100 | 366 | 100 |

If a comparison is made on the population and paper consumption region wise, it is apparent that Asia, which represents 60.7% of the world population consumes only 38% of the total paper and paper board as against North America which consumes 27% of the world produce of paper and paper board with a population of only 5.1% of the total. In compassion, India, which accounts for 16% of the world population consumes only 2% of the total produce of paper and paper board.

WORLD PRODUCTION BY COUNTRIES - EMERGENCE OF NEW PLAYERS

| PRODUCTION OF PAPER AND BOARD BY COUNTRY | | | | |
|---|---|---|---|---|
| COUNTRY | PRODUCTION (MILLION TONS) | | | |
| | 2002 | SHARE, % | 2005 | SHARE, % |
| USA | 80.8 | 24 | 82.6 | 23 |
| CHINA | 37.8 | 11 | 56 | 15 |
| JAPAN | 30 | 9 | 31 | 8 |
| CANADA | 20 | 6 | 19.5 | 5 |
| GERMANY | 18.5 | 6 | 21.7 | 6 |
| FINLAND | 12.7 | 4 | 12.4 | 3 |
| SWEDEN | 10.7 | 3 | 11.7 | 3 |
| SOUTH KOREA | 9.8 | 3 | 10.5 | 3 |
| FRANCE | 9.7 | 3 | 10.3 | 3 |
| ITALY | 9.2 | 3 | 10 | 3 |
| BRAZIL | 7.7 | 2 | 8.6 | 2 |
| INDIA | 5.6 | 2 | 6.6 | 2 |
| UK | 6.2 | 2 | 6 | 2 |
| RUSSIA | 5.8 | 2 | 7 | 2 |
| SPAIN | 5.3 | 2 | 5.7 | 2 |
| TAIWAN | 4.3 | 1 | 4.7 | 1 |
| WORLD TOTAL | 330.7 | 100 | 367 | 100 |

As evident from the above table, China has gained significance which now produces 15% of the world production, next only to the market leader, USA. Likewise, the other non Japan Asian countries have also gained slightly in their share of the world production.

WORLD CONSUMPTION – BY COUNTRY.

| WORLD PAPER AND BOARD CONSUMPTION BY COUNTRY | | | | |
|---|---|---|---|---|
| | | | | |
| COUNTRY | CONSUMPTION (MILLION TONS) | | | |
| | 2002 | SHARE, % | 2005 | SHARE, % |
| USA | 88.1 | 26 | 89.7 | 24 |
| CHINA | 42.6 | 13 | 59.3 | 16 |
| JAPAN | 30 | 9 | 31.5 | 9 |
| GERMANY | 18.2 | 5 | 19.2 | 5 |
| UK | 12.4 | 4 | 12.5 | 3 |
| ITALY | 10.9 | 3 | 11.5 | 3 |
| FRANCE | 10.8 | 3 | 10.8 | 3 |
| SOUTH KOREA | 8.1 | 2 | 8.4 | 2 |
| CANADA | 7.7 | 2 | 7.5 | 2 |
| SPAIN | 6.9 | 2 | 7.4 | 2 |
| BRAZIL | 6.8 | 2 | 7.3 | 2 |
| INDIA | 5.9 | 2 | 7.1 | 2 |
| TAIWAN | 4.6 | 1 | 4.9 | 1 |
| RUSSIA | 3.8 | 1 | 5.2 | 1 |
| AUSTRALIA | 3.6 | 1 | 4.2 | 1 |
| THE NETHERLANDS | 3.5 | 1 | 3.5 | 1 |
| 186 OTHER COUNTRIES | 72.7 | 22 | 76.4 | 21 |
| WORLD TOTAL | 336.6 | 100 | 366.4 | 100 |

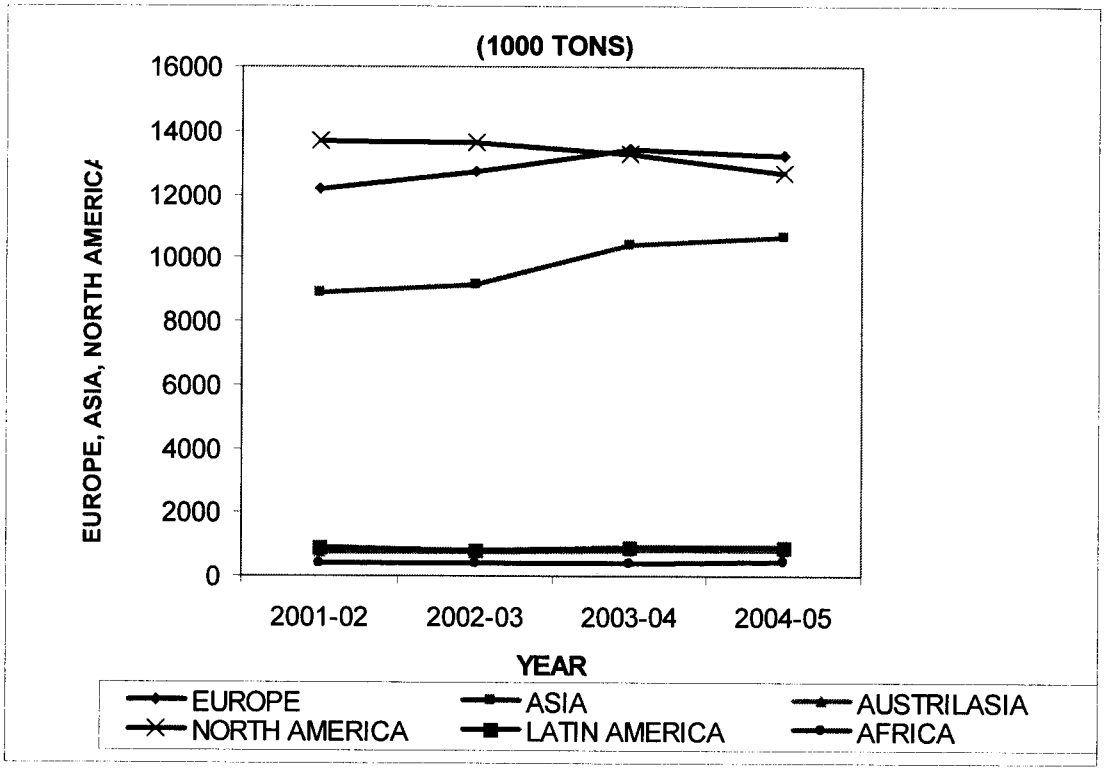
As regards the consumption, USA, China and Japan have been the major consumers of paper and paper board in the world. Togenter thes countries consume nearly half of the world production.

## PULP AND PAPER – INTERNATIONAL PRODUCTION (X1000 TONS)

| | 2002 | | 2003 | | 2004 | | 2005 | |
|---|---|---|---|---|---|---|---|---|
| PAPER AND BOARD TYPE | PRODUCTION, | SHARE, % | PRODUCTION, | SHARE, % | PRODUCTION, | SHARE, % | PRODUCTION, | SHARE, % |
| NEWSPRINT | 36863 | 12.15 | 37542 | 11.79 | 39208 | 11.75 | 38700 | 11.36 |
| PRINTING/ WRITING PAPER | 101615 | 33.49 | 104223 | 32.72 | 111546 | 33.42 | 112466 | 33.00 |
| TISSUE | 22171 | 7.31 | 22923 | 7.20 | 23896 | 7.16 | 25267 | 7.41 |
| CONTAINER BOARDS | 100424 | 33.09 | 110727 | 34.76 | 112766 | 33.79 | 116645 | 34.23 |
| BOARDS | 42369 | 13.96 | 43113 | 13.54 | 46318 | 13.88 | 47692 | 14.00 |
| TOTAL | 303442 | 100 | 318528 | 100.00 | 333734 | 100 | 340770 | 100 |

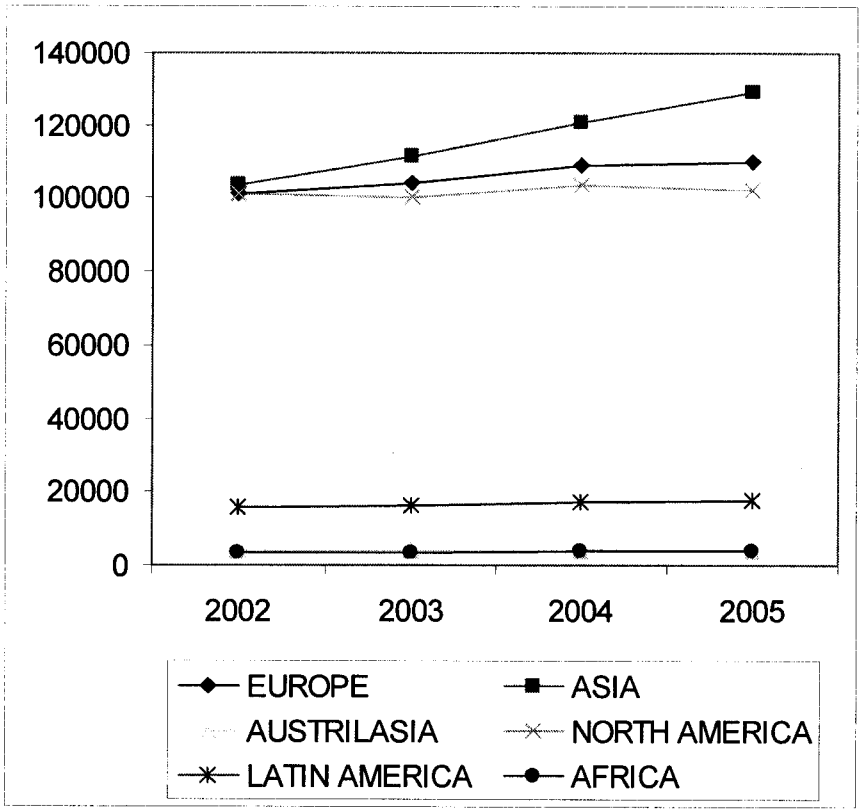
The total share of production of newsprint in world production has been exhibiting a slight downtrend in the last four years, where nearly a percentage point reduction can be seen. The share of printing and writing segment has been more or less constant at about 33%. The rest of the segments also do not depict any trends and exhibit a central tendency to a base figure.

TIME SERIES PRODUCTION TREND OF NEWSPRINT BY REGION




The data goes to indicate that the gain in the production of newsprint in Asia is at the expense of the lowering of production from North America and Europe. The trend may see sustenance as there are large capacitates coming up in China and other east Asian countries.

## PAPER AND PAPER BOARDS: GLOBAL PRODUCTION TRENDS




The total production of paper and paper board also indicates a growing production in the Asian sub continent. In fact, the rate of growth of production in Asia has been higher than that exhibited by the North American and European paper and paper board segments.

# STATUS OF THE INDIAN PAPER INDUSTRY

## THE INDIAN PAPER AND NEWSPRINT INDUSTRY – A GIST

Paper Industry

With the emergence of open market economy leading to reduced tariff barriers and the promulgation of free Trade Agreements with thriving neighboring economies, the competitiveness of the Indian paper industry has come to the sharp focus on the fronts of costs and quality. The industry has been in turbulent state since the economy was opened and paper import was allowed under the Open General License scheme.

Faced with the various issues and challenges like, availability of fibrous raw material, technological obsolescence, cost, quality and environment, the industry has taken steady steps to enhance its competitiveness by way of addressing these issues. The demand for paper, paper board and newsprint has been rising in the recent past and the domestic market has been registering a growth rate of around 6% against the world average growth of about 2.8% .

Paper Industry, which includes pulp, paper and paperboard, is a delicensed one. This is one of the high priority industries where FDI up to 100% is allowed on the automatic route in all activities except those requiring industrial license where prior Government approval is required.

Presently the total operating installed capacity is 8.50 million tons for paper & paperboard and 1.38 million tons for newsprint production. Out of 8.50 million tons, 1 million tonne is closed due to environmental problems. The paper industry produces 5.80 million tons of paper & paperboard and 0.76 million tons of newsprint per annum.

Even through there sufficient domestic production, certain specialty papers are still being imported. The industry has a turnover of more than Rs.18,000 crores. It contributes to the exchequer Rs.2500 crores annually by way of excise duty. It employs more than 3 lakh persons directly and about 10 lakh persons indirectly.

**STRUCTURE OF INDIAN PAPER INDUSTRY**

| | SCALE OF OPERATION, TONS PER DAY | NO. OF MILLS | PRODUCTION SHARE % |
|---|---|---|---|
| LARGE INTEGRATED WOOD BASED | 101 – 800 (Avg. 300) | 33 | 36 |
| MEDIUM AGRO BASED | 50 – 100 (Avg. 60) | 165 | 29 |
| SMALL WASTE PAPER | 5 –50 (Avg. 15) | 510 | 35 |
| TOTAL | | 708 | 100 |

There are around 700 pulp and paper mills in India producing nearly 6.8 million tons of paper, paper board and newsprint out of which 5.8 million tons accounts for the paper and paper board and the remaining is newsprint. The paper mills in the country can be broadly classified in to three categories. Mills that have integrated , largely forest based operations and produce over 100 TPD are classified as large mills. These mills are 33 in number but account for 36% of the total production. Medium size mills having a capacity between 50-100 TPD using agro based fibrous raw materials are 165 in number. These account for 29% of the total production. The mills up to 50 tons consists mostly of the units using waste paper as the fibre base. These mills are 510 in number and account for 35% of the total production. In the past few years, many mills, which were earlier using renewable crop residues as fiber base shifted to using recycled fiber in the face of the CREP norms, which stipulated the use of Chemical Recovery for these units manufacturing paper from the virgin pulp employing agro based fibrous raw material.

The industry is highly fragmented consisting of large, medium and small paper mills having capacities that range from 5 tons to 800 tons per day. The average capacity of paper machine is about 14000 TPA as against the world average of 32,000 per annum. The per capita consumption of paper is around 6-7 kgs as compared to 54 kgs of world average.

Paper & Paperboard

**Excise Duty**

In the current budget, a uniform excise duty of 12% has been imposed on manufacture of paper and paper board. However, the duty is 8% up to the first clearance of 3,500 metric tons per annum on paper manufactured from non – conventional raw materials such as bagasse and straws.

**Customs Duty**

Until the last financial year, the basic duty on the import of all items of paper and paper board classified under the chapter 48 of the ITC-HS classification stood at 20%. Over the basic duty, the government has levied 4% SAD and a CVD of 16% as well as an additional Education Cess of 2%. In the recent 2005-06 budget, the basic duty has been reduced to 12.5%.

**NEWSPRINT SECTOR**

The Newsprint industry in India is now delicensed. However, in order to avail the excise duty exemption, the newsprint mills have to apply for inclusion in the Schedule – I of the Newsprint Control Order. The Indian industry manufactures standard newsprint. As per the Schedule – I, there are 76 units listed for the manufacture of newsprint in the country.

**Newsprint Import Policy**

Import of newsprint was decontrolled with effect from 1.5.1995 vide notification dated 30.4.1995 issued by then Ministry of Commerce. Imports of all types of newsprint including glazed newsprint are allowed under OGL with actual user condition. There is no statutory control over the prices of newsprint.

**Excise Duty**

The availability of nominally prices newsprint it linked with the right of the Indian citizens to information. Therefore, the government, in an effort to provide the best prices to the newspaper industry, has not levied any excise duty on Newsprint. However, this concession is only liable if the newsprint is manufactured by a manufacturer of newsprint registered under Schedule – I of

the newsprint control order, 1962 and supplied against a purchase order placed against such manufacturer by a newspaper registered by Registrar of Newspapers in India (RNI)

**Custom Duty**

The basic customs duty on Newsprint has remained at 5% since 1998-99. Before this, on demand of Indian newsprint industry, actual user condition was imposed on 29.1.1997. The same duty has been retained This is retained in the Interim Budget of 2002-03 without 4% SAD. However, in the full budget placed by the present government in 2005-06, a 2% Education Cess has been levied.

**Issues faced by the newsprint industry**

The Indian Newsprint Industry has been representing for increasing the present import duty level of 5% to a level which would take care of various comparative disadvantages that Indian industries suffer. These disadvantages are very similar to those experienced by the paper and paperboard like, high power cost, scarcity of raw materials, higher transaction costs, technological obsolesce etc. Further, the industry is closely watching the recent downwards trend in the International prices of newsprint, which is likely to affect the performance of this sector in the short term.

# INDIAN PAPER INDUSTRY – SPECIFIC ISSUES, CHALLENGES AND STRATEGIES

SPECIFIC ISSUES, CHALLENGES AND STRATEGIES

The Indian paper industry presents a unique picture as compared with the major global players. The Indian industry is highly fragmented and is made up of a mixture of tiny, small, medium and large size mills. However, even the largest mill in India can not be compared to the size of any of the major international players. Consequently the problems faced by the Indian paper industry are also unique.

## AVAILABILITY OF GOOD QUALITY FIBROUS RAW MATERIAL

The Indian paper industry uses a diverse mix of fibrous raw material primarily forest based agro resides including bagasse, straw and waste paper. Though agro—residues are available in plenty, however, associated problems like complexity during processing of these fibres, quality of the end product and environmental issues are the major concerns and sometimes the limit to encourage use of this potentially available renewable raw material.

As regards waste paper nearly 1 million tonne waste paper is currently recovered annually showing a recovery rate of about 20% which is very low as compared to global scale where the average recovery rate is around 50%. This requires a well refined and aggressive collection and grading system to contain imports of waste papers.

With regard to the forest based raw materials, currently the paper industry meets its demand from the government sources and through the farmers. Industry has also being successful in raising wood in marginal land held by the farmers and this may not be adequate to ensure sustained supply of fibrous raw materials and to cope up with the future growth of the industry. Taking into account the increased usage possible from use of non-conventional raw materials like agro based fiber and waste paper, the paper industry will require nearly 16 million tones of wood per annum by the year 2010.

However, responding to the challenges posed by a liberalized system of international trade, the major players in Indian paper industry have taken up aggressive initiatives in this direction through social forestry programme.

## SCALE OF OPERATION

The lower scale of operations has been one of the major constraints in improving the competitiveness of the Indian paper industry. The average size of paper machine in India is around 14,000 TPA against the world average of around 50,000 TPA. However, the industry constrains for green field expansion has adopted the global trend of mergers and acquisitions to gain economic scale besides upgradation the existing capacities. The industry in the recent past has seen some major merger, acquisitions and portfolio reorganization exercises, BILT, JK Corps, ITC, West Coast Paper Mills, APPM, Emami Papers, Abhishek Industries and few others are witness to this exercise, which a step towards improvement in the competitiveness.

## OBSOLESCENCE OF TECHNOLOGY

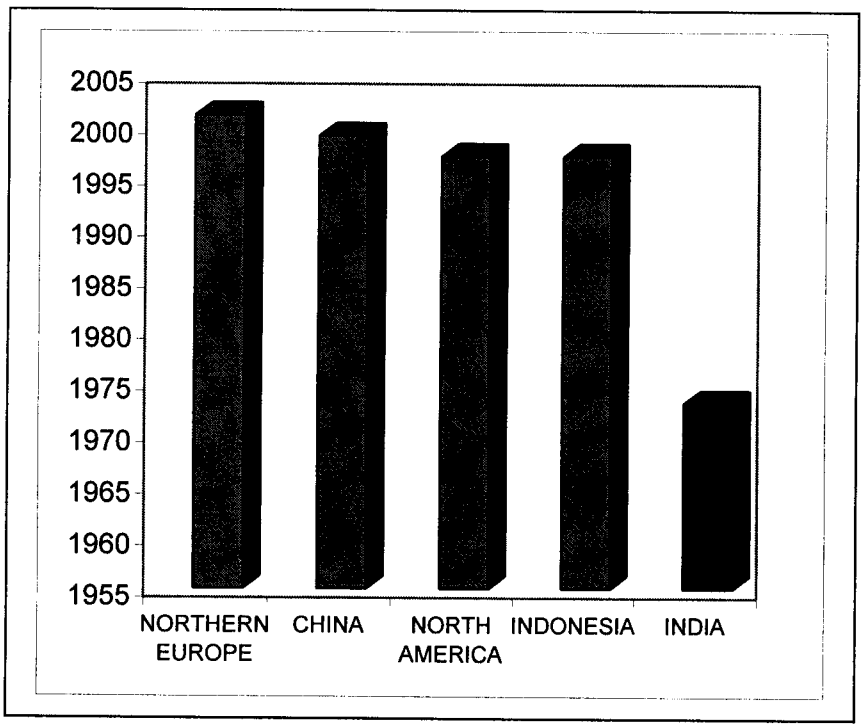
Technological obsolesce is also seen as a major problem in the Indian paper industry. Many of the small mills were established using second hand imported machinery, However, over the intervening years, the technology for making paper has undergone a sea change. The larger players of the Industry have already initiated steps to catch up with the rest of the world. But, perhaps due to financial constraints, the small and medium size units continue to use obsolete technology.

The industry is still depending upon obsolete technology with multiplicity of equipment of limited size. The structure of the industry being complex, the technology and equipment adopted by these mills prefer largely due to their size and raw material furnishing. Not only does technological obsolesce have an adverse effect on quality and cost of the product, it also involves environmental concerns. Old technologies are not only less efficient, they are also more polluting. Though some of the large players have gone for adoption of modern, cleaner technologies, much needs to be done particularly in the agro based sector.

A comparison of the estimated technological level of the Indian mills as compared to the world leaders and other South East Asian counties are presented hereunder, which gives out the baseline data for the year 2001. As clear from the illustration, even the best Indian production

lines is about 30 years behind the best lines in Europe. On the contrary, countries like China and Indonesia, which began the process of liberalization much after India. Clearly the technological obsolesces puts Indian paper industry in a competitive disadvantage particularly against the regional players like China and Indonesia. The situation merits urgent concerns in view of the FTA'S with some regional players.

**ESTIMATED TECHNOLOGICAL LEVEL – INDIA AND THE WORLD**




## ENVIRONMENTAL ISSUES

Holding synergy with this are the CREP requirements, that need to be met by the large as well as the small mills in a phased manner in the next few years. Some of the provisions laid down under the CREP will necessarily require technology up gradation and modernization. The need for reduction of AOX, control of emission of odorous gases, control of solid waste generation, removal of color from effluent etc are particular case in point. Here again majors such as Andhra Pradesh Paper Mills Ltd, ITC, TNPL, Sirpur Paper Mills and few more have taken the lead by

going in for technological advancements by way of adoption of an elemental chlorine free bleach sequence to address environmental issues which could prove to be a step towards improving a competitiveness of the industry.

## STRATEGIES TO IMPROVE COMPETITIVENESS – TECHNOLOGY UPGRADATION

## TECHNOLOGICAL GAPS IN INDIAN MILLS V/S MILLS ABROAD

The technological gaps in different areas are as under

**Pulping**

Mainly Rotary or stationary batch digesters are being used in Indian mills whereas continuous cooking system like super batch process, RDH pulping is employed abroad along with oxygen delignification.

**Brown Stock Washing**

Ultra filters like belt filter, double wire belt washer, twin roll washer & diffuser washers with minimum dilution factor & chemical losses & maximum washing efficiency are used abroad whereas potcher washers, rotary drum vacuum filters are being used in Indian mills.

**Bleaching**

Bleaching employed in most of Indian mills make use of elemental chlorine whereas abroad it is Total Chlorine Free (TCF) or Elemental Chlorine Free (ECF) which are more environmental friendly techniques.

**Chemical Recovery**

Most Indian mills have long tube vertical type evaporator (LTV) whereas abroad evaporation is by full stream of Falling Film evaporators with inclusion of thermal treatment.

Mills abroad have Lime kiln to reburn lime & sludge whereas only few mills in India have this arrangement

**Process Control**

DCS control & online instrumentation to monitor control of different process parameters. Only few Indian mills have such set up.

**Stock preparation & Paper Machine**

Mostly conical refiners are being used in Indian mills whereas mills abroad have energy efficient refiners.

**DCS controls with automatic metering.**

Very high speed machine with modern head boxes, high speed with wider deckle equipped with closed head box with automatic CD profile control system, twin wire former bi nip, tri nip presses closed hood with efficient condensate removal system combination of soft nip & hard nip calendars.

**Environment**

Mills abroad have

- Better effluent treatment practices thus enabling more reuse of water
- Efficient dewatering of secondary sludge by screw press.
- NCG control system.

The Indian mills are lacking in these areas.

## AREAS REQUIRING MODERNIZATION IN THE FIBER LINE IN INDIAN PAPER INDUSTRY

Looking in to the overall requirement of the industry vis a vis quality, efficiency competitiveness, environmental norms etc. sector wise enumeration can be made on the areas that requires technological modernization / upgradation.

a) Forest based Sector

**(i) Raw material preparation and handling**

- Modification of chippers and chip conveying system
- Chip washing and storages

**(ii) Pulping and pulp washing**

- Insulation of Digesters
- Indirect steaming through heat exchangers
- Blow heat Recovery system
- Blow down system

- Efficient pulp washing system by introducing belt washer & double wire washers and screw presses
- DCS control systems

**(iii) Bleaching**

Improved conventional bleaching through equipment modification and new process configuration viz;

- Oxygen delignification / Oxygen prebleaching stage
- Chlorine dioxide bleaching system
- Peroxide and Oxygen addition to extraction stage

**(iv) Paper Making**

- Replacement of conical and wide angle refiners with power efficient disc refiners in stock preparation.
- Modification of head boxes
- Modification of forming section and introduction of high speed twin formers
- Improved press configuration using nip press and closed draw systems
- Installation of cascade steam condensate system
- Incorporation of on line measurement and control system for basis weight, moisture and caliper and paper machine drives
- Incorporation of DCS system
- Improved finishing devices

b) Agro Based Small / Medium mills

**(i) Raw Material Handling**

- Adoption of advanced method of collection, baling, mechanical handling storage transportation, bale breaking and chopping for straws
- Modern straw cleaning through disc milling
- Efficient depithing system and belt conveying system for bagasse.

**(ii) Pulping and Pulp Washing**

- Installation of Pandia continuous digester

- Insulation of Digesters
- Indirect steaming through heat exchangers
- Blow heat recovery system
- Efficient pulp washing through installation of double wire presses or belt washer
- Installation of screw press in straw based mills before vaccum washer to increase the specific loading rate.

C) Recycled Waste Paper Based Mills.

(i) **Pulping / Shushing**

- Inclusion of high density pulpers
- For efficient contaminant removal, introduction of high density Cleaner, turboseparators and power screens in the fibre line
- Incorporation of modern deinking cell for efficient removal of ink particles particularly for the production of deinked pulp for newsprint and writing printing grades of paper.
- Dispersion system to reduce the dirt/speck count in the final deinked stock.
- Incorporation of screw press before dispersion system
- Bleach Towers for post bleaching of deinked stock with $H_2O_2$ / Sodium hydrosulphite.

COPING WITH GLOBAL COMPETITIVENESS

With India becoming a member of WTO, it has become important for the paper industry to evolve a strategy to become globally competitive. During the phase of industrialization after the independence, the immediate focus of the industry was essentially on growth and expansion. In a regulated market under a mixed economy, it has developed a feeling of compliance. For a long time it often came to compromise with quality – perhaps due to monopolistic conditions in a close market scenario. Indeed, for several decades, a major part of the Indian industry never really came to attach significance to terms like market forces, economy of scale, quality and customer satisfaction etc.

But, in the wake of the economic liberalization , triggered by the new economic policy of the Govt. in 1991, the Indian paper industry found itself confronted with international competition. Almost overnight, the industry was exposed to the difficult task of integrating with the global economy. This also had an evolutionary effect on the traditional Indian management style so as

to trigger serious redesigning of strategies for survival. Today, the concept of globalization, eco-cycle compatibility and other environmental issues are being integrated at the planning level itself not only by the major players of the Indian paper industry but by many other mills which are now planning expansion and growth strategies for sustainability and to be competitive domestically and globally.

This industry, however, has traditionally faced with challenges like the sustained availability of good quality of cellulosic raw materials, inadequate infrastructure, uneconomical scale of operations, technology obsolescence and emerging environmental issues.

## MODERNIZATION OF FIBRE LINE – THE CLEAN DEVELOPMENT MECHANISM (CDM) ROUTE

The global warming is seen as the main cause of concern for the very survival of the planet. In Kyoto Protocol in 1997, the nations of the world agreed that the industrialized countries will reduce their aggregate emission by 5.2% below 1990 levels by 2008-12. The protocol establishes three mechanisms to supplement national actions to achieve real, long term measurable .and cost effective GHG reductions. These are (a)Clean Development Mechanism(CDM); (b) International Emission Trading(IET); & (c)Joint Implementation(JI). In the last two decades continuous efforts are being made by the industry to reduce pollutants and paper industry through out the world has made a remarkable achievements in this direction. Indian pulp & paper industry while recognizing the environmental implications, has been making all round efforts to address the major environmental issues including the gaseous emissions. The Clean Development Mechanism offers a path for developing technologies and processes and also has a potential to act as source of foreign exchange for the country by way of trading of carbon credits.

Specific resources are available that have been ear marked by countries willing to buy the carbon credits that are generated by an activity which improves efficiency and reduces carbon dioxide emissions. There is a lot of potential for the Indian paper industry to explore the funding of all such projects and activities that result in reduction of carbon dioxide emissions or reduce the consumption of fossil fuels. However, the identification and evaluation of the projects that qualify for funding under the CDM route is carried out under a very specific regimen and procedures.

As per estimate, the paper industry accounts for only one percent of the total $CO_2$ emissions by the industry in India. None the less, there are avenues that can be explored to fund developmental activities through the CDM route.

Plantation activity can be very well fitted into a new definition of Kyoto protocol since planting trees should held to reduce global output of the Carbon dioxide by absorbing it and storing it in the form wood fibre. Now the developed countries can offset their carbon emission by investing in plantation programs in developing countries like India and depending on the type of programme, these countries may be eligible for carbon created under the Kyoto protocol. As per estimates, the paper cycle contributes nearly 1.5% of total global carbon dioxide emissions. This has a particular importance of the farm forestry programs that are being followed aggressively by the major players. This could be one of the potential activities which could be funded through the clean developed mechanism route in developing sustainable fiber base. Some of the mills have been contemplating the use of waste lands for growing trees which can be harvest in a cyclic manner, preferably involving the local communities. This activity has the potential to increase the canopy cover by cultivating stretches of land which at present are lying vacant or unused. This increased cover will provide a viable sink for the carbon dioxide, thereby generating carbon credits.

Another activity that can be taken up through the CDM route is the switch over from the rotary digester to the continuous digesters. As per estimates, the use of a continuous digester has the potential to result in a saving of about 700 million tons of carbon dioxide per ton of the product.

None the less, there are various areas for modernization / technological upgradation in the fibre line requiring attention to modernize / upgrade its technologies technological upgradations which are required for increasing the competitiveness, that the Indian paper industry finds difficult to finance or afford, have the potential of being funded through the CDM route.

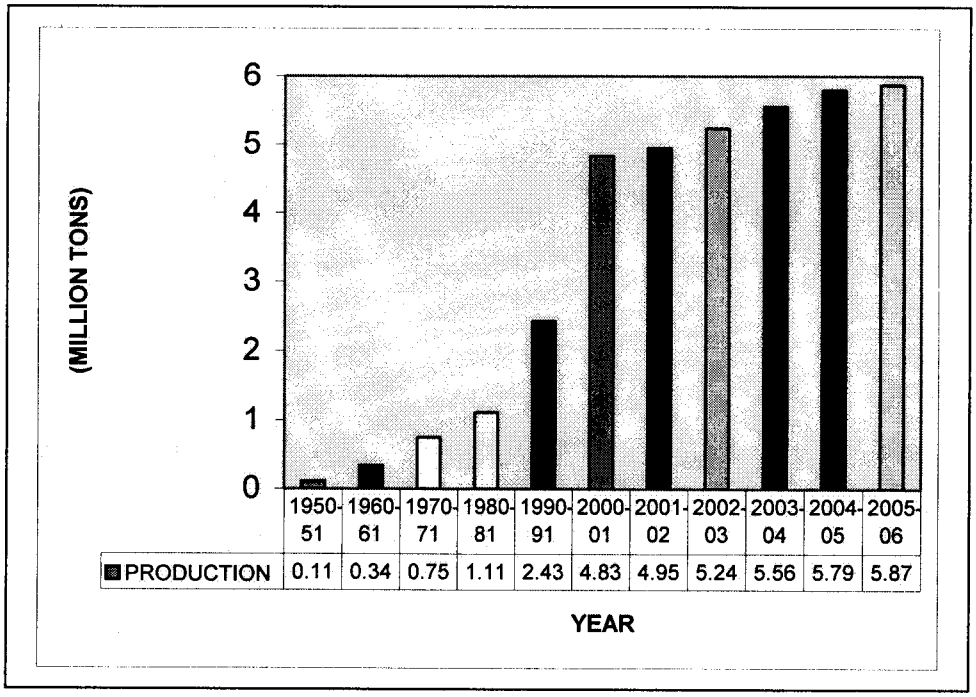
# DEMAND, SUPPLY, IMPORTS AND EXPORTS

## DEMAND, SUPPLY, EXPORTS AND IMPORTS

### PAPER AND PAPER BOARD

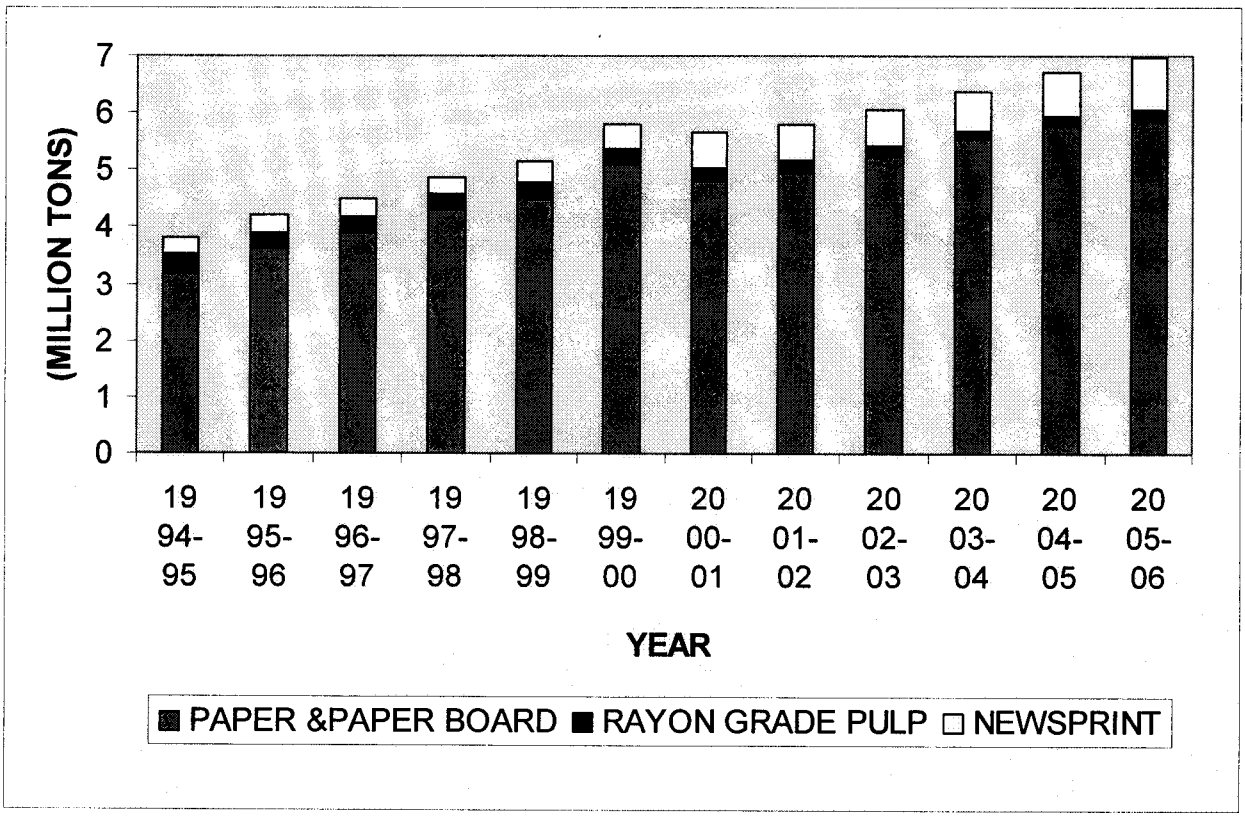
The data goes to indicate that the positive trend in production growth is being maintained by the paper industry. However, there does seem to be a short term slow down in the production growth rate. This is by no means a reflection of a slow down. In fact, most of the operating capacity of the Indian paper industry is now operating at its near maximum efficiency, aided by the buoyant demand across the sectors. This has further prompted many of the large and medium players go go in for capacity expansions. Many steps were taken in 2005-06 to this effect and it is expected that there will be substantial production capacity increase during the years of 2007-2009.

**PRODUCTION GROWTH, (MILLION TONS)**



**PRODUCTION OF PAPER, PAPER BOARD, NEWSPRINT AND RAYON GRADE PULP (1994-2006)**

| YEAR | PAPER &PAPER BOARD | RAYON GRADE PULP | NEWSPRINT | TOTAL |
|---|---|---|---|---|
| 1994-95 | 3.2 | 0.33 | 0.28 | 3.81 |
| 1995-96 | 3.6 | 0.29 | 0.31 | 4.2 |
| 1996-97 | 3.9 | 0.29 | 0.3 | 4.49 |
| 1997-98 | 4.3 | 0.27 | 0.29 | 4.86 |
| 1998-99 | 4.5 | 0.28 | 0.36 | 5.14 |
| 1999-00 | 4.91 | 0.28 | 0.42 | 5.8 |
| 2000-01 | 4.8 | 0.23 | 0.63 | 5.66 |
| 2001-02 | 4.95 | 0.24 | 0.62 | 5.81 |
| 2002-03 | 5.24 | 0.2 | 0.63 | 6.07 |
| 2003-04 | 5.58 | 0.14 | 0.68 | 6.38 |
| 2004-05 | 5.79 | 0.17 | 0.76 | 6.72 |
| 2005-06 | 5.87 | 0.20 | 0.91 | 6.98 |



- The total consumption for paper and paperboard has been exhibiting a rising trend over the past few years. In the year 2005-06, the average YoY consumption growth rate for the sector was around 4% .
- Of the total demand of paper and paper board, the writing and printing paper account for nearly % , whereas the contribution by the Industrial grade of papers stands at %. The remaining demand of % constitutes other papers including tissue.

Cream Wove

- It is used in textbooks, notebooks, account books etc. The goverenment is the largest user of this product.
- In the writing and printing segment, cream wove accounts for %, maplitho (included branded copier) for % and coated paper for %.
- Major players in the cream wove sector are APPM, BILT, Century Pulp and Paper, HPC, TNPL etc. In addition, many medium/small waste paper based mills have alos been active in the segment.

Map Litho

- Maplitho is a surface sized paper used mostly in the printing industry.
- Major players of the segment include APPM, BILT, Century Pulp and Paper, JK Paper, TNPL etc.

Coated Paper

- It is superior quality paper and is used for high end printing jobs.
- Main player in the field was BILT. However, things are getting cokmpetitive in this sector with the entry of other major players such as JK Paper and Century Paper.

Industrial Paper

- Industrial paper is categorized in to kraft, duplex board, gray and white board and machine glazed paper, which account for nearly % of the countries total paper and paper board production. Of this, the krafyt paper accounts for %, duplex board for % and the remaining consumption is made up of grey and white board.

- The medium and small mills are the major contributors to the production of kraft paper in the country. However, there are majors such as APPM, ITC, Seshasayee Paper and Board, Star Paper Mills etc. in this segment.
- The other variety of industrial paper viz duplex board are used for the manufacture of small cartons. ITC and West Coast are the major players in this segment.

TRENDS IN DEMAND AND SUPPLY

| DEMAND AND SUPPLY SCENARIO, PAPER AND PAPER BOARD, (MILLION TONS) | | | | |
|---|---|---|---|---|
| YEAR | PRODUCTION | IMPORTS | EXPORTS | CONSUMPTION |
| 1995-96 | 3.54 | 0.07 | 0.09 | 3.52 |
| 1996-97 | 3.91 | 0.1 | 0.07 | 3.94 |
| 1997-98 | 4.29 | 0.12 | 0.06 | 4.35 |
| 1998-99 | 4.44 | 0.11 | 0.06 | 4.48 |
| 1999-00 | 5.10 | 0.11 | 0.11 | 5.10 |
| 2000-01 | 4.83 | 0.11 | 0.15 | 4.8 |
| 2001-02 | 4.95 | 0.11 | 0.18 | 4.9 |
| 2002-03 | 5.24 | 0.15 | 0.22 | 5.17 |
| 2003-04 | 5.56 | 0.23 | 0.22 | 5.56 |
| 2004-05 | 5.79 | 0.19 | 0..27 | 5.72 |
| 2005-06 | 5.89 | 0.29 | 0.30 | 5.87 |

As is well known, India is more or less self sufficient when it comes to paper and paper board consumption. The same trend is depicted by the above table. Historically, the imports have been more or less comparable with exports. Asides, newsprint, the other varieties which are generally imported include specialty papers and coated papers. The exports have constituted mainly the hand made papers and cultural papers.

The sections presented hereunder give out the details of the top 10 items imported and exported by India

## NEWSPRINT

## NEWSPRINT MILLS NOTIFIED UNDER THE NEWSPRINT CONTROL ORDER

Despite increase in number of indigenous producers of newsprint (which are 77 as registered under the schedule – I per the Newsprint Control Order, 1962, with an installed capacity of about 1.5 million tons) nearly 40% of the demand is met by imports.

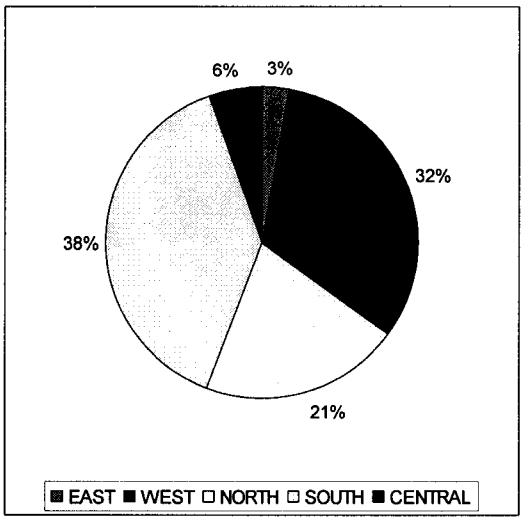
| | | | |
|---|---|---|---|
| | Name of the Company | State | INSTALLED CAPACITY |
| 1 | AJANTA PAPER & GENERAL PRODUCTS LTD | Maharashtra | 8200 |
| 2 | AJANTA PAPER & GENERAL PRODUCTS LTD | Gujarat | 24000 |
| 3 | AMARAVATI SRI VENKATESA PAPER MILLS LIMITED | Tamil Nadu | 12000 |
| 4 | AMRIT PAPER (DIV. OF AMRIT BANSPATI CO.LTD) | Punjab | 24000 |
| 5 | ANURAG BOARD & PAPER MILLS (P) LTD. | Uttar Pradesh | 6000 |
| 6 | APEX PAPER MILLS (NGP) PVT LTD | Maharashtra | 5360 |
| 7 | AURANGABAD PAPER MILLS LTD | Maharashtra | 20000 |
| 8 | BROWN PAPER TECHNOLOGY LTD (FORMERLY SHIRKE PAPER MILLS LTD.) | Maharastra | 6000 |
| 9 | BVV PAPER INDUSTRIES LTD | Tamil Nadu | 7500 |
| 10 | CHADHA PAPERS LTD. | Uttar Pradesh | 10000 |
| 11 | CHANDPUR ENTERPRISES LTD | Uttar Pradesh | 8250 |
| 12 | COASTAL PAPERS LTD. | Andhra Pradesh | 36000 |
| 13 | CORAL NEWSPRINTS LIMITED (REF. TO BIFR) | Uttar Pradesh | 12600 |
| 14 | COSBOARD INDUSTRIES LTD. | Orissa | 9900 |
| 15 | DAMAN GANGA PAPERS MILLS (P) LTD. | Gujarat | 33000 |
| 16 | DANALAKSHMI PAPER MILLS LTD. | Tamil Nadu | 7250 |
| 17 | DELTA PAPER MILLS LTD. | Andhra Pradesh | 12000 |
| 18 | ELLORA PAPER MILLS LTD | Maharashtra | 9000 |
| 19 | EMAMI PAPER MILLS LTD., | Orissa | 41500 |
| 20 | GAURAV PAPER MILLS (PROP. RAVINDRA STEEL LTD) | Maharashtra | 7200 |
| 21 | GULMOHAR PAPER LTD | West Bengal | 5000 |
| 22 | GVG PAPER MILLS (P) LTD | Tamil Nadu | 20000 |
| 23 | HINDUSTAN PAPER CORPORATION | Assam | 20000 |

| | | | |
|---|---|---|---|
| | LIMITED (CACHAR PAPER MILLS) | | |
| 24 | HINDUSTAN PAPER CORPORATION LIMITED (HINDUSTAN NEWSPRINT LTD) | Kerela | 100000 |
| 25 | HINDUSTAN PAPER CORPORATION LIMITED(NAGAON PAPER MILL ) | Assam | 20000 |
| 26 | INDO AFRIQUE PAPER MILLS LTD | Maharashtra | 24000 |
| 27 | JAYANT PAPER MILLS LTD. | Gujarat | 18000 |
| 28 | KALPTARU PAPERS LTD. | Gujarat | 15690 |
| 29 | KAMAKSHI PAPERS PVT. LTD. | Uttar Pradesh | 7200 |
| 30 | KASAT PAPER & PULP LTD | Maharashtra | 18000 |
| 31 | KAYGAON PAPER MILLS LTD | Maharashtra | 7200 |
| 32 | KHATEMA FIBRES LTD., | Uttar Pradesh | 10000 |
| 33 | LAXMI BOARD & PAPER MILLS LTD | Maharashtra | 12661 |
| 34 | MADHYA DESH PAPERS LTD | Maharashtra | 21780 |
| 35 | MALU PAPER MILLS LTD | Maharashtra | 19800 |
| 36 | MOHIT PAPER MILLS LTD. | Uttar Pradesh | 7000 |
| 37 | MURLI AGRO PRODUCTS LTD. | Maharastra | 21000 |
| 38 | NACHIKETA PAPERS LTD | Punjab | 12000 |
| 39 | NELSUN PAPER MILLS LTD | Tamilnadu | 6000 |
| 40 | NEPA LTD | Madhya Pradesh | 88000 |
| 41 | NR AGRAWAL INDUSTRIES LTD (UNIT - II) | Gujarat | 30000 |
| 42 | PARTAP PAPER MILLS LTD | Punjab | 10000 |
| 43 | PRAGATI PAPER INDUSTRIES LTD | Uttar Pradesh | 6000 |
| 44 | PRAGATI PAPER INDUSTRIES LTD | Himanchal Pradesh | 12000 |
| 45 | PRAGATI PAPERS INDUSTRIES LTD. | Punjab | 75000 |
| 46 | PUDUMJEE PULP & PAPER MILLS LTD. | Maharashtra | 13500 |
| 47 | RAMA NEWSPRINT AND PAPERS LTD | Gujarat | 132000 |
| 48 | RAMA PAPER MILLS LTD | Uttar Pradesh | 39500 |
| 49 | RAMALINGESWARA PAPER PRODUCTS (P) LTD. | Andhra Pradesh | 6000 |
| 50 | RAMDAS PAPER BOARDS PVT LTD.(Unit -II) | Andhra Pradesh | 16500 |
| 51 | RAWAL PAPERS LTD. | Uttar Pradesh | 5115 |
| 52 | RAYALSEEMA PAPER MILLS LTD | Andhra Pradesh | 20000 |
| 53 | ROLEX PAPER MILLS | Andhra Pradesh | 9500 |
| 54 | RUBY MACONS LTD | Gujarat | 15500 |
| 55 | SANGAL PAPERS LTD | Uttar Pradesh | 19800 |
| 56 | SERVALAKSHMI PAPER & BOARDS LTD. | Tamil Nadu | 15000 |
| 57 | SHAH PULP & PAPER MILLS LTD | Gujarat | 21000 |
| 58 | SHAHKUMBRI STRAW PRODUCTS LTD | Uttar Pradesh | 10000 |
| 59 | SHIVA PAPER MILLS LTD | Uttar Pradesh | 10000 |

| | | | |
|---|---|---|---|
| 60 | SHREE INDUSTRIES LTD | Gujarat | 5000 |
| 61 | SHREE RAJESHWARANAND PAPER MILLS LTD | Gujarat | 22000 |
| 62 | SHRI HARI KRISHNA PAPERS PVT. LTD | Tamil Nadu | 6000 |
| 63 | SHRI RAM CHANDRA PAPER BOARD MILLS | Andhra Pradesh | 12000 |
| 64 | SIKKA PAPERS LTD | Uttar Pradesh | 16000 |
| 65 | SRI VENKATESA PAPER & BOARDS LTD | Tamil Nadu | 15000 |
| 66 | SUMIT AGRO PRODUCTS LTD | Uttar Pradesh | 8000 |
| 67 | SUN PAPER MILL LTD | Tamilnadu | 22000 |
| 68 | SURYA CHANDRA PAPER MILLS LTD. | Andhra Pradesh | 10000 |
| 69 | TAMIL NADU NEWS PRINT & PAPERS LIMITED | Tamil Nadu | 100000 |
| 70 | THE MYSORE PAPER MILLS LIMITED | Karnataka | 75000 |
| 71 | THE SIMPLEX MILLS CO. LTD (PAPER DIVISION) | Maharastra | 5000 |
| 72 | THE SOUTH INDIA PAPER MILLS LTD | Karnataka | 6480 |
| 73 | THREE STAR PAPER MILLS LTD. | Uttar Pradesh | 6000 |
| 74 | UNITED PULP & PAPER LTD. | Punjab | 20000 |
| 75 | V.G.PAPER & BOARDS LTD | Tamil Nadu (Coimbatore) | 27000 |
| 76 | V.G.PAPER & BOARDS LTD | Tamil Nadu (Dindigul) | 13000 |
| 77 | VISHNUPRIYA PAPER MILL PRIVATE LIMITED | Tamil Nadu | 10000 |
| | | | |
| | TOTAL CAPACITY | | 1597986 |

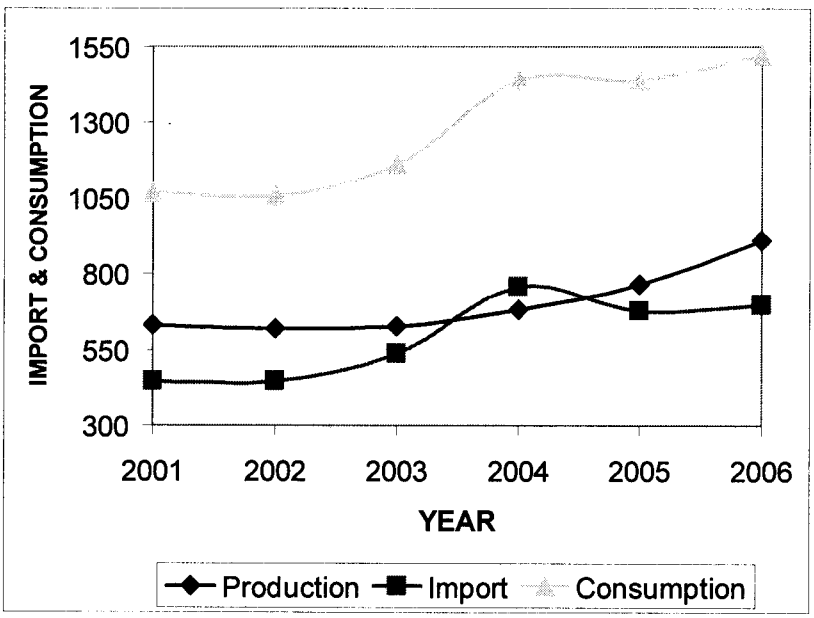
Nearly 38% of the installed capacity for newsprint lies in the southern part of India, while a near matching 32% lies in the west. The north accounts for 21% of the capacity.

GEOGRAPHIC SPREAD OF NEWSPRINT CAPACITIES IN INDIA




## GROWTH PATTERNS IN THE NEWSPRINT INDUSTRY IN INDIA

The production of newsprint rose to a level of 900 thousand tons in 2005-06 (figure –5), registering a healthy growth of 19%, up from 11.7% during the last fiscal. In another significant movement, the imports of newsprints have declined by a little over 10% . This has been primarily due to the increase in the production of newsprint which has seen a spurt because of increasing realizations by way of hardening prices. Further, though the amount of newsprint exported is very small, still it is interesting to observe that the export volumes have more than doubled in the past year. Thus, whereas the export volume of newsprint is 0.005 million tons in the year 2004-05, it increased to 0.01 million tons in the year 2005-06.



The consumption levels of newsprint have been more or less the same at 1.44 million tons. This segment has seen a turn of fortunes in the recent past fuelled manly by the increasing international prices of newsprint, which have now crossed $ 650 mark. However, the domestic industry has to address the question of quality and economics of scale to compete with newsprint imports. The sector has to address the problem of raw material by going in for captive plantations in the country and aboard. To this effect, many newsprint mills are looking at plans to have a swing capacity to make other products in lean periods.

## TOP 10 ITEMS IMPORTED AND EXPORTED

### YEAR 2002-03

| Sr. No. | Commodity Code | Commodity | Quantity- (Tons) |
|---|---|---|---|
| | | | |
| 1 | 48102200 | Light-weight coated paper other graphic papers out of total fiber contntfibr obtained by mechanical process>10% by weight | 28226 |
| 2 | 48064010 | Glassine paper | 22864 |
| 3 | O_481011 | Weighing not more than 150 g/m2 | 12488 |
| 4 | 48109900 | Other coated paper and paperboard | 10814 |
| 5 | O_48101109 | Others (OLD 48101109) | 8280 |
| 6 | O_481012 | Weighing more than 150 g/m2 | 7836 |
| 7 | O_48101209 | Others | 6927 |
| 8 | 48026190 | Other (paper and paperboard with more than 10% CMP/MP) | 6661 |
| 9 | 48102900 | Other paper & paperboard for writing etc of which >=10% by wt of total fibers content consists of fibers obtained by a mechanical process | 6146 |
| 10 | 48022090 | Others (uncoated paper and paperboard used for writing printing purpose) | 4205 |
| | | Total | 114448 |

### YEAR 2003-04

| **Sr. No.** | **Commodity Code** | **Commodity** | **qty (Tons)** |
|---|---|---|---|
| | | | |
| 1 | 48102200 | Light-weight coated paper other graphic papers out of total fiber containing fiber obtained by mechanical process>10% by weight | 55845 |
| 2 | 48114100 | Self adhesive paper & paperboard | 49992 |
| 3 | 48101990 | Other (coated paper and paperboard with kaolin (china clay) | 22364 |

| | | | |
|---|---|---|---|
| 4 | 48109900 | Other coated paper and paperboard | 19294 |
| 5 | 48101390 | Other (coated paper and paperboard with kaolin (china clay) | 7606 |
| 6 | 48025760 | Currency note paper | 6118 |
| 7 | 48043900 | Other kraft paper & paperboard weighing <=150g/m2 | 5216 |
| 8 | 48119099 | Others (paper, paperboard, cellulose wadding and webs of cellulose fibers, coated, impregnated) | 3994 |
| 9 | 48045100 | Kraft paper/paperboard weighing /225g/m2 unbleached | 3512 |
| 10 | 48055000 | Felt paper and paperboard | 3486 |
| | | **Total** | **177426** |

YEAR 2004-05

| **Sr. No.** | **Commodity Code** | **Commodity** | **qty (Tons)** |
|---|---|---|---|
| 1 | 48102200 | Light-weight coated paper other graphic papers out of total fiber containing fiber obtained by mechanical process>10% by weight | 46684 |
| 2 | 48101990 | Other (coated paper and paperboard with kaolin (china clay) | 25025 |
| 3 | 48101390 | Other (coated paper and paperboard with kaolin (china clay) | 17723 |
| 4 | 48109900 | Other coated paper and paperboard | 14228 |
| 5 | 48119099 | Others (paper, paperboard, cellulose wadding and webs of cellulose fibers, coated, impregnated) | 6013 |
| 6 | 48043900 | Other Kraft paper & paperboard weighing <=150g/m2 | 5302 |
| 7 | 48045100 | Kraft paper/paperboard/225g/m2 unbleached | 5187 |
| 8 | 48025760 | Currency note paper | 4493 |

| | | | |
|---|---|---|---|
| 9 | 48059100 | Other uncoated paper & paperboard of wt<=150 g/m2 | 4197 |
| 10 | 48022090 | Others (uncoated paper and paperboard used for writing printing purpose) | 3811 |
| | | **Total** | **132662** |

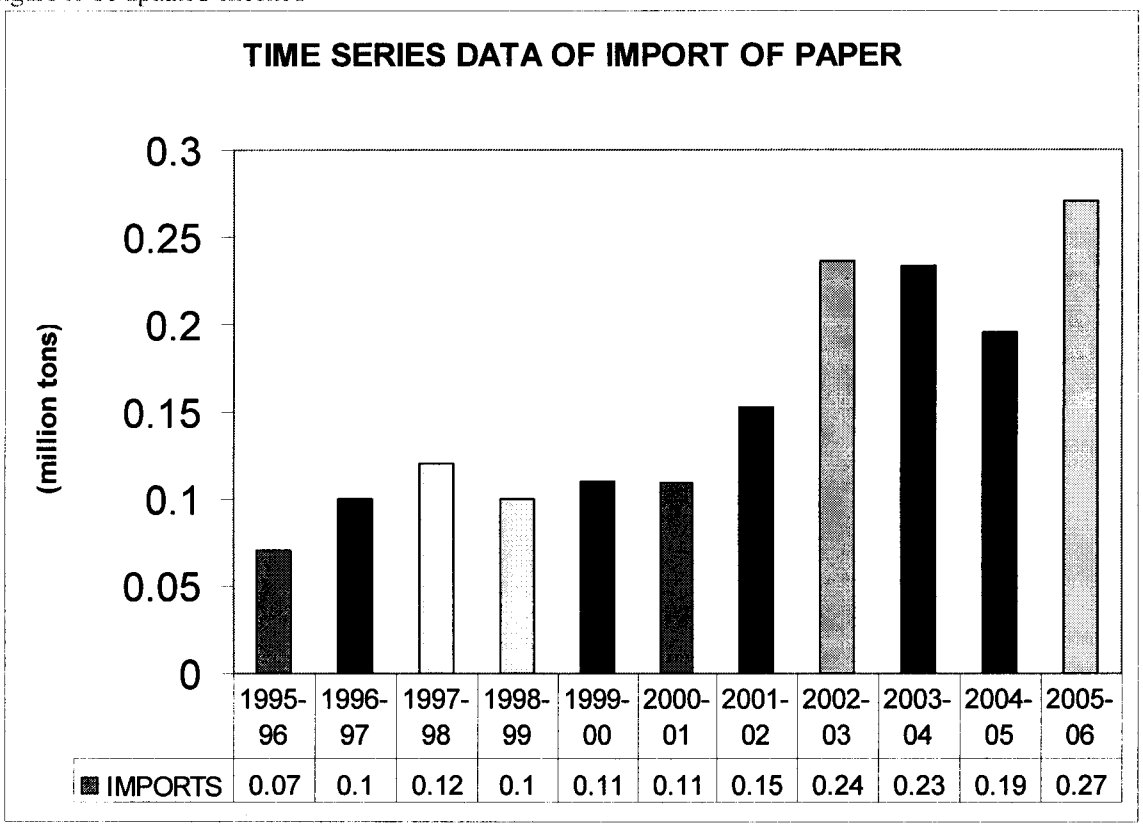
**Year 2005-06**

| Sr. No. | Commodity Code | Commodity Name | |
|---|---|---|---|
| | | | qty (ton) |
| 1 | 48101990 | Paper /paperboard other than rolls/sheets, Other | 45674 |
| 2 | 48102200 | Light-weight coated paper other graphic papers out of total fiber content fiber obtained by mechanical process>10% by weight | 43399 |
| 3 | 48101390 | Others (Other Kraft paper and paperboard not used for writing printing or other graphic purposes) | 35670 |
| 4 | 48109900 | Other coated paper and paper board (not multiply) | 14032 |
| 5 | 48043900 | Other Kraft paper & paper board weighing<=150g/m2 | 12420 |
| 6 | 48119099 | Others (Other paper /paperboard cellulose wadding & webs of cellulose fibers, ) | 10851 |
| 7 | 48059100 | Other uncoated paper & paper board of wt<=150 g/m2 | 8537 |
| 8 | 48042900 | Other sack kraft paper | 6803 |
| 9 | 48025760 | Currency note paper | 6764 |
| 10 | 48115900 | Other paper & paperboard coated impregnated covered with plastics (excl adhesive ) | 6132 |
| | Total | | 190282 |

The data of the top 10 items imported goes to indicate that light weight coated paper forms the most imported product by volume after newsprint. This trend was maintained from 2000-2004. In the year 2005, a C2S variety of coated paper pushed LWC imports to the second place. Generally, the other varities in the top 10 items include glassine papers, self adhesives, coated papers, currency note paper and certain other impregnated varieties.

The over all trend of total imports of paper and paper board are depicted hereunder

figure to be updated/checked



TOP 10 ITEMS EXPORTED FROM INDIA

YEAR 2002-03

| Sr. No. | Commodity Code | Commodity | qty (Tons) |
|---|---|---|---|
| | | | |
| 1 | 48026190 | Other (paper and paperboard with more than 10% CMP/MP) | 80205 |
| 2 | 48109900 | Other (coated paper and paperboard) | 38685 |
| 3 | O_481011 | Coated Paper (Weighing not more than 150 g/m2) | 22809 |
| 4 | O_48101102 | Art Paper | 22237 |
| 5 | 48115900 | Other paper & paperboard coated impregnated covered with plastics (excl adhesive ) | 15814 |
| 6 | O_48113901 | Surface Decorated Plastic Laminated Paper | 11356 |
| 7 | 48202000 | Exercise books | 8708 |
| 8 | 48201090 | Others (Register/Note book etc.) | 8028 |
| 9 | 48021010 | Hand made paper | 7270 |
| 10 | 48102200 | Light-weight coated paper other graphic papers out of total fiber containing fiber obtained by mechanical process>10% by weight | 6172 |
| | **Total** | | **221284** |

**YEAR 2003-04**

| Sr. No. | Commodity Code | Commodity | qty (Tons) |
|---|---|---|---|
| 1 | 48211020 | Labels | 33234 |
| 2 | 48109900 | Other coated paper and paperboard (not multiply) | 31328 |
| 3 | 48026990 | Other (Coated paper and paper board and writing & printing CMP/MP | 26660 |
| 4 | 48026190 | Other (paper and paperboard with more than 10% CMP/MP) | 25340 |
| 5 | 48025490 | Others (Uncoated Paper & paperboard and writing and printing) | 19828 |

| | | | |
|---|---|---|---|
| 6 | 48202000 | Exercise books | 12907 |
| 7 | 48021010 | Hand made paper | 11094 |
| 8 | 48201090 | Others (Register / Account book / note book) | 9820 |
| 9 | 48101390 | Other (coated paper and paperboard) | 8677 |
| 10 | 48239019 | Decorative laminates | 8004 |
| | **Total** | | **186892** |

YEAR 2004-05

| Sr. No. | Commodity Code | Commodity | qty (Tons) |
|---|---|---|---|
| 1 | 48109900 | Other (coated paper and paperboard | 37472 |
| 2 | 48026190 | Other (paper and paperboard with more than 10% CMP/MP) | 34678 |
| 3 | 48202000 | Exercise books | 22256 |
| 4 | 48026990 | Other (uncoated paper and paperboard with writing printing) | 21028 |
| 5 | 48025490 | Others (Uncoated paper and paperboard / writing printing | 19839 |
| 6 | 48021010 | Hand made paper | 17437 |
| 7 | 48026110 | Drawing paper | 15525 |
| 8 | 48101390 | Coated paper and paperboard | 12634 |
| 9 | 48025790 | Other paper (uncoated - specialty paper) | 11900 |
| 10 | 48239019 | Decorative laminates | 9417 |
| | **Total** | | **202186** |

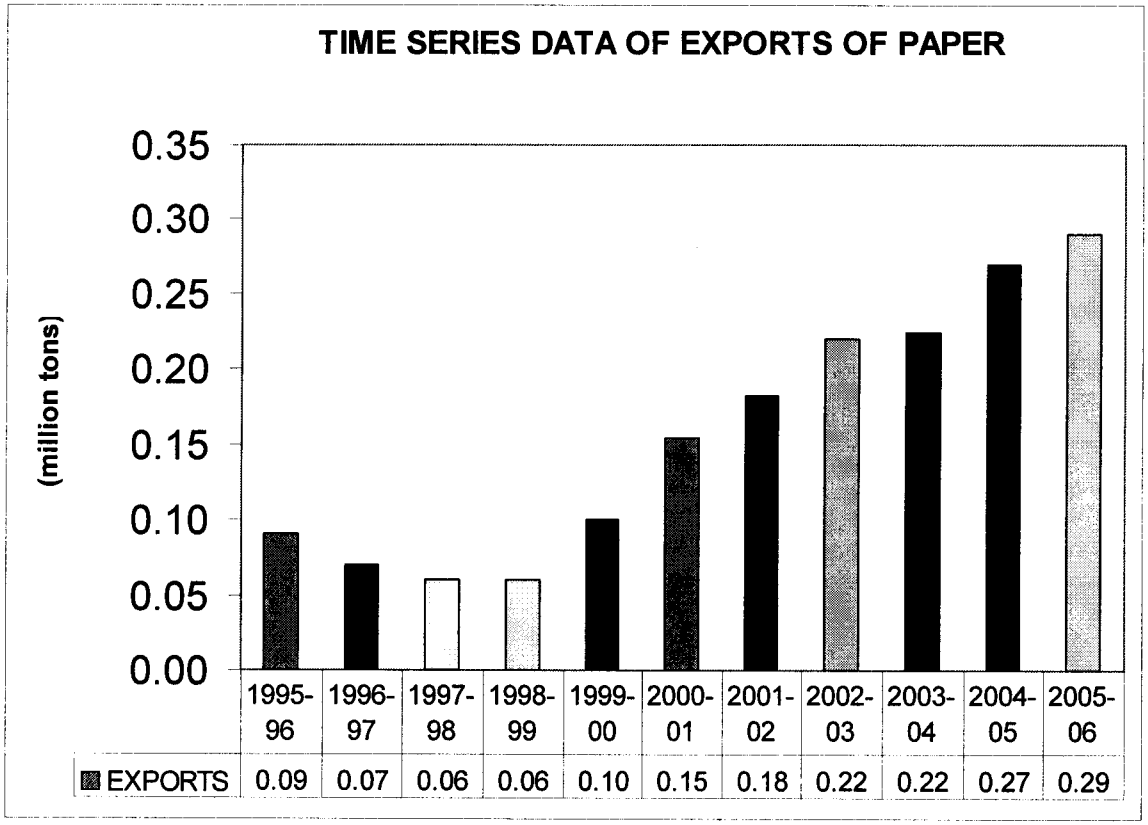
**YEAR 2005-06**

| Sr. No | Commodity Code | Commodity Name | qty (ton) |
|---|---|---|---|
| 1 | 48109900 | Other coated paper and paper board (not multiply) | 58627 |
| 2 | 48239019 | Decorative laminates | 25923 |
| 3 | 48025490 | Others | 22350 |
| 4 | 48025590 | Other paper | 21349 |
| 5 | 48021010 | Hand made paper | 19445 |
| 6 | 48202000 | Exercise books | 19424 |
| 7 | 48026190 | Other | 18295 |

| | | | |
|---|---|---|---|
| 8 | 48026110 | Drawing paper | 17512 |
| 9 | 48201090 | Others | 12397 |
| 10 | 48025790 | Other paper | 10526 |

The trends in export of paper and paper boards from India are more or less consistent over the last few years. The main exports include mechanical papers. Coated papers, impregnated papers, writing and printing papers, excise books and hand made paper.

GRAPH TO BE UPDATED



## TOP 10 COUNTRIES OF IMPORT

### A) FOR THE YEAR 2003-04

| Country | qty (Tons) | Value (Rs.Lakh) |
|---|---|---|
| Taiwan (Taipei) | 49155.76 | 910.81 |
| USA | 33330.82 | 13439.82 |
| Finland | 30365.10 | 11188.43 |
| Germany | 27859.71 | 29512.07 |
| Sweden | 20310.07 | 11000.15 |
| Indonesia | 14552.17 | 5178.25 |
| UK | 10557.54 | 20050.78 |
| Netherlands | 9069.25 | 3250.58 |
| Canada | 6887.75 | 1732.6 |
| China | 5124.90 | 3394.31 |
| | 202213.1 | 99657.8 |

### B) FOR THE YEAR 2004-05

| **Country** | **qty (tons)** | **Value (Rs. Lakhs)** |
|---|---|---|
| | | |
| | | |
| Finland | 36075.36 | 13107.58 |
| USA | 35418.75 | 14632.03 |
| Germany | 20239.81 | 21786.97 |
| Sweden | 16676.75 | 13610.31 |
| Indonesia | 14766.95 | 5845.08 |
| China | 10842.21 | 6858.15 |
| Netherlands | 10409.4 | 4032.4 |
| UK | 6830.968 | 9640.95 |
| Austria | 5916.665 | 2653.72 |
| Italy | 5279.587 | 3629.39 |
| | 162456.5 | 95496.58 |

C) FOR THE YEAR 2005-06

| Country | qty (ton) | Value - (Rs. In lac |
|---|---|---|
| Canada | 200728.8 | 56521.55 |
| Russia | 164988.3 | 44496.09 |
| Korea Republic (South) | 109569.7 | 31453.64 |

| | | |
|---|---|---|
| Finland | 75627.3 | 27300.43 |
| USA | 66664.4 | 23354.04 |
| Sweden | 48211.0 | 24265.73 |
| Indonesia | 46331.5 | 14681.81 |
| China | 44127.6 | 19267.75 |
| Germany | 36425.1 | 32093.12 |
| Philippines | 29333.6 | 8434.04 |
| Austria | 27792.3 | 10154.29 |

The above tables present a list of top 10 countries of import for paper and paper bard for India. As can be seen, the countries from EU , Russia, USA etc. figure at prominent positions in the above lists. Within the Asian region, the major countrie of imkport include Indonesia and China.

TOP 10 COUNTRIES OF EXPORT

## A) FOR THE YEAR 2003-04

| Sr. No. | Countries | Quantity (Tons) | Value (Rs. Lakhs) |
|---|---|---|---|
| 1 | Sri Lanka | 48439 | 13620 |
| 2 | Tanzania | 38629 | 1233 |
| 3 | Nigeria | 37587 | 11124 |
| 4 | Bangladesh | 25616 | 6550 |
| 5 | USA | 25268 | 13575 |
| 6 | UAE | 17022 | 7469 |
| 7 | Nepal | 15972 | 5655 |
| 8 | UK | 14412 | 8407 |
| 9 | Malaysia | 12781 | 3880 |
| 10 | Egypt | 9863 | 2818 |
| | **Total** | **245589** | **74333** |

## B) FOR THE YEAR 2004-05

| Sr. No. | Countries | Quantity (Tons) | Value (Rs. Lakhs) |
|---|---|---|---|
| 1 | Sri Lanka | 45960 | 13307 |
| 2 | Nigeria | 43350 | 12782 |
| 3 | UAE | 26558 | 10973 |
| 4 | Bangladesh | 22083 | 6459 |
| 5 | USA | 21657 | 12476 |
| 6 | Nepal | 18459 | 6332 |
| 7 | Egypt | 18198 | 5483 |
| 8 | Malaysia | 17843 | 5864 |
| 9 | UK | 14736 | 8886 |
| 10 | Ghana | 7351 | 2506 |
| | Total | 236194 | 85069 |

## C) FOR THE YEAR 2005-06

| Country | qty (ton) | val (Rs. Lac) |
|---|---|---|
| Sri Lanka | 67906.5 | 20816.5 |
| Nigeria | 66526.1 | 20241.4 |
| UAE | 25536.7 | 12923.8 |
| USA | 23552.6 | 15574.1 |
| Nepal | 23363.6 | 5779.8 |
| Bangladesh | 22411.3 | 7132.8 |
| UK | 21492.9 | 13162.1 |
| Egypt | 16885.9 | 4553.6 |

| | | |
|---|---|---|
| Malaysia | 11276.8 | 3806.1 |
| Saudi Arabia | 10905.8 | 5642.7 |

The above tables presents the details of the top 10 countries which receive the exports of paper and paper boards from India. The trend of Sri Lanka – Nigeria – UAE has dominated positions over the last two years. In fact, the close proximity of Sri Lanka to Indian shores have seen the largest volume being exported there.

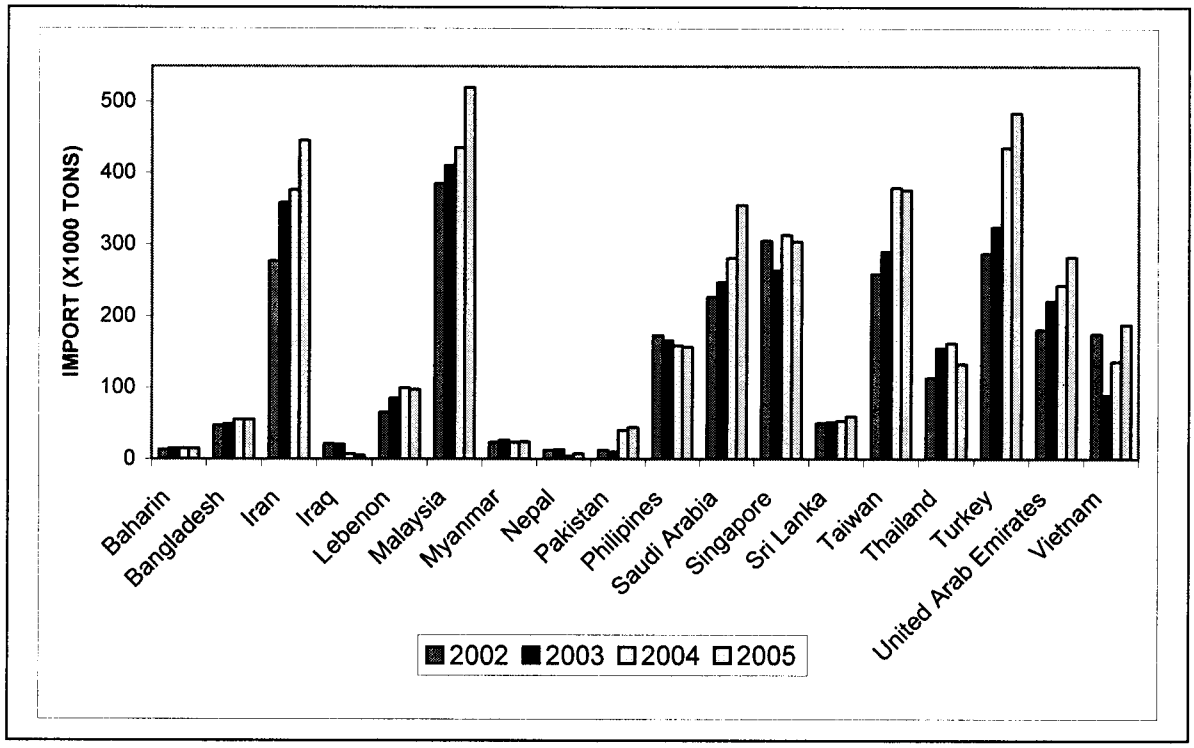
## POSSIBLE EXPORT MARKETS – A SECTORAL ANALYSIS

Exports from the Indian paper industry have been traditionally low in volumes and aimed at certain neighboring countries and the third world. However, with the economy picking up in ASEAN and non Japan Asia, there are growing avenues of exports that the Indian paper industry must plan to tap in order to increase its standing at least in the local region and to give a fair competition to China, the neighborhood paper tiger.

Connected with the exports will be the quality issue as well. With the strengthening of market economies, quality will also be in demand along with the cost factor. Not with standing the Chinese strategy, the recent moves at least by the organized sector to upgrade will definitely present opportunity to utlilize this newly generated demand.

The total exports from India have not been significant and as on date, nearly 0.3 million tons of paper and paper board is exported which basically includes the coated , uncoated (writing printing) , exercise books, hand made paper and decorated laminates. However, in the recent past, the paper industry has addressed the problems related to quality, cost and competitiveness while planning the expansion programs. It is felt that with the increase in capacities and quality issues being addressed at the process front, India has every chance of tapping the export market for writing and printing, newsprint and packaging papers and paper boards in the south east and the milled east countries.

## WRITING AND PRINTING GRADE PAPERS




| X1000 tons | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|
| Bahrain | 4 | 5 | 1 | 3 |
| Saudi Arabia | 43 | 48 | 55 | 63 |
| United Arab Emirates | 20 | 16 | 25 | 44 |
| Iran | 50 | 57 | 75 | 85 |
| Iraq | 5 | 5 | 1 | 2 |
| Lebanon | 8 | 10 | 12 | 15 |
| Phillipines | 14 | 7 | 1 | 1 |
| Turkey | 247 | 372 | 453 | 502 |

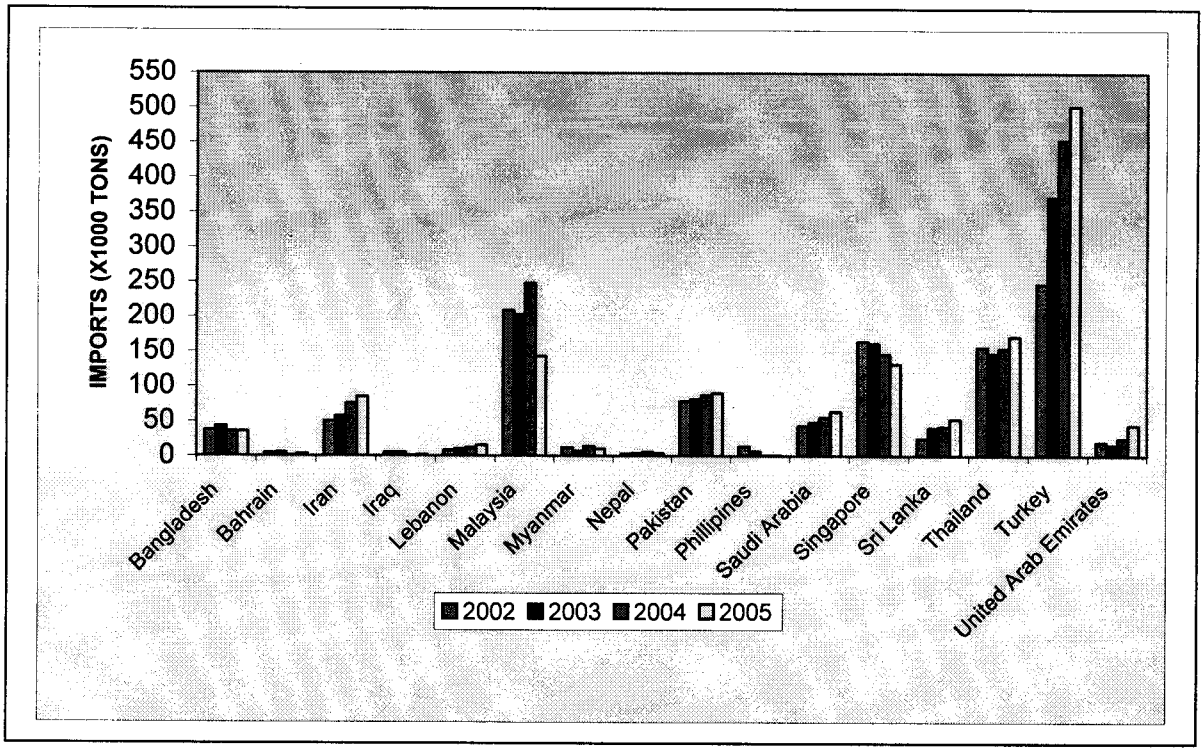
**INDIA**

| X 1000 tons | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|
| Pakistan | 78 | 81 | 87 | 90 |
| Bangladesh | 37 | 43 | 35 | 35 |
| Myanmar | 12 | 7 | 14 | 10 |
| Nepal | 3 | 4 | 6 | 4 |
| Malaysia | 209 | 203 | 248 | 143 |
| Singapore | 164 | 161 | 146 | 132 |
| Sri Lanka | 25 | 40 | 42 | 52 |
| Thailand | 156 | 147 | 154 | 171 |

The above figure gives the trends in the imports of writing and printing papers of the neighboring countries of India for the last four years. The data goes to indicates a growth trend for the requirement of writing and printing papers in Iran, Lebanon, Malayasia, Saudi Arabia, Taiwan, Thailand, Turkey, and UAE. Further, the immediate neighborhood of the country including Sri

Lanka, Myanmar, Pakistan and Nepal have the potential to be the growing market in the near future.

**NEWSPRINT**



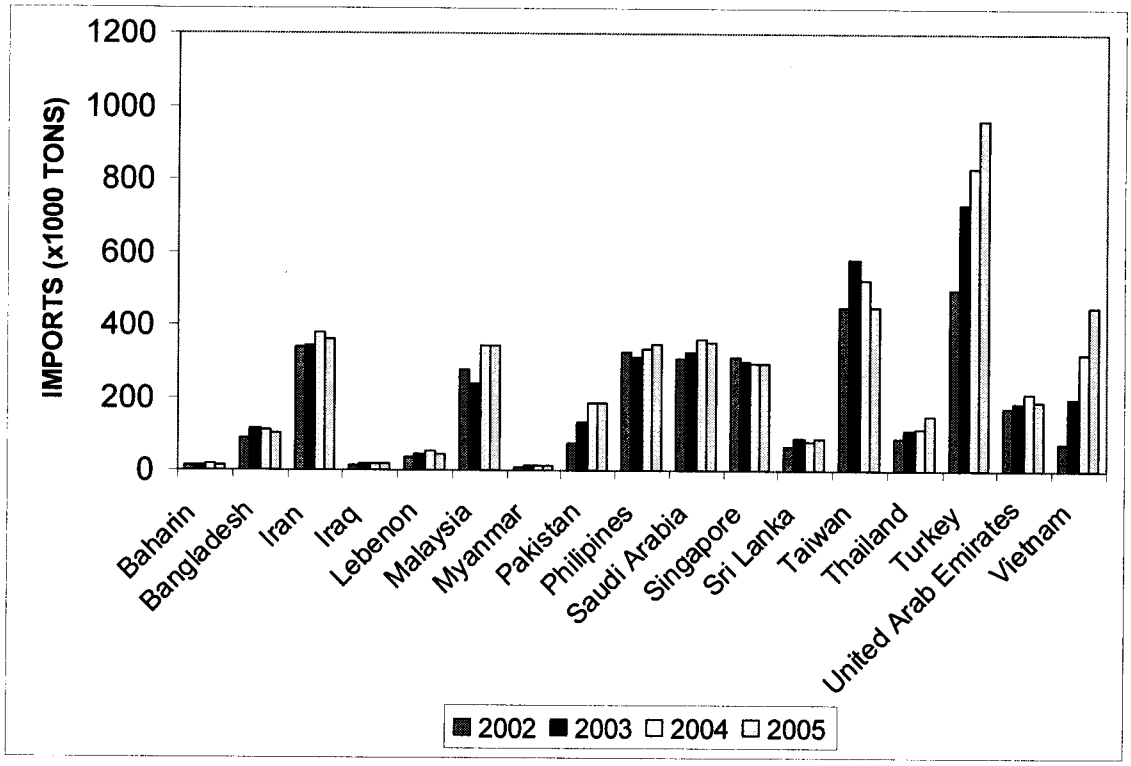

| X 1000 tons | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|
| Bahrain | 4 | 5 | 1 | 3 |
| Saudi Arabia | 43 | 48 | 55 | 63 |
| United Arab Emirates | 20 | 16 | 25 | 44 |
| Iran | 50 | 57 | 75 | 85 |
| Iraq | 5 | 5 | 1 | 2 |
| Lebanon | 8 | 10 | 12 | 15 |
| Phillipines | 14 | 7 | 1 | 1 |
| Turkey | 247 | 372 | 453 | 502 |

INDIA

| X 1000 tons | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|
| Pakistan | 78 | 81 | 87 | 90 |
| Bangladesh | 37 | 43 | 35 | 35 |
| Myanmar | 12 | 7 | 14 | 10 |
| Nepal | 3 | 4 | 6 | 4 |
| Malaysia | 209 | 203 | 248 | 143 |
| Singapore | 164 | 161 | 146 | 132 |
| Sri Lanka | 25 | 40 | 42 | 52 |
| Thailand | 156 | 147 | 154 | 171 |

The figure gives the possibilities of export of newsprint in the region close to Indian shores. The most potential export market for newsprint for India are Hong Kong, Malaysia, Singapore, Thailand and Turkey. The potential emerging markets for this segment include Bangladesh, Iraq and Pakistan.

## PACKAGING PAPER AND PAPER BOARD




| X 1000 tons | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|
| Bahrain | 15 | 13 | 17 | 15 |
| Iran | 340 | 345 | 377 | 359 |
| Iraq | 15 | 19 | 18 | 19 |
| Lebenon | 35 | 45 | 52 | 45 |
| Pakistan | 76 | 134 | 185 | 185 |
| Saudi Arabia | 308 | 325 | 361 | 353 |
| Singapore | 310 | 299 | 296 | 294 |
| Turkey | 498 | 731 | 829 | 961 |
| United Arab Emirates | 170 | 183 | 209 | 188 |

**INDIA**

| X 1000 tons | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|
| Bangladesh | 87 | 115 | 110 | 100 |
| Malaysia | 276 | 238 | 345 | 345 |
| Myanmar | 10 | 14 | 12 | 13 |
| Philippines | 326 | 313 | 334 | 349 |
| Sri Lanka | 65 | 90 | 79 | 88 |
| Taiwan | 449 | 580 | 523 | 450 |
| Thailand | 88 | 111 | 113 | 148 |
| Vietnam | 73 | 200 | 323 | 449 |

The leading consumers of packaging paper and paperboards are Turkey, Taiwan, Singapore, Vietnam and the Middle East. Vietnam in particular seems to be a potential candidate for exporting packaging paper and paper board. However, Turkey, Thailand and Taiwan have

substantial packaging paper and paper board capacity and seem to import only some specialized variety.

# RAW MATERIAL SCENARIO

## FIBROUS RAW MATERIAL IN INDIAN PAPER INDUSTRY

The Indian paper industry uses a diverse mix of fibrous raw material primarily forest based agro resides including bagasse, straw and waste paper. Though agro—residues are available in plenty, however associated problems like complexity during processing of these fibres, quality of the end product and environmental issues are the major concern to encourage use of this potentially available renewable raw material.

The operations of the paper industry depend on the sustained availability of quality fibrous raw material – a fact that goes in stark contrast with ecological conservation. The natural forests in India have long been declared as protected and only controlled felling is allowed. As a result, of date, the forest based raw material can not be sourced for sustained pulp and paper operations in India.

However, demand and market forces have lead to the increase in installed capacity of individual units in the country. This has necessitated a critical review of the raw material base available to the Industry to meet out the fiber demand. To that effect, there three major path ways to source the fiber base – through captive plantations/social forestry programs, non – wood based raw material and recycled paper.

### WOOD BASED FIBER SOURCES

The total land mass of the Indian peninsula adds up to 328.8 million hectares out of which 47% is used for the agricultural purposes. Nearly 30% of the land is uncultivated, barren and non-agricultural land. Forests and woodlands occupy 20% of the landmass out of which 38.6 million hectares is dense forest with a crown density of more than 40%. The rest of the area amounting to about 31 million hectares is considered as degraded forestland. The pulp and paper industry uses only 3-4% of the total wood i.e. nearly 6 million tons, 6.5% of the wood is consumed by sawn wood/ply wood industry whereas major portion i.e. 90% of the wood is consumed to meet out the fuel requirement.

In the south and east of the country, the forests are tropical rain forests whereas in the Himalayan region, there are dry alpine forests. These forest have been classified in to 16 broad types and 251 sub-types based on climatic and other conditions.

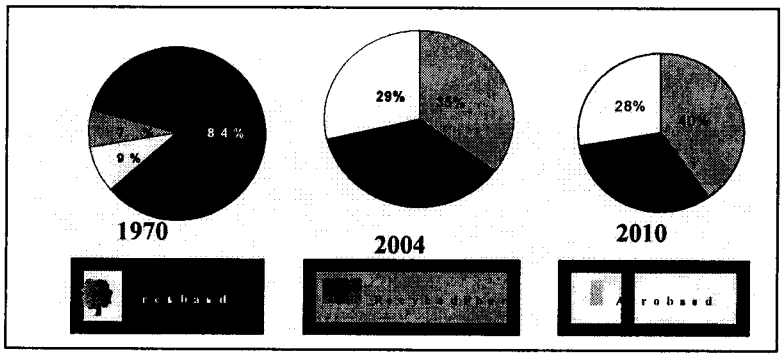
Plantations account for 50% of the forest area; most of them consist of hardwood species. However, only small portions of the plantations are used as a source for pulpwood. The major

competing use for native and plantation grown trees is the use of wood as a fuel in the rural parts of the country.

As per the existing forest policy, the paper industry can not use wood from any of the national forest reserves. This leaves the paper industry with little choice for sourcing of wood based raw materials. More and more mills are using recycled fiber for the manufacture of paper. In the seventies, 84% of the mills were using wood based raw material. However, with the stringent regulations on the felling of trees in the forest area, the industry took to the use of non – wood based raw materials. Currently, nearly 30% of raw material was coming from annually renewable materials and about 35% was being contributed by the recycled fiber. It is estimated that by 2010, the use of waste paper will rise by about 5% (figure – 6)

FIGURE – 6

TRENDS IN THE USE OF RAW MATERIALS




With regard to the wood based raw materials, currently the paper industry meets its demand from the government sources and through the farmers. Industry has also being successful in raising wood in marginal land held by the farmers and this may not be adequate to ensure sustain supply to coup up with the future growth of the industry. Taking into account, the increased uses possible from agro based and waste paper, the paper industry which presently consumes nearly 6.0 million tons per annum will require nearly 9.0 million tones of wood per annum by the year 2010 and this demand is likely to be increased to around 13.2 million tons by the year 2020. India has about 100 million hectares of waste land and about 32 million hectares of degraded forest lands and even if a small portion of this i.e. about 1 million hectare is allocated to the industry, it should be able to meet its requirement for the future. The industry has also approached the

government to look for possibilities of allotting degraded forests/waste lands near the mills or nearby forests on long lease for plantation.

**BAMBOO**

India is next only to China in the production of Bamboo. As per one data, 125 species in 23 genera have been recorded, which are distributed over 10.03 million ha from sea level to 3,700 meters above sea level. It accounts for 12.8% of country's forest area. The distribution is, however, not uniform, the rich areas being confined to north east, Shivalik hills of Uttar Pradesh, Bastar, region of Madhya Pradesh, Western Ghats in South India and Andaman Islands. The north-east is the richest source accounting for about 50% of extant growing stock. Out of the available species, 12 have been investigated for pulp and paper production and 2 for panels (mat board). *Dendrocalamus strictus* is the most widely used species for pulp and paper, and followed by *Bambusa bambos* and *Melocanna baccifera* accounts for 83% of all bamboos used for pulping. *Ochlandra travancorica* and *Bambusa bambos* are used for mat board.

The world market for bamboo is valued at US $ 10 billion of which China's share alone is to the tune of 50%. Market for bamboo expected to reach about US $ 20 billion by 2015. The size of the Indian bamboo industry is estimated to be about Rs.6505 crores, which may grow to Rs.26,000.00 crores by 2015..

The domestic bamboo sector is faced with many constraints, such as:

- Lack of scientific methods for propagation and cultivation.
- Lack of post harvest treatment and technology for product development.
- Inadequate trained manpower.
- Inadequate infrastructure for large scale harvesting in the event of gregarious flowering.

The government has planned a coverage of 2 million ha under bamboo during the X Plan involving an investment of Rs. 2608 crores. The estimated fund requirement for the $10^{th}$ Plan is Rs.2608.00 crores covering Rs.2000.00 crores for raising new bamboo plantations in 2 million ha, Rs. 208.00 crores for technology development, Rs.275.00 crores for handicrafts development, Rs.125.00 crores for trade and market development. Being essentially a forest based material, bamboo, although a non wood fibre source, is included with wood, in all Indian studies relating to raw material for pulp and paper. In the national statistics, it is often difficult to separate the contribution and role of wood and bamboo fibres.

Bamboo yield in the natural forests is as low as 0.40 tonnes per ha per annum. It is, however, known that yield in rain fed areas can be increased 4 to 5 times in five years if protection from grazing is ensured and proper management practices (soil working, fertilization and thinning) are adopted. The estimated current growing stock is 150 million tonnes, of which Dendrocalamus strictus accounts for 53%. The annual harvest is estimated to be about 4 million tonnes, out of which about 50% is used in rural construction, scaffolding, handicrafts, etc.

When it was established in 1922-24 that bamboo was an eminently suitable material for pulp and paper production, a new dimension was added to its utilization. Bamboo soon became the dominant fibre source and accounted for about 75% of fibre sources for pulp and paper in the fifties. As supplies remained stagnant at about 1.5 million tonnes (green weight) per annum and capacity enlarged to meet increasing demand, search for alternate sources were intensified, which resulted in the utilization of hardwoods in early seventies. The trend may be seen in Table 2

Table 2 –
Utilization of bamboo in total paper production

| Year | % of bamboo by air dry weight in total fibre weight |
|---|---|
| 1936 | 49 |
| 52 | 74 |
| 58 | 74 |
| 70 | 56 |
| 75 | 54 |
| 79 | 53 |
| 80 | 29 |
| 88 | 28 |
| 90 | 27 |
| 95 | 22 |
| 2000 | <10 |

The use of Bamboo as a raw material source declined from the 1980's, although there was a marginal increase in the supplies (1.7-1.8 million tons, green weight). This may have been due to the fact that the supply of bamboo available was inadequate to cater to the capacity.

Bamboo is a better fiber source as compared to the other noon woods. The shortcomings in the utilization of non wood fibre sources do not apply to bamboo in that magnitude. Unlike straws, it is available through out the year though the growth is concentrated in certain catchment areas only, the only constraints being bulk and the resultant high cost of transport. This apart, bamboo is almost similar to the traditional raw material wood and in pulping characteristics, it is even better than hardwood. Only constraint is bulk and resultant higher cost of transport. In view of emphasis given to raising bamboo plantation and success achieved in mass propagation techniques, it is expected that availability of bamboo will increase in future. But there is little hope of supplies to pulp paper and panels industries increasing correspondingly, in view of following reasons:

Being essentially a forest based material, supplies are subject to Govt. regulations as in the case of wood;

Competition is severe. Cottage industries (like incense sticks) and handicrafts are already facing problems due to inadequate supplies;

On account of widening gap between demand and supply, there has been a sharp increase in price. Paper, pulp and panels industries can ill afford the much increased price;

It is characterized by a wide range of production, processing and marketing systems. A thorough understanding of the production to consumption systems is necessary to initiate development interventions to optimize its role in industrial uses;

Bamboo has not been favored by farmers in the bipartite or tripartite tie up arrangements the industries have been forging with them although it is fast growing, because of the difficulties encountered in protection from cattle and the fear of long term commitment of land.

## AGRO BASED RAW MATERIALS

India is a source of rich non wood fibre resources, in respect of diversity and abundance. The non woods vary from essentially forest based sources like bamboo to agricultural residues chiefly bagasse, rice and wheat straws. As per one estimate, India is world's largest producer of bagasse and second largest producer of bamboo, next only to China. Historically, the utilization of non

wood fibres for manufacturing paper started in 1880 when 5 small mills were established with grass and jute sticks as major raw material. However, the utilization of this abundant availability has been hampered in the pulp and paper sector due to various factors. Some of these factors are:

- Sustained and uninterrupted availability of supply
- Quality of the raw material as required for making quality paper.
- Uneconomical storage and transport of the non woods.
- Major competitive uses of the non woods

However, the industry has taken some advantage of this availability, with about a third of the production being attributed to non wood based mills.

Agro based raw materials are widely used in the Indian paper industry. The agricultural waste based sector is of the opinion that future of the Indian paper lies in more intensive utilization of this abundantly available resource. There is sufficient quantity of agricultural residues available in the country. (table – 3). As of date, these materials are also being used by other sectors, lowering their availability for use in the pulp and paper sector. Wheat straw has traditionally being use as cattle feed as well as for construction of hut roofs in rural India. The competition from bagasse comes from the sugar mills which use it as a fuel for cogeneration. The use of jute, kenaf and mesta is limited because of location disadvantages and technological problems associated with manufacture of pulp using these materials.

TABLE –3

ANNUAL POTENTIAL OF AGRO BASED FIBERS IN INDIA

| Agro residue | Availability Million Tons |
|---|---|
| Wheat Straw | 22 |
| Rice Straw | 15 |
| Bagasse | 12 |
| Jute, Mesta, Kenaf | 2 |
| Total | 51 |

**BAGASSE**

Bagasse, a residue obtained after crushing of sugar cane in sugar industry has emerged as one of the important fiber base for the Indian paper industry. Of all the agricultural based residues used by the paper industry, the share of bagasse is the maximum. Bagasse is the industrial waste, which originates from the processing of sugar cane for the manufacturing of sugar, gur (jaggery) and khandsari (unrefined sugar). Bagasse is recovered from all these processes, but the gur and khandsari sectors typically use almost the entire quantity of bagasse as captive fuel. Therefore, the possibility of sourcing bagasse from these two sub-sectors is negligible.

The sugar industry produces some surplus bagasse, which is being utilized by the paper industry particularly for the production of newsprint, cream wove and maplitho grades.

India is the world's largest producer of sugar cane with about a present total production of 280-million tonnes/ annum. Table- 4 shows the distribution of the supply of sugar cane for various uses. Bagasse obtained from the sugar mill is known as the ''mill wet bagasse' and is approximately about $1/3^{rd}$ of the total sugar cane crushed.

**TABLE- 4**

**Distribution of Sugar Cane in Different Sectors**

| Particular | Cane Sugar |
|---|---|
| Production, million tonnes/ annum | 280 |
| Supply to sugar mills, % | 50 |
| Seeds, % | 12 |
| Unrefined sugar industry, % | 30 |
| Household, % | 8 |

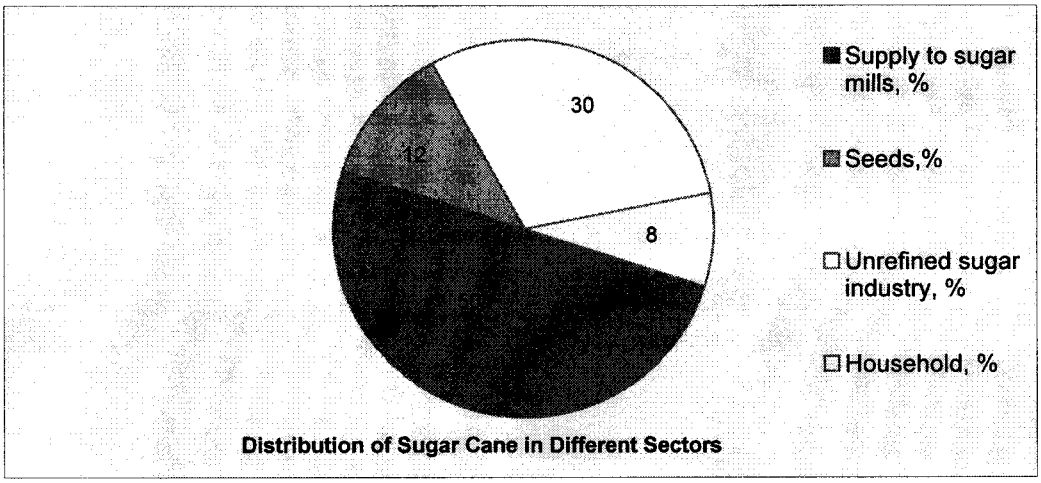
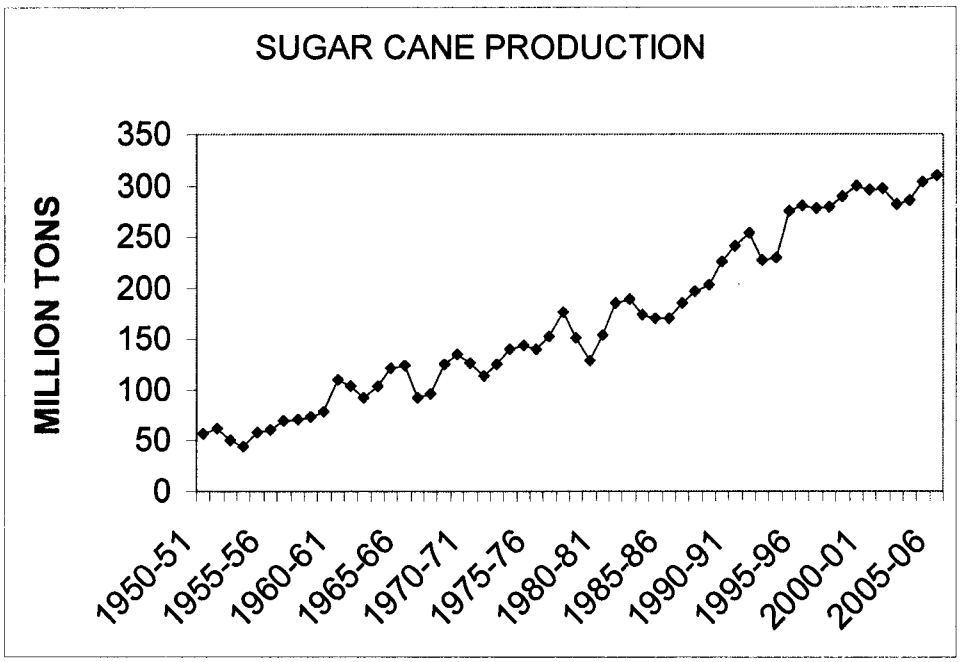



Fig.7

Cultivation of sugar cane and hence the availability of bagasse is concentrated in the states of Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Tamilnadu and Uttar Pradesh.

Among various non-wood plant fiber sources, bagasse occupies a commanding position. Bagasse has proved itself to be the most promising alternative for hardwoods.

FIGURE - 8



Sugar cane is one of the major cash crops in India. As per the data available, the sugar cane growth has seen a gross upwards trend. The total production of sugar cane has touched nearly 300 million tons (Figure – 8). A large segment of the sugar cane produced in the country is utilized for the making of sugar. Competing use for the same comes from the unorganized sector making country sugar and jaggery. As per FAO estimates, nearly 89% of the total production of sugar cane will be crushed for making sugar and the rest 11% will be employed as seed, cattle feed and human consumption. Since 30% of the cane crushed for sugar will end up as bagasse, this translates to a current availability of nearly 90 million tons. The table hereunder (Table – 5) shows the past and possible future contribution of bagasse as a raw material to paper making. The 2010-11 figure has been based on the time series CARG of production of sugar observed from 1988 onwards.

TABLE – 5
AVAILABILITY OF BAGASSE

| | (all figures in million tons) | | | |
|---|---|---|---|---|
| Particulars | 1994-95 | 2000-01 | 2004-05 | 2010-11 |
| Sugar production | 14.6 | 18.5 | 13.50 | 20 |
| Cane crushed | 146 | 200 | 135 | 200 |
| Bagasse yield | 43.8 | 60 | 40.5 | 60 |
| (% availability for paper making) | 7 | 10 | 12 | 13 |
| Quantity -do- | 3.1 | 6 | 4.86 | 7.8 |
| Paper production | 0.62 | 1.2 | 0.972 | 1.56 |

Source: FAO, CPPRI Data Projection

From the table it is indicated that out of the 1.8 million tons of paper produced from agro based sector in the year 2005-06, 5% could be contributed by bagasse alone, requiring about 5 million tons of the material as such.

**STRAWS**

The paper mill in India utilize rice and wheat straw in small and medium size mills producing mainly writing printing and packing grades of paper. In spite of abundant availability of rice straw (over 50 million tons) and of wheat straw (120 million tons) the surplus available quantity is hardly 30%. There are various problems associated with the use of these straw as a source of fiber for paper making. These are mainly

scattered nature of the resource thereby increasing the cost of collection and transportation

bulky nature of the commodity posing difficulties in handling and transportation.

Seasonal availability necessitating ample space and elaborate space for storage at mill site.

Poor strength and drainage properties of the straw pulp

high silica content and

uncertainty of the availability.

**RECYCLED WASTE PAPER**

The use of waste paper has made significant progress in last few years. While in 1970, the production of paper based on waste paper was merely 5%, amounting to 37000 tons only, which was increased to 6.5 lakh tons in 1994-05, contributing to 26% of the total production. This share of waste paper in 2005-06 has further increased to nearly 2 million tons, contributing to 34% of the total production, being produced from nearly 510 number of small, medium and large paper mills with an installed capacity of 58.3 lakh tons. The outlook for the use of recycled paper in the industry is bright despite the fact that the rate of recovery is low and the fiber quality is poor. This necessitates the incorporation of the imported waste paper of long fiber origin to achieve satisfactory quality. The recycled waste paper based mills therefore have been continuously urging the government to extend certain incentives and concessions like

- Abolition of customs duty on waste paper

- Abolition of sales tax on sale of waste paper
- Zero customs duty for equipment and machines for recycling waste paper and 100% depreciation for the same.

Most of paper is recovered, but, due to alternative uses the availability of the recovered waste paper to the paper industry is below 20% which is rather low as compared to the other countries like USA (45.5%), China (31%), Germany (73.3%), France, (53.3%), Japan (56%) and Sweden (63%). (Table 6).

TABLE – 6

| COUNTRY | PER CAPITA CONSUMPTION, KG | RECOVERY RATE, % |
|---|---|---|
| USA | 354 | 45.5 |
| GERMANY | 215 | 73.3 |
| U.K. | 215 | 40.6 |
| FRANCE | 153 | 51.3 |
| JAPAN | 243 | 56.3 |
| SWEDEN | 257 | 63 |
| CHINA | 30 | 31 |
| INDIA | 6 | 20 |

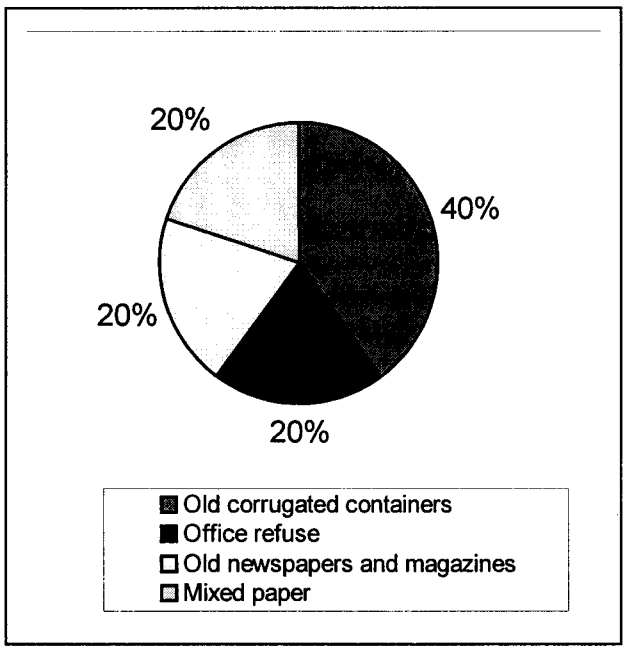
Waste paper recovery and trading are still unorganized in India and low rate of recovery is attributed to

- unorganized collection of the waste paper, which is confined only to major towns, and that too only to a limited extent.
- Segregation is not carried out at the selection, resulting in contamination
- Absence of facilities for collection, sorting and bailing.

The collection is being carried out by individual wheelers, and the system of sorting is unsophisticated. The Indian recovery is not keeping pace with recycled paper utilization, resulting in increase in Imports. Multiple use of paper products (as wrapping papers, packaging applications, etc.) is common in India, and often these end uses pay better price for waste paper than paper industry. The main grades of waste paper available for recycling are old corrugated containers, office refuse, old newspapers/magazine waste and mixed waste paper. Figure 9 gives the distribution of the variety wise availability of waste paper in India.

FIGURE – 9

AVAILABILITY OF WASTE PAPER




IMPORT OF RECOVERED PAPER

The capacity expansions in the Indian paper industry are planned not only on virgin fiber based but incorporates the recycled fiber base to a greater extent. In view of the limited availability of

the domestic recycled waste paper, the Indian waste paper industry has to depend mainly on imported recycled fiber base, and therefore the import of waste paper has increased in the recent years at accelerated rate as shown in Figure 10 below, whihc shows that the import of waste paper, which was about 800 thousand tons in 2000-01 has more than doubled in last five years, touching nearly 1800 thousand tons.

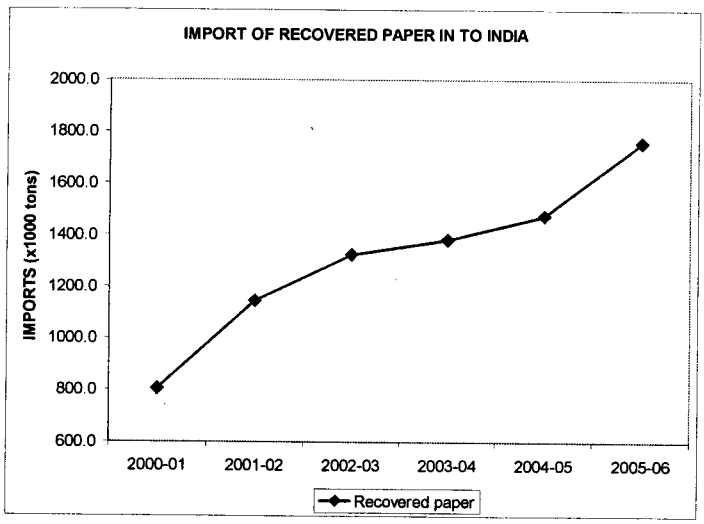



FIGURE – 10

The use of waste paper as an input for pulp and paper is now gaining world wide importance in view of environmental constraints and concerns, even legislative interventions have been initiated for utilization of recycled waste paper. In some countries like USA, it is stipulated that 40% of the paper produced should be from recycled fiber.

**FIBROUS RAW MATERIAL – CURRENT SCENARIO IN INDIAN PAPER INDUSTRY**

Responding to the challenges posed by a liberalized system of international trade, the major players have taken up aggressive initiatives through various steps. Hindustan Paper Corporation, a major player in the public sector has chalked out deals with the local farm communities for plantation of bamboo, particularly in the tea gardens, with a buy back procedure to ensure the supply of raw material in the future. Similarly, the Mysore Paper Mills Ltd., a large player is actively pursuing plantation program using identified fast growing and better quality species. Tamilnadu Newsprints and Paper Ltd., another major in the public sector has developed "paper

cane" from a wild sugar cane variety. Likewise, other players such as APPM and West Coast have also taken up programs related to farm forestry.

Further, in a recent move, the government of India has also announced a move for consideration of putting up a multi stake holder partnership in the plantation sector, which would allow private firms to invest in plantations in the degraded forests and waste lands. If implemented, this proposal will go a long way in solving the raw material crises of the paper industry.

The Indian industry has also begun looking beyond the shores to address the smooth availability of raw material for its proposed growth. BILT, the leading manufacturer of pulp and paper, has acquired the Malaysia based Sabah Forest Industries in a US$ 261 million deal. This deal would assure the availability of high class raw material and pulp for the future.

Vietnam Paper Company (VPC) a state owned enterprise has initiated moves to approach the Indian paper industry to invest in plantations in Vietnam. VPC has decided to harvest trees on nearly 135,000 hectares of land in the central northern region of the country with a view to provide a supply base of good quality forest based raw material for Indian and South Asian pulp mills. Vietnam currently also is a hot destination for raw material with a total available resource area of 105,000 hectares with an average yield of $80m^3$/hectares/7 years.

Likewise, the Australian government has come forward to market its fibre resources to the Indian paper industry. In a recent move, its federal forest ministry has identified India along with other South Asian countries as possible growth drivers for the Australian wood based plantation industry .

Further in a recent move, a number of leading Indian Pulp and Paper firms (JK Paper Mills Ltd., Andhra Pradesh Paper Mills Ltd., Orient Paper Mills Ltd., Ballarpur Industries Limited and ITC Limited) and some non paper firms (Anmol Polymers Pvt. Ltd.) plan to source dry raw bamboo and eucalyptus forest material from Land and Sea Development – Ethiopia PLC (LSDE). Under a five year, USD 136 million contract LSDE will sell and deliver dry raw bamboo and eucalyptus forest material to its Indian customers. The imports of the products in to India is likely to start with in the year.

Where as the raw material problem has been addressed in real earnest in the recent past, there is still a long way to go as regards the forest policy in the country. To be cost competitive, the Indian paper industry will need to consolidate in size even further, which will only heighten the need of additional quality fibrous raw materials in bulk. The tendency of outsourcing of raw material or pulp from captive production from overseas undermines the interest of the indigenous society at large as the benefits to the local public that would have been accrued due the operations up to the pulping stage will be lost. Moreover, farm forestry or community farm projects are small in size for the expected demand leading to logistic problems to the large units even today. Therefore, efforts are needed to develop the presently available waste lands to be the wood banks for the Indian paper industry so as to tide over the inevitable high demand of quality raw material in the times to come. The industry feels that the need of the hour is the formulation of policy to promote plantation on degraded forest land/wasteland so as to address the problem of availability of quality raw material paper making in India.

# CAPACITY EXPANSIONS IN THE INDIAN PAPER INDUSTRY

## MAJOR CAPACITY EXPANSIONS IN THE INDIAN PAPER INDUSTRY

### GREEN FIELD PROJECTS

In the last decade, the Indian paper industry had only two major green field projects, namely the bagasse based Tamilnadu Newsprints and Papers Ltd, with an installed capacity of 19000 TPA which came up in 1994 and Sinar Mas Pulp and Paper (BILT Graphics after its acquisition by BILT in 2001) with a capacity of 1.15 lakh tons per annum of coated paper in 1996. With the changing trend in the recent past, as many as seven green field projects have been announced which are under various stages of implementation. An additional capacity of around 1.0 million tons is expected to be increased by these projects. The details of the announced green field plans are tabulated hereunder.

| S. No. | NAME OF THE COMPANY | GREEN FIELD CAPACITY DECLARED (TPA) | COST (RS. Crore) | EXPANSION SEGMENT |
|---|---|---|---|---|
| 1 | A.P. Paper Mills | 250,000 | 1800 | Writing and Printing Paper |
| 2 | West Coast Paper Mills Ltd . | 1,00,000 | 230 | Paper and Duplex board |
| 3 | ITC | 2,00,000 | 2500 | Paper board |
| 4 | Whitefield Paper Mills | 200,000 | 1200 | Writing and Printing Paper |
| 5 | Hindustan Paper Corporation | 300000 | 2500 | Writing and Printing |
| 6 | MBD Group | 20000 | NA | Writing/printing |
| | TOTAL | 1070000 | 8230 | |
| | | | | |

## BROWN FIELD CAPACITY EXPANSIONS

With the Indian economy poised to grow over 6% in the current financial year, (2006-07), the Indian paper industry is expected to continue its growth momentum that began in the year 2003-04. It is expected to perform well and the major players across the sector have announced capacity expansions to upgrade their technologies keeping in view the CREP norms. However the supply will catch up with the demand over a period of time. The Indian paper industry across the sector witnessed huge expansion plans taking the total investments from Rs. 10000 crores in 1996-2001 to Rs. 15000 crores in 2004-05 with the recent estimates being put up to 17000 crores. The expansion plans in general have factored mainly the requirements of the energy and environmental norms required to be met by these mills by way of technology upgradation. Technology upgradation, which will take up around 40% of the capital expenditure, consists mainly of the installation of modern pulping, chlorine free bleaching facility, cogeneration facility to mitigate dependency on grid power to reduce energy costs etc.

Given the low fibrous raw material availability, particularly faced by the forest based integrated paper mills, majority of these mills are actively enhancing captive plantation and contract farming to become self reliant in terms of additional pulp requirement for the expanded capacities.

The implemented and proposed expansion plans are likely to have an effect on the structure of the Indian paper industry as many of the so called medium agro based mills are upgrading their capacity with the installation of chemical recovery to comply with the provisions laid down in the Charter on Corporate Responsibility for Environmental Protection, the provisions of which have been agreed upon by the Industry and the regulatory authorities.

Satia Paper Mills Ltd, ( Punjab) Yash Papers Ltd., (U.P.) Ruchira Paper Mills (Himanchal Pradesh), Naini Pulp and Paper (Uttranchal) in the agro based sector are in the process of expanding their capacities with the installation of chemical recovery system which should not only improve the viability but also makes the operations more sustainable. In the process, these mills have also added to their product portfolio by acquiring facilities to make high quality writing and printing grade of paper. With these initiatives, these mills are consolidating and

strengthening their position in the domestic market with a focus on capacities, backward and forward linkages.

Similarly the waste paper based segment has alos initiates steps for upgration. Thus Khanna Paper Mills in Punjab, a waste paper based mill, has upgraded itself to present capacity of 231,000 tons from about 20,000 tons per year a few years ago. Further, by March 2007, Emami Paper Mills, an agro and waste paper based mill will raise the production level from 60,000 to 1,45,000. The promoters of the mill plan to increase the production to 300,000 tons per year in the next three years.

A list of the expansion programs undertaken by the Indian paper industry is placed in the table hereunder,

**MAJOR CAPACITY EXPANSIONS IN THE INDIAN PAPER INDUSTRY**

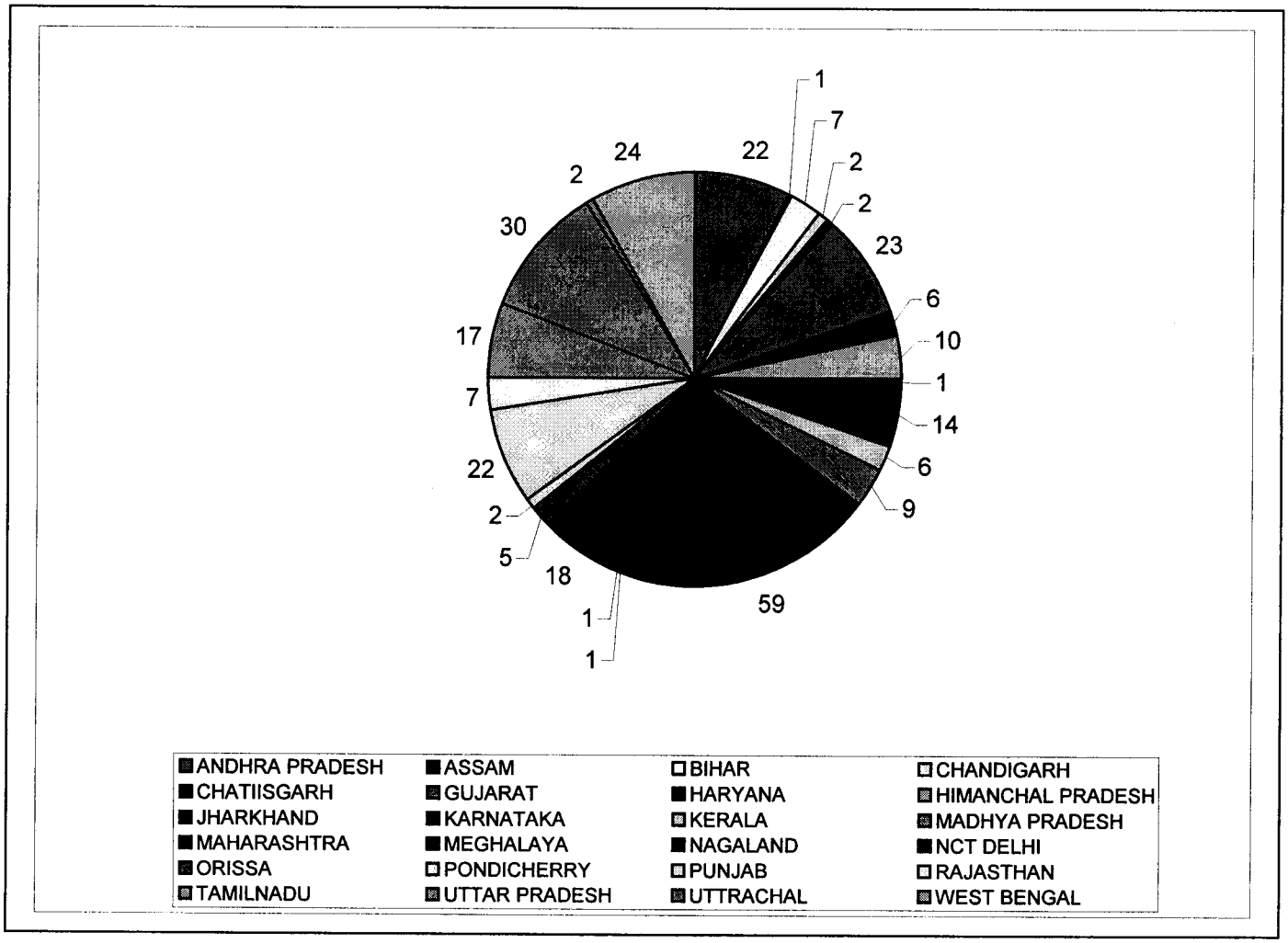
| S. No. | NAME OF THE MILL | CAPACITY EXPANSION PLAN, t/A | EXPANSION COST (RS., Crore) |
|---|---|---|---|
| 1 | Ballarpur Industries Ltd., | 200,000 (Bhigwan Unit)<br>40,000 ( Sewa Unit)<br>10,000 (Kamalpuram Unit ) | 1200 |
| 2 | J. K. paper, | 30,000 (packaging board)<br>60,000 (coated packaging paper | 280<br>235 |
| 3 | Tamilnadu Newsprints and papers Ltd., | 1,00,000 (Copier, Pulp & Paper)<br>15,000 (Paper, through the Mill Development Plan, by September 2006) | 600<br>56 |
| 4 | Hindustan paper Corporation Ltd., | 2,00,000 (Newsprint & Paper) | 1000 |
| 5 | Sirpur Paper Mills, Ltd. | 54,000 (Paper & Paperboard) | 294 |
| 6 | Khanna Paper Mills | 50,000 (Greyback, Kraftback)<br>100,000 (Waste paper based ) | 300<br>270 |
| 7 | West Coast Paper Mills Ltd | 1,00,000 (WP Paper & duplex board) | 820 |
| 8 | Rama Newsprints and Papers Ltd. | 2,00,000 (Newsprint & WP Paper) | 350 |
| 9 | Andhra Pradesh Paper Mills Ltd., | 45,000 (Pulp, Paper & WP Paper) (phase –I by June 2006, Phase –II by January 2007) | 635.0 |

| | | | |
|---|---|---|---|
| 10 | ITC | 75,000 (Paper & Paperboard)<br>100000 (Paper and Paper Board) (by April 2008) | 2500.0<br>1100.0 |
| 11 | Star Paper Mill | 80,000 (Industrial, cultural paper) | 175.0 |
| 12 | Yash Paper | 23,000 (Kraft Paper, by 2006 end) | 85 |
| 13 | Emami Paper | 83,500 (Newsprint) (production by 2007 March) | 300.0 |
| 14 | Century Paper | 39,750 (Paper & Paperboard) | 525.0 |
| 15 | Sri Luxmi Tulasi Agro Papers | 25,000 (Kraft Paper) | 313.0 |
| 16 | Orient Papers, Amlai | 20,000 (Tissue paper, to be under production by April 2008) | 55.00 |
| 17 | Seshasayee Papers and Boards Ltd., | (Specialty paper, to be operative by around 2007 end) | 350.00 |
| 18 | Shree Bhawani Paper Mills Ltd., | 23,000 | 69.0 |
| 19 | Shri Krishna Paper Mills | 25,000 ( Writing and Printing Paper) | |
| 20 | Malu Paper Mills Ltd. | 70,200 (Swing capacity between newsprint and writing and printing paper). To be on steam by 2007 middle | 70.0 |
| 21 | Nagaland Pulp and Paper | 33000 | - |
| | Total | 1801450 | 11862 |

# MILLS REFERRED TO THE BOARD OF INDUSTRIAL AND FINANCIAL RECONSTRUCTION

REGISTERED CASES OF PULP AND PAPER MILLS WITH THE BIFR

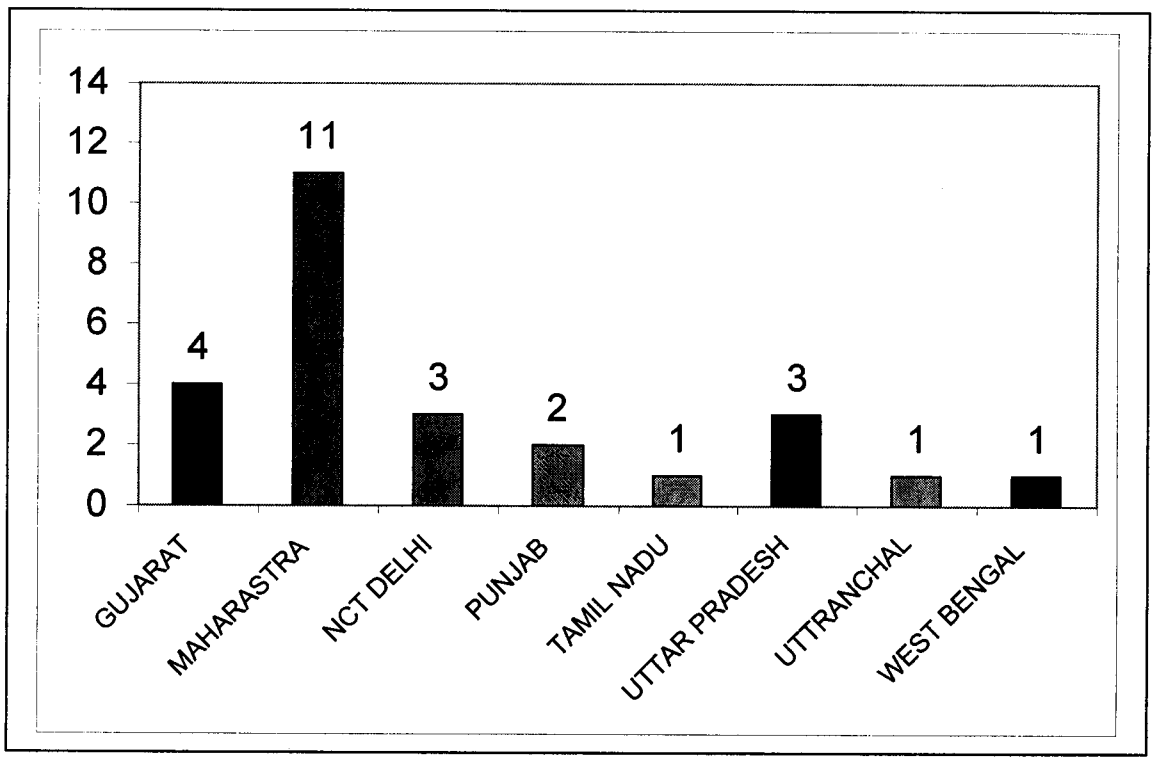
In the paper industry, there have been 291 registration with the BIFR in the period from 1987 to 2005. As can be seen from the figure, the largest referrals have been made from the state of Maharastra. The referrals in the 20's have come from the stas of Andhra Pradesh, Haryana, Punjab, Uttar Pradesh and West Bengal.




Out of the above mills, the cases of Delta Paper Mills, Ellora Paper Mills and Rama Paper Mills were droped as the net workt of these mills turned postive after the referral.

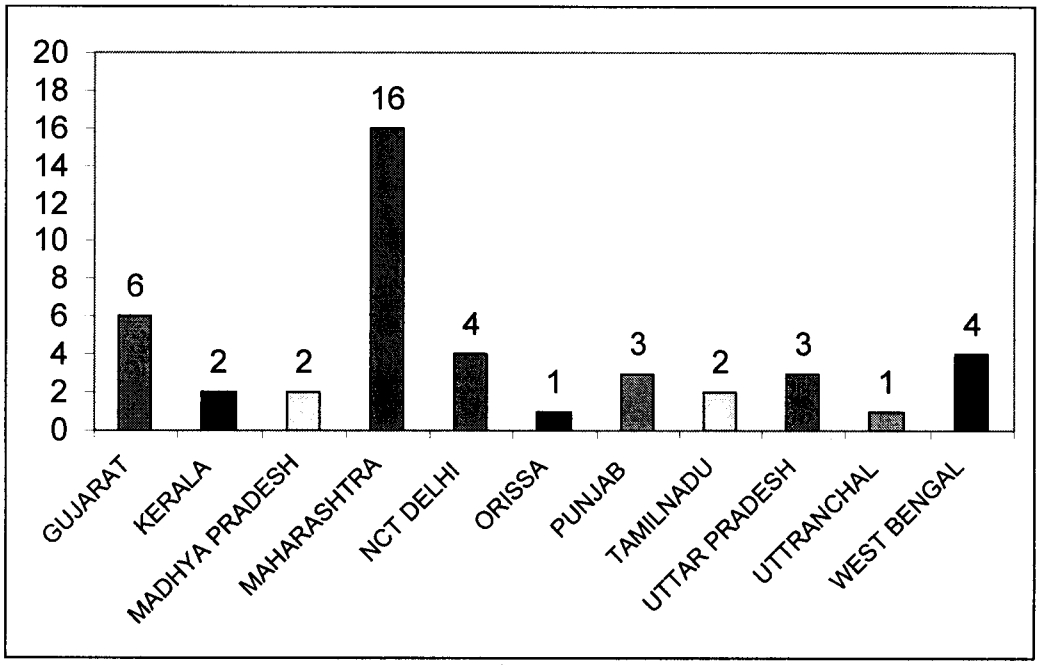
DECLARED SICK INDUSTRIES

Out of all the cases referred to the BIFR, there were only 28 cases which were found maintainable and were officially declared as sick industries.




The largest incidence of paper mills declared sick have come from the state of Maharastra, whereas Tamilnadu, Uttranchal, and West Bengal have got one unit as a declared sick unit.

CASES PENDING




There are many cases which are pending, to be considered as possible cases of sickness. Normally there is a process that has to be flowed, which has to go through several steps. This leads to a certain amount of piling up. At present the cases have to be considered for sickness since 1999. A major share of pending cases refer to the state of Maharastra followed by Gujarat.

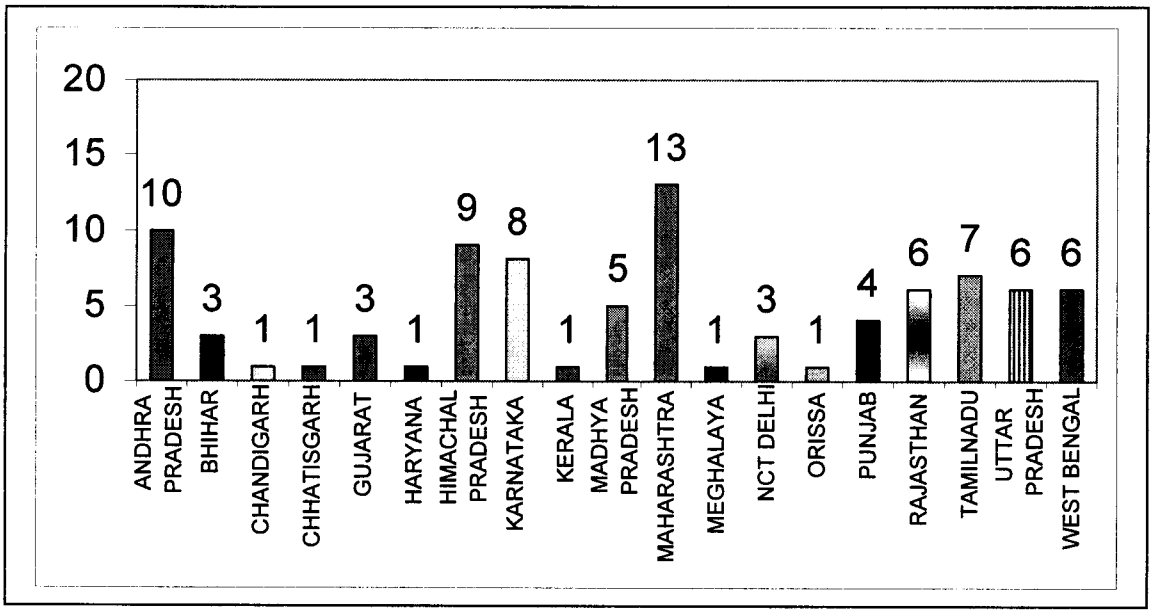
WINDING UP NOTICE

| Sr. No. | Year | Company | State |
|---|---|---|---|
| 1 | 1989 | SUPREME PAPER MILLS. | WEST BENGAL |
| 2 | 1997 | THE BENGAL PAPER MILLS (1989)CO. LTD. | WEST BENGAL |
| 3 | 1998 | SHAAN INTERWELL (INDIA) LTD. | MAHARASHTRA |
| 4 | 1998 | CREST PAPER MILLS LTD. | MAHARASHTRA |
| 5 | 1998 | ASHIANA PAPERS PVT LTD. | PUNJAB |
| 6 | 2001 | NAYAGARATECHNOLOGIES LTD. | ANDHRA PRADESH |
| 7 | 2003 | SHIVA PAPER MILLS LTD. | NCT DELHI |

In the history of the referrals to the BIFR, to date (since 1989), the final winding up notice has been given to only seven mills. West Bengal and Maharstra account for two of such mills each. Shiva Paper Mills Ltd., with its head quarters in New Delhi was located in U.P. (Rampur).

WINDING UP RECOMMENDED

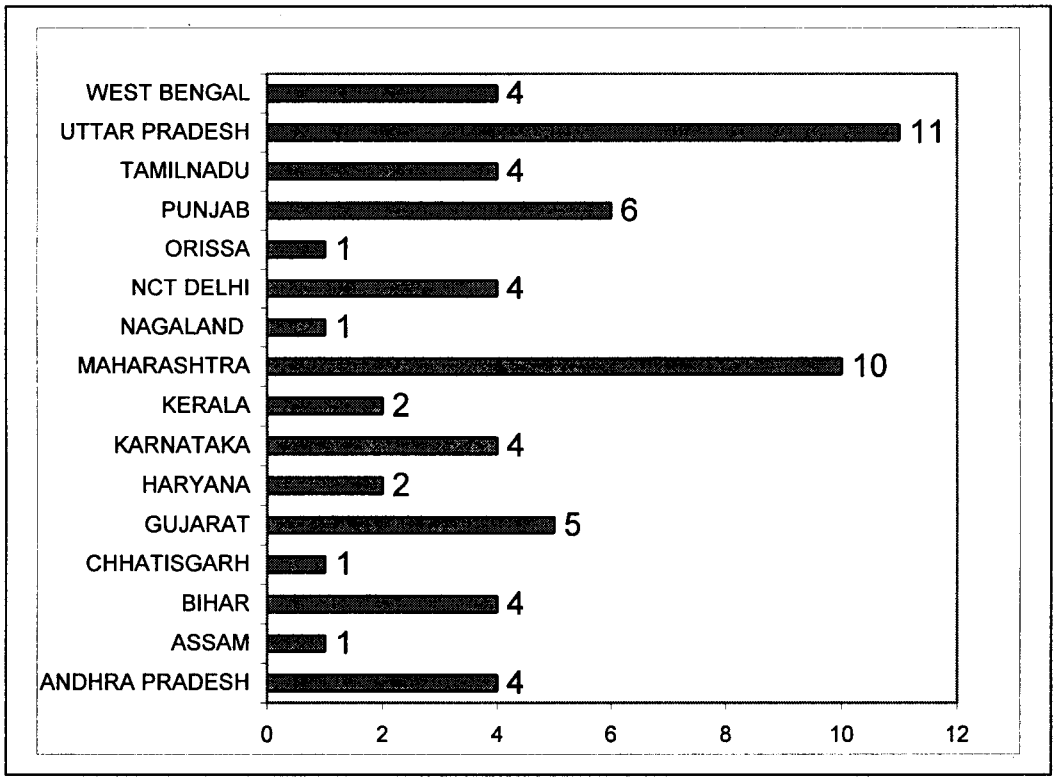
After considering all the pleas given to it, the board in its penultimate step, recommends the winding up of the mills, which it feels are beyond any probability or revival. However, as per the provisions of the BIFR act, the companies are free to appeal against this judgment to the Appellate Authority or even to the Court.




Thus it is clear from the table, most pending winding up operations are in the state of Maharastra, followed by Andhra Pradesh, Himanchal Pradesh, Karnataka and Tamilnadu.

CASES NON MAINTAINABLE

Non maintainable cases are the pulp and paper mills, which were refereed to the BIFR to be taken as a sick industry but could not be considered for various laid down reasons. The cases declared non maintainable may, if so desired, re apply after fulfilling the norms or can even go for an appeal in the appellate authority.




Uttar Pradesh and Maharashtra top the list in the present case.

## REVIVAL SCHEMES SANCTIONED

Revival schemes have been sanctioned for 14 pulp and paper mill operations, which are scattered over different states. On an average one scheme is sanctioned for the pulp and paper industry. As of date there is definite knowledge of the operations of Pondicehrry Papers, Shree Rayalseema ( now called Sai Rayalseema), Guru Nanak Paper Mills Ltd., Jayant Paper Mills, Sengal papers and Rama Pulp and paper.

| REVIVIAL SCHEME SANCTIONED BY BIFR/AAIFR | | | |
|---|---|---|---|
| Sr. No. | Year | Company | State |
| 1 | 1987 | PONDICHERRY PAPERS LTD | PONDICHERRY |
| 2 | 1988 | CENTRAL PULP | GUJARAT |
| 3 | 1989 | SAIYADERI PAPER MILS | MADHYA PRADESH |
| 4 | 1989 | SHEE RAYALSEEMA PAPER MILLS | ANDHRA PRADESH |
| 5 | 1993 | SHIVASHAKTI PAPER MILLS LTD. | MADHYA PRADESH |
| 6 | 1995 | MOHAN FIBRE PRODUCUTS LTD. | PUNJAB |
| 7 | 1995 | GURU NANAK PAPER MILLS LTD. | PUNJAB |
| 8 | 1997 | KALIK PAPER INDUSTRIES LTD. | WEST BENGAL |
| 9 | 1997 | MANSAROVAR PAPER & INDUSTRIES LTD. | UTTAR PRADESH |
| 10 | 1998 | JAYANT PAPERS MILLS LTD. | MAHARASHTRA |
| 11 | 1999 | SENGAL PAPER LTD. | UTTAR PRADESH |
| 12 | 2000 | RAMA PULP & PAPERS LTD. | MAHARASHTRA |
| 13 | 2001 | KHARTHIKEYA PAPER & BOARD LTD. | TAMILNADU |
| 14 | 2002 | USMAN PAPER MILLS PVT LTD. | GUJARAT |

# COATED PAPER SEGMENT IN INDIA

## COATED PAPER SEGMENT IN THE INDIAN PULP AND PAPER INDUSTRY

The present study is concentrated on the coated paper and paper board segment. As per the definition of ITC HS followed in India, the coated paper is imported in two heads, which are as follows:

48.10

Paper and paperboard, coated on one or both sides with kaolin (China clay) or other inorganic substances, with or without a binder, and with no other coating, whether or not surface-colored, surface-decorated or printed, in rolls or rectangular (including square) sheets, or any size.

( This pertains to Paper and paperboard of a kind used for writing, printing or other graphic purposes, not containing fibres obtained by a mechanical or chemi-mechanical process or of which not more than 10% by weight of the total fibre content consists of such fibres. )

48.11

Paper, paperboard, cellulose wadding and webs of cellulose fibres, coated, impregnated, covered, surface-colured, surface-decorated or printed, in rolls or rectangular (including square) sheets, of any size.

## COATED PAPER & PAPERBOARD - THE TECHNOLOGY

### Pigment Coating

The rate of growth in demand for pigment-coated papers exceeds the growth rate of total paper demand. This situation, which has persisted for several decades, has provided a strong stimulus for technical effort and has prompted the development of new and improved materials, machinery, and methods for the production of pigment-coated paper. Developments in all three of these areas have been important in the advancement of the pigment-coating process.

The principal reasons for applying a pigment coating to paper and paperboard are to improve printability and appearance. In its simplest form a pigment coating consists of a pigment and a binder that is present to bind the pigment particles both to one another and to the base sheet of paper. Pigments are the main constituent of pigment coatings; the various binders and additives that are used along with the pigment normally comprise less than 20 percent of the formulation. The pigment coating provides a surface that is more uniform and more receptive to printing ink than are the uncoated fibers and, in turn, both facilitates the printing process and enhances the graphic reproduction. The improvement in print quality is readily apparent, especially in image areas or when multiple colors are involved.

Pigment coating is somewhat different from functional coating. Functional coatings are designed for purposes other than printing enhancement, and pigmentation is either not required or is of secondary importance.

### Outlook

The development and use of pigment-coated printing papers has not, of course, been restricted to the United States. Considerable research and production has taken place in Europe and elsewhere. In many instances the grade structure and finished product properties differ from country to country, reflecting differences in regional availability of raw materials as well as in the end-use requirements of local printers and publishers. The growth drivers for the coated paper

include a rising level of education, increased leisure time and growing affluence in the developed countries, and a rapid rise in literacy in the developing countries.

There is some concern that the growth of electronic communication systems will have an adverse impact on pigment-coated paper volume. Most knowledgeable individuals foresee some substitution, but it is generally agreed that any major incursion into the present paper-based system is many years off. The convenience, cost, quality, and portability of hard copy afforded by coated paper will be very difficult if not impossible to match.

**Principal Grades**

There are many different grades of pigment-coated printing papers. The two major classifications are coated one side (C1 S) and coated two side (C2S). Cl S paper is used primarily for labels, wrappings, and the like where only the coated surface is printed; it represents about 10 percent of the total pigment-coated paper production in the United States. C2S paper is divided into five grade categories based on brightness, fiber furnish, and gloss. No. 1 is the brightest and contains 100 percent chemical fiber; No.5 is the least bright and includes a percentage of mechanical pulp. The American Paper Institute ranks coated paper by brightness: No. 1 coated is specified at a 85 percent [General Electric (GE)] brightness or higher; No.5 coated is specified at a 72.9 percent (GE) brightness or lower. No.5 coated accounts for approximately 50 percent of the total pigment-coated paper production and 56 percent of the total C2S production in the United States. No.5 C2S is also referred to as publication grade. About 70 percent of this grade is used for magazine publishing, the remainder being used for periodicals, catalogs and commercial printing. Since the 1950s, a major portion of the research and development work in pigment coating has been focused on publication grades. This emphasis was the direct result of the rapid increase in mailing and distribution charges which prompted an industry-wide effort to lower basis weight and thus reduce the unit shipping cost. During a period when postage rates tripled, a 30 percent reduction in basis weight was made, which offset one-third of the increase. This reduction had to be accomplished without any loss in print quality to maintain high impact level and prevent the loss of magazine advertising revenues to television and other media.

**Coating Process**

There are three basic materials used in pigment coating: (1) the pigment, (2) the adhesive or binder used for bonding the pigment, and (3) the carrier which is water. The pigments in common use are clay, calcium carbonate, and titanium dioxide. The principal adhesives used are starch, casein or soybean protein, and synthetic resins, usually in emulsion or latex form. Other pigment-coating systems have been proposed from time to time, such as an electrostatic process in which coating material is deposited on the paper in a strong electrostatic field, but the relatively simple aqueous system remains the cheapest and most efficient coating process and the only one used to any significant extent. At first glance, applying a pigment coating to paper appears to be a rather simple operation. This would be true if quality considerations could be ignored. However, commercially coated paper must meet a comprehensive list of specifications that includes both intrinsic and performance properties. Meeting these specifications is not a simple task; it is complicated by the size of the equipment involved and the speed at which this equipment must be operated. Despite many years of research and development effort, there are still many unanswered technical questions and areas wherein additional technology is needed.

Producing pigment-coated paper involves a consideration of many factors. The most important factors to be considered are: (1) choice of raw materials including base stock, pigments, and binders; (2) the procedure used for preparing he coating mixture; (3) the rheological properties of the coating mixture; (4) the method of applying the coating; (5) the drying rate; and, finally, (6) the specifications and end-use requirements for the finished paper. Each of these terns is discussed separately, but first a brief look at the composite coated paper should provide a better understanding of the interrelationships between these actors and of the important interactions that must be recognized and controlled.

The raw stock represents approximately 70 percent of the weight and 90 percent of the volume of a C2S paper. It is a porous mat formed by fibers of various dimensions and degrees of agglomeration so that it has a discontinuous surface comprised of about equal percentages of fiber and irregular void areas. Fortunately, most of the voids are of microscopic magnitude; thus

surface uniformity can be significantly improved by applying pigment coating. However, the variability of the raw stock does influence the thickness and structure of the coating layer.

## Raw Materials for Paper Coating

Pigment-coated paper is comprised essentially of three materials: the base paper or raw stock, pigment, and binder. On a weight basis, representative percentages would be 70 percent raw stock, 25 percent pigment, and 5 percent binder. An approximate volume relationship would be 90 percent raw stock, 9 percent pigment, and 1 percent binder. In addition, a number of materials such as dispersants, lubricants, and the like are used in minor percentages.

The composition of the base paper depends on the grade and end-use requirements of the coated paper. The type of fiber used in the manufacture of the raw stock is important; the large dimensions of chemical fibers from fast-growing softwood species can cause problems, especially in lightweight coated grades. Wood-free grades should contain essentially no mechanical fiber. The percentage of long-fiber pulp is determined by the strength and the folding endurance specifications for the finished paper. The short fibers provide bulk, resiliency, and texture; they contribute to the physical uniformity of the fiber web and provide a more level surface for the coating. The pigment filler in the raw stock increases the receptivity of the raw stock for the coating and contributes to the optical properties of the coated paper. A high degree of fiber bonding is desirable to minimize the intrusion of fibers into the pigment coating and to prevent picking of the coated paper during printing. The type and amount of sizing used in raw stock varies over wide range; it depends on the coating process used, the percent solids content of the coating mixture, and the intended use for the coated paper. Many coated publication papers are unsized; coated one-side label papers may be heavily sized. Raw stock for low-solids coating, for example, 40 to 50 percent solids, should be moderately sized to control penetration of coating into the raw stock and to maintain the integrity of the base paper.

## Pigments for Paper Coating

Pigment is the major component of a pigment coating. Several different types of pigments are used in coating, and numerous variations of each type are used. The principal pigment by far is kaolin, sometimes referred to as china clay. Other pigments include: calcium carbonate, titanium

dioxide, aluminum trihydrate, amorphous silicas and silicates, satin white, talc, zinc oxide, barium sulfate, and plastic pigments. The physical characteristics and results obtained with each of these pigments are reviewed separately. Some of the more important properties of pigments are the following:

- Shape of the particles; this influences the packing tendency.
- Dispersion; poor dispersion results in decreased pigment packing (increased sediment volume) independent of the pigment particle shape, particle size, and chemical composition.
- Chemical composition; this may be more important that particle shape in governing the packing tendencies of some pigment combinations.
- Particle packing; this influences the flow properties of pigment slips.

**Clay**

Clay is a natural, earthy, fine-grained material composed of a limited group of crystalline minerals known as clay minerals. For paper coating, by far the most important clay mineral is kaolin. A small amount of bentonite (smectite) is used in some specialty coatings. Kaolin is a clay consisting of substantially pure kaolinite, or related clay minerals, that is naturally white or nearly white or can be made so by beneficiation and is amenable to beneficiation by known methods. The term is applied without direct relation to the purity of the deposits. Many very large kaolin deposits are essentially pure and require little beneficiation. Most are slightly off color and require leaching or some other brightening procedure before they are suitable for paper coating. Some deposits contain as little as 10 percent clay and necessitate extensive washing and concentration to recover the marketable kaolin.

**Binders for paper coating**

The binder may be the most important ingredient in a pigment coating. In addition to its primary role of binding the pigment to the raw stock, the binder performs several other important functions. The binder, also referred to as the adhesive, is the dominant ingredient in the aqueous phase of the formulation. Thus it plays a major role in determining viscosity, rheology, water release, and set time for the coating. The amount of binder and its distribution in the coating layer can affect both the optical and the printing properties of the final coated sheet. Ideally, the

quantity of binder should be no more or less than that required to maintain the continuity of the dry pigment coating through printing, binding, and/ or other converting operations. Use of excess binder should be avoided because of its cost and its adverse impact on optical and printing properties.

Paper coating binders can be divided into two general classifications:

- Water-soluble colloids such as starch, protein, and polyvinyl alcohol
- Aqueous emulsions of synthetic polymers such as styrene-butadiene, polyacrylate and polyvinyl acetate. Starch and its derivatives dominate the field although recent trends to very-high-solids coating mixtures have increased the use of synthetic binders.

A broad classification up of the binders used is given hereunder

Starch

Starches are of following type

- Enzyme converted
- Thermal chemical converted
- Oxidized (chlorinated)
- Hydroxyethyl ether
- Others (acetate, cyroethyl, cationic, thin boiling)

Proteins

These are

- Soybean extract
- Casein (from skim milk)
- Others (Animal glue, gelatin)

Synthetic Latexes

These are suspensions of 100 to 200 nm particles in water. These commonly used latexes are-

- Styrene butadiene polymer
- V Vinyl acetate polymer
- Acrylic polymer
- Alkali sensitive latexes (swollen by dilute alkalis)
- Latex starch solution

Synthetic soluble binders

These includes

a. Polyvinyl alcohol

b. Carboxymethyl cellulose

## STARCH

Starch is the most widely used paper coating binder. The price/performance value of starch binders, together with their availability from many well-established producers, assures continued large volume usage in paper coating. As starch is a renewable resource, the long term outlook is favorable. Starches derived from corn account for about 90 percent of the starch used in paper coating. Tapioca, potato, and wheat starches comprise
most of the remaining volume.

The native of unmodified starches are unsuited for most paper coating application as viscosity prevents their use in anything but low-solids coating. Furthermore, in the case of corn, native starch has a strong tendency to gel or retrograde, resulting in coating mixtures of high yield value. Most native starches contain two fractions: amylose and amylopectin. The amylose fraction (linear chain modecules) has greater pigment-binding strength than the amylopectin (branched chain) fraction, but has a greater tendency to increase in viscosity and yield value with time. When the amylose fraction is modified to lower viscosity, it tends to lose strength much more rapidly than the amylopectin fraction. For these reasons, it is desirable to use starches containing a minimum of amylose. The percentage of amylose is 20 percent in corn, 26 percent in potato, and 20% in tapioca starch. For most coating applications modified starches with relatively low viscosity are desired, but it should be noted that all modified starches tend to lose strength as the viscosity is reduce.

The advantages and disadvantages of starch are listed hereunder

| Advantages | Disadvantages |
|---|---|
| - Economics<br>- Availability & variety<br>- Good adhesive strength per unit cost<br>- Good rheology<br>- Ease of attaining desired viscosity<br>- Blends with many latexes and PV A<br>- Good heat and light stability (does not discolour)<br>- Low odours<br>- Good blister resistance (more than latex)<br>- Water receptivity (improve printing properties in web offset printing) | - Binder migration (Mottle)<br>- Difficult to insolubilize (Low wet pick)<br>- Low gloss<br>- Film tends to be brittle (dusting & cracking at folds)<br>- Retrogradation - viscosity increase/decrease on storage. |

**Comparison of different modified starches in coating**

The table compares the properties of differently modified starches.

| Property | Enzyme converted | Thermal | Oxidized | Ethylated |
|---|---|---|---|---|
| Viscosity stability | Fair | Fair | Excellent | Good |
| Binding capacity | Fair | Good | Good | Excellent |
| Colour | Good | Fair | Good | Excellent |
| Economy | Excellent | Excellent | Good | Fair |
| Pigment dispersion | Poor | Poor | Excellent | Poor |

## PROTEINS

These are

- Soybean extract
- Casein (from skim milk)
- Others (Animal glue, gelatin)

### Soy Protein

Commercial introduction of soy protein binders to the paper coating industry dates back to 1937 when it was used in the American industry. Since then its use has grown significantly. A fair amount of the decline in the use of casein can be attributed to its replacement by soy protein. Several types of soy protein are available commercially. These are classified as unhydrolyzed types (sometimes referred to as unmodified) and hydrolyzed types of high-, medium-, low-, and extra-low viscosity grades. Each of these has been designed to fill a specific need in paper coating Other types of soy protein have been available from time to time, but these have no significance insofar as current paper applications are concerned.

### Casein

From 1895 to 1935 casein was the principal binder used in paper coating. The advent of machine coating and the accompanying requirement for high-solids coating mixtures forced the paper coater to switch to starch-based adhesives for most grades. Casein is still used in cast coating, it is used in combination with latex for some premium enamels, it is also used as the binder in label stock and in coated kraft board for food cartons. A small amount of casein is sometimes added to latex coating mixtures for its protective colloid value and water-retention properties.

### Animal Glue

With the introduction of casein and starch, it was largely displaced so that today the use of animal glue is limited to specialty papers such as playing-card stock, wallpapers, metal-coated papers, and other grades where a high gloss and water-resistant coating is desired. Technical gelatin is used as the binder with barium sulfate pigment in making coated photographic papers. Glycerol, sorbitol, or butanol are added to condition the coating.

The advantages and disadvantages of protein are

| Advantages | Disadvantages |
|---|---|
| - Excellent glueability<br>- High stiffness<br>- High opacity<br>- Excellent binding strength<br>- Excellent runnability on coating machine<br>- Improves stability and water retention of high latex level coating<br>- Good dispersing agents for pigments<br>- Adds blocking resistance | - High viscosity of liquid coating at high solids<br>- Brittle films<br>- Foam stabilized in coating<br>- Odour<br>- Low gloss coating<br>- Low brightness coating<br>- Cost<br>- Must be cooked with alkali to prepare |

**SYNTHETIC LATEXES**

These are suspensions of 100 to 200 nm particles in water. These commonly used latexes are-

- Styrene butadiene polymer
- Vinyl acetate polymer
- Acrylic polymer
- Alkali sensitive latexes (swollen by dilute alkalis)
- Latex starch solution

**Styrene-Butadiene Latex**

Latexes based on styrene-butadiene dominate the market for synthetic paper coating binders. Consumption is high and is expected to increase further in line with the swing to very-high-solids coating. Binder selection has the greatest single influence on coated sheet characteristics, especially printability. The identical pigment composition can be used for letterpress, offset, and rotogravure printing, but the type and amount of binder must be altered to meet the economic and property requirements of each printing method. Latex is ideally suited to this situation because its composition can be varied over a wide range and thus tailored to meet specific performance requirements.

The styrene is the "hard" monomer, and the butadiene is the "soft" monomer that internally plasticizes the hard monomer. Changes in the styrene-butadiene ratio have an effect on coated paper properties. The 50 to 60 percent styrene content range is used for most paper-coating latices since all the properties are in an acceptable range for most coated papers.

In making styrene-butadiene latex, polymerization is usually initiated by a peroxide compound. A chain transfer agent may be added to control (lower) the molecular weight of the copolymer. Buffer salt is added to control the pH. An electrolyte is included to regulate the particle size and to make the latex more fluid. A chelating agent is present to sequester any undesirable metal ions. The vinyl acid provides pendant functional groups (usually carboxylic acid) which impart chemical and colloidal reactivity to the latex particle. When the ingredients are combined and subjected to agitation, polymerization is initiated. The liquid monomers are dispersed into large stabilized droplets. The emulsifier forms soap micelles, and the monomers diffuse from the large droplets into the soap micelles where polymerization proceeds. The process continues as long as there are monomers available and the appropriate conditions exist. The reaction may require 16 hr at $70^0$C.

| Advantages | Disadvantages |
|---|---|
| Advantages<br>- Excellent overall properties<br>- Gloss ink holdouts<br>- Bonding strength<br>- Wet rub and abrasion resistance<br>- Gloss | Disadvantages<br>- Glueability<br>- Blistering tendencies<br>- Odour<br>- Mottle |

**Polyvinyl Acetate Latex**

The use of polyvinyl acetate latex binders in paper coating dates from 1955. The initial application of polyvinyl acetate (PV Ac) was for the coating of bleached board and folding boxboard where it was used because it produced coatings with excellent gluing characteristics, high brightness, and good ink receptivity. PVAc is also used in the coating of paper where it results in improved ink transfer and increased stiffness of the finished paper. PVAc has become a

particularly popular binder for the coating of paper to be printed by web offset where its porosity is an important contributor to blister resistance.

The physical properties of vinyl acetate polymers that should be controlled are viscosity, particle size, molecular weight, and stability. Typical physical properties of a polyvinyl acetate latex are as follows:

| | |
|---|---|
| Solids, percent | 47.0 |
| Density, 25°C, kg/m3 (Ib/gal) | 120 (9.0) |
| PH | 5.5-7.0 |
| Viscosity, cps | 50-100 |
| Particle size, μm | 0.1-0.2 |
| Film hardness (Sward Rocker) | 40 |
| Tg (glasss transition) temperature), ° C | 30 |
| Surface tension, dynes/cm at 25°C | 40 |

Mechanical and chemical stability of the latex are important to ensure good performance when the coating mixture is applied under conditions of high shear, Probably the most outstanding property of PV Ac is its essential freedom from odor.

As mentioned previously, PV Ac-bound coatings have excellent glueability, this is perhaps the most significant advantage of PV Ac-latex-bound coatings. Since many of the high-speed packaging adhesives are polyvinyl acetate based, there is an inherent compatibility between these adhesives and the PV Ac binder used in the pigment coating. When dextrin is used as the gluing adhesive, the PV Ac pigment coating provides an easily wetted surface, as measured by the water drop and/or Cobb tests. It is believed that the more readily a coated surface accepts water in these tests the faster it will glue. Another advantage of PVAc latex is that it permits very low-viscosity high-solids coating mixes. Typical solids-viscosity relationships for PV Ac coating mixtures in comparison to styrene-butadiene and acrylic coating mixtures are shown in Table. PVAc coatings have excellent ink receptivity; the rate of ink adsorption as determined by K&N ink test readings versus contact time indicates ink transfer at two to three times the rate obtained with styrene-butadiene latex.

Viscosity of Pigment-Coating mixtures made with latex and soy protein comparing polyvinyl acetate latex with styrene-butadiene lates and an acrylic emulsion

| Binder | Ratio Synthetic Adhesive to Soy Protein | Coating Solids (Percent) | Viscosity (eps) |
|---|---|---|---|
| Styrene-butadiene | 90:10 | 44 | 250 |
| Polyvinyl acetate | 90:10 | 57 | 120 |
| Acrylic | 90:10 | 47 | 230 |

**ADVANTAGE/DISADVANTAGE SB LATEX**

| Advantages | Disadvantages |
|---|---|
| Brightness and brightness stability<br>- Stiffness<br>- Blistering resistance<br>- Hydrophilic | - Ink holdout<br>- White pitch<br>- Low binding strength |

**ADVANTAGE/DISADVANTAGE ACRYLIC LATEX**

| Advantages | Disadvantages |
|---|---|
| - Excellent overall properties<br>- Excellent runnability<br>- Brightness and brightness stabilities. | - Very high cost |

**Polyvinyl Alcohol**

From the standpoint of bonding strength, polyvinyl alcohol (PV A) is the strongest paper coating binder available. It is an excellent film former and is resistant to wetting by oils, greases, and organic liquids. Since it is a synthetic binder, the properties of polyvinyl alcohol can be controlled precisely over a wide range of values. The high bonding strength permits the use of low levels of binder, for example, 3 to 8 parts of PVA per 100 parts of pigment. Such a low ratio of binder to pigment results in a large void area between the pigment particles which, in turn, manifests itself in high brightness and opacity values. Conversely, the high void volume in the coating results in low holdout of ink or varnish.

If we compare the binding performance per unit of cost then the rankings of different binders are as follows-

| Binder | Rank |
|---|---|
| Starch | 1 |
| S. B Latex | 2 |
| Protein | 3 |
| Acrylic Latex | 3 |
| PVAC Latex | 4 |
| PV Alcohol | 5 |

Binder requirement depends on the type of raw stocks, method of coating and printing. Generally the dosages of binder used are-

| Printing method | Sheet requirement | Binder (Solid per 100 part pigment) |
|---|---|---|
| Sheet offset (Trackiest oxidizing type printing ink) | High gloss Good water resistance High gloss ink holdout high picking | 14-20 (Latex exceed 50% with co-binder starch, casein) |
| Web offset (Heatset ink) | Dry & Wet pick resistance lesser than sheet offset | 12-18 (Latex is 25-35%) |
| Sheet letterpress (Less tacky ink) | Wet pick resistance not required | 8-16 |
| Rotogravure (fluid ink) | No pick resistance | 7-12 (Starch as main binder alongwith small latexes) |

**Printability vs. Latex properties**

Printability can be defined by the combination of press runnability and print quality. Although press runnability and print quality are closely interdependent, the former is more concerned with how fast and how long a printing press can be run trouble-free, while the latter is more concerned with the quality of image reproduction, print gloss, print mottle, back-trap mottle, water repellency, missing dots etc. Some of the important latex properties affecting print quality are discussed below.

**Ink Gloss**

Ink gloss depends not only on the unprinted initial sheet gloss, but also on the surface porosity and ink-binder interactions. Generally, the higher the initial sheet gloss is, the higher is the ink gloss. Ink gloss increases with decreasing latex particle size, suggesting that the ink gloss improves with decreasing interactions between latex polymer and ink solvent. This finding is also supported by the effect of acrylonitrile content of latexes on ink gloss; the higher the acrylonitrile is, the less is the interaction between the latex polymer and ink solvent and the higher ink gloss.

**Ink receptivity and Ink absorption**

Ink receptivity and ink absorption are two important properties of coated papers to be printed. There are a number of factors affecting the ink receptivity and ink absorption of coated surfaces, but the most important factor is the binder level in the coatings: the lower the binder level is, the higher the receptivity and absorption of ink are. Among different types of latexes, PVAc latexes are more ink receptive than either SB latexes or acrylic binders. Generally, ink receptivity increases with increasing latex particle size and increasing hardness of latex polymers. Also, it can be increased by limiting the coalescence of latex particles.

**Web offset blister resistance**

Web offset printing requires a blister resistance of coated papers during drying the printed papers. PVAc latexes are more blister resistant than either SB or SA latexes. Although PVAc produce more porous coatings, the porosity is not the only reason for their excellent blister resistance. Their high thermal flow behaviors are responsible for blister resistance. Based on this finding, blister resistant SB latexes were developed by reducing their cross linking density. Many studies have been made on the effect of the gel content of SB latex polymers on blister resistance. The blister resistance of SB latexes improves with their decreasing gel content. However their bonding strength also decreases with decreasing gel. Therefore, blister resistance and binding strength are often compromised for the development of blister resistant SB latexes. The effect of gel content on both the blister resistance and binding strength of SB latexes.

**Rotogravure Printability**

Rotogravure printability depends mainly on the transfer of ink from recessed cells to paper at the printing nip. Therefore, rotogravure printability requires both good fiber coverage and high compressibility of coated papers. As mentioned earlier, good fiber coverage and coating smoothness can be achieved by controlling the interaction of latexes with pigments or the colloidal stability of coating formulations, thus lowering their immobilization points. Although good fiber coverage is essential, it alone might not be sufficient for good rotogravure printability. The effect of latex polymer softness on missing dots is: the softer the latex polymer is, the better the rotogravure printability is in terms of missing dots.

**Foam Controlling Agents**

Three major types of antifoam/defoamers are available for coating – Water based, Oil based and polymeric. Water based ones are particularly susceptible to voids 'fisheyes'. Cylinder board mills using furnish contaminated with wax or oil and air-knife coating application found this type of antifoam of particular value because water based products did not further aggregate the 'fish eye' conditions.

Oil based compositions are most generally used compositions for coating applications because they seem to be most adaptable and versatile, both for chemical formulations and the user using paraffin oil as a base. The formulator adds hydrophobes as required depending upon the end use. The polymeric type products are the choice when formulator does not want to use an oil based composition and finds water based composition less effective.

**WATER RETENTION AND RHEOLOGY MODIFIERS**

Water Retention and Rheology Modifiers (WRRMs) are used widely in paper coating. The primary function is to provide the water retention and rheology control. These functions are known to play an important role in determining the runnability, coat weight and optical/mechanical properties of furnished coated paper or paperboard.

Commonly used WRRMs are
- Alginates
- Cellulosics (CMCs, HECs)

- Polyacrylates

Aiginates

Algin is a natural polysaccharide when it's formed on brown seaweeds of the group 'Phaeophycca'. These are processed to form various grades of alginates. It promotes water retention in coating. It exhibits low penetration into process substrates. The high water retention properties of alginate are well suited for bleached board coating, which are applied at relatively low speed and high solids.

**Carboxy Methyl Cellulose (CMC)**

CMC forms stable solutions over a broad range of pH. It is more tolerant of calcium ions than sodium alginate and does not require chelating agents for use in paper coatings. Usually low to medium type CMC's viscosity give higher water retention than high viscosity CMC. CMC is the predominant WRRM employed industrially free sheet paper coating formulation. It is also employed in some bleached board coatings. CMC has found little utilization in LWC papers due to use of starch as the primary binder.

**Hydroxy Ethyl Cellulose (HEC)**

HEC is a non-ionic water soluble derivative of cellulose. There are some essential differences between HEC and CMC. HEC has been found to absorb the Kaolin clays to a greater extent than the corresponding CMC. HEC has been reported to give higher K & N rank absorption as compared to CMC. These are desirable in some board grades and rotogravure coating formulation. HEC is employed industrially in free sheet, bleached board and recycled board coating applications.

**POLYACRYLATES**

Polyacrylate emulsions are petroleum based products and are used in coated paper and paperboard. The dosage is 0.15 to 1.0 parts per hundred parts pigment. The emulsion is usually added last to the coating colour to thicken the coating to the target viscosity.

## COLOURS

Various types of colourants are used in water based paper coatings to produce a wide range of coloured papers ranging from tinted white to deeply coloured specialty grades. The choice of colourants depends on -

- End use requirement such as brightness, various light and chemical fastness.
- Compatibility of the colourants with coating slurry
- Ease of handling.

Fluorescent Whitening Agent (FWA) effectivity is adversely affected by TiO2 as it is a strong absorber of UV light. Of the two types available, anatase and rutile, the Anatase is preferred for use with FWA, as rutile absorbs more visible light A more economical approach in place of TiO2 to increase opacity will be used higher percentages of clay and aluminium trihydrate. White clay does absorb some energy but it is lower than TiO2.

## DISPERSANTS

Dispersants are chemicals used in deflocculation process of coating pigments. The dispersants usually are

- The anionic polymer dispersants
- The polyphosphate
- The alkali silicates
- The alkalis
- The non-ionic polymer dispersants

With the increase in dispersant dosage firstly viscosity decreases rapidly at first, then a viscosity minimum occurs at the optimum dosage. The viscosity gradually increases beyond dosage. The viscosity minimum signals the optimum dosage of dispersant for specific system and conditions.

## INSOLUBILIZERS

Paper coating insolubilizers are primarily used to reduce water solubility of pigment binders used in the coating. Water resistance is important for many applications of coated paper or paperboard on which the coated substrate may sometimes be moistened. Wet rub and wet pitch resistance are important for offset printing process.

The insolubilizers used by coaters and their dosages are-

- Formaldehyde (0.5-5.0%)
- Glyoxal (0.25-5.0%)
- Hexamethylene Tetramine(2.0-8.0%)
- Dimethylol Urea (2.0-10.0%)
- Urea Formaldehyde (2.0-5.0%)
- Melamine formaldehyde (1.0-4.0%)

**BIOCIDES**

Deterioration or spoilage of paper coating mixtures and ingredients used show up as loss viscosity, change in pH, odour development or change of colour. Different chemical preservatives used are organosulfur compounds, organohalogens, phenolic compounds, heterocyclic nitrogen compounds etc.

**TYPICAL COATING FORMULATIONS ARE-**

Formula No.1

| Components | Composition |
|---|---|
| China Clay | 750 parts |
| CaCO3 | 150 parts |
| TiO2 | 50 parts |
| Soapstone | 50 parts |
| Polyphosphate | 3 parts |
| Starch | 90 parts |
| Latex (SBR 50% solid) | 30 parts |

The coating mixture will be of about 58% solids.

Formula No.2

| Components | Composition |
|---|---|
| China Clay | 940 parts |
| TiO2 | 60 parts |
| Polyphosphate | 03 parts |
| Latex | 100 parts |
| Starch | 100 parts |
| Casein | 0.5 parts with ammonia |

The coating mixture will be of about 58% solids.

## PRODUCTION OF COATED PAPER AND PAPER BOARD

The production of coated paper board has seen an increase in the last year due to major capacity enhancement of ITC, on of the major players in the field. Other players such as Cheema have also increased capacities. Further, many off line coaters have also come in to the business in the recent past. The table indicating the year wise and variety wise production figures of the players in the coated paper business is appended with this document. Whereas some figures could be obtained in original, the others are close estimates. The salient features are given hereunder

| | |
|---|---|
| Total Estimated installed capacity of the coated segment in India | 1.61 million tons |
| Total Estimated production of the coated segment in India | 0.99 million tons |
| Total estimated production of coated art paper/board | 360 thousand tons |
| Total estimated production of chromo paper/board | 18 thousand tons |
| Total estimated production of other varieties | 621 thousand tons |

**UNIT WISE PRODUCTION OF COATED PAPER FOR THE YEAR 2004-05**

| Sr. No. | Name of the Mill | Total Installed Capacity (TON) | Art Paper /Board | Chromo Paper/ Board | Others | Total |
|---|---|---|---|---|---|---|
| 1 | BILT (SHREEGOPAL UNIT) | 55868 | - | - | 7000 | 7000 |
| 2 | BILT GRAPHIC PAPER LTD. | 115000 | 84341 | 9804 | 20167 | 114312 |
| 3 | ITC Ltd. | 400000 | 190000 | 0 | 210000 | 400000 |
| 4 | JK PAPER LTD. (Rayagada) | 46000 | 3694 | - | - | 3694 |
| 5 | JK PAPER LTD. (CPM UNIT), PRODUCTION BY 2007 | 60000 | - | - | - | - |
| 6 | SESHASAYEE PAPER & BOARDS LTD. | 115000 | 1732 | - | - | 1732 |
| 7 | KHANNA PAPER MILLS LTD | 200000 | - | - | 113000 | 113000 |
| 8 | MULTIWAL PULP & BOARD MILLS LTD | 12000 | - | - | 15000 | 15000 |
| 9 | NR AGRAWAL INDUSTRIES LTD | 60000 | - | - | 30000 | 30000 |
| 10 | NATH PULP AND PAPER MILLS LTD | 38000 | 7500 | - | - | 7500 |
| 11 | PITAMBAR COATED PAPERS LTD. | 9000 | 620 | 60 | - | 680 |
| 12 | SHREE KRISHNA PAPER MILLS & INDUSTRIES LTD. | 15000 | 11600 | - | - | 11600 |
| 13 | VISHAL COATERS LTD | 6600 | 5000 | - | - | 5000 |
| 14 | SOMA PAPERS & INDUSTRIES LTD | 10000 | 9000 | - | - | 9000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | GLOBAL BOARDS LTD | 56000 | - | - | - | - |
| 16 | HANUMAN CHROMOCOATES LTD | 13200 | 4500 | - | - | 4500 |
| 17 | SARDA PAPERS LTD | 9000 | 2775 | - | - | 2775 |
| 18 | SUDHIR PAPERS LTD | 7500 | 7500 | - | - | 7500 |
| 19 | MURLI AGRO PRODUCTS LTD. | 46200 | - | - | 30000 | 30000 |
| 20 | RAINBOW PAPERS LTD. | 36000 | 6000 | 6000 | 22000 | 34000 |
| 21 | BALKRISHNA INDUSTRIES LTD (NOT WORKING) | 54000 | - | - | - | - |
| 22 | GAYATRI SAKETI PAPER & BOARDS LTD | 51150 | - | - | 30000 | 30000 |
| 23 | CHEEMA PAPERS LTD. | 45000 | - | - | 50000 | 50000 |
| 24 | SARADHAMBIKA PAPER AND BOARD MILLS LTD. | 3000 | 5000 | - | - | 5000 |
| 25 | BINDLAS DUPLEX | 30000 | - | - | 30000 | 30000 |
| 26 | SHREE SWAMI HARIGIRI PAPER MILLS LTD. | 14400 | 13000 | - | - | 13000 |
| 27 | GEMCOTE LTD. (COATING DIVISION OF GENERAL METALLISERS) | | | - | 3300 | 3300 |
| 28 | SPECIALITY COATAING & LAMINATIONS LTD. | 20000 | 2000 | 2000 | 3000 | 7000 |
| 29 | SURYA COAT (P) LTD. | 6000 | 6000 | - | - | 6000 |
| 30 | JAMMU PAPER AND BOARD | 10000 | - | - | 8000 | 8000 |
| 31 | DEVPRIYA | 25000 | - | - | 25000 | 25000 |
| 32 | ANAND DUPLEX | 25000 | - | - | 25000 | 25000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 33 | MANSAROVER PAPER AND INDUSTRIES LTD (NOT WORKING) | 18000 | - | - | - | - |
| | Total | 1611918 | 360262 | 17864 | 621467 | 999593 |

**IMPORTS OF COATED PAPER (IN KGS., UNLESS OTHERWISE SPECIFIED)**

| S. NO. | PARTICULARS | YEAR (APRIL TO MARCH FIGURES) | | | | |
|---|---|---|---|---|---|---|
| | | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 |
| 2 | COATED ART PAPER/PAPER BOARD, CHROME (ONE SIDE COATED) | 128245 | 4036 | 48140 | 674665 | 217319 |
| 4 | LIGHT WEIGHT COATED PAPER | 23213985 | 26880887 | 28225837 | 55844814 | 46684204 |
| | SUB TOTAL - KGS | 38971223 | 42757964 | 55117810 | 93641758 | 97779709 |
| 6 | INSULATING COATED PAPER | 935318 | 1904059 | 1988986 | 2660809 | 2656120 |
| 8 | PLASTIC COVERED COATED PAPER | 4849953 | 4437677 | 2290728 | 1496191 | 3871317 |
| 10 | THERMAL PAPER | 0 | 0 | 0 | 268213 | 274552 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | [illegible] | | | | | |
| | | | | | | |
| | [illegible] | | | | | |
| | | | | | | |
| | [illegible] | | | | | |
| | | | | | | |

For the purpose of calculating the demand supply scenario only those varieties (S.No. 1-5) have been considered, that are being produced in the country is a significant amount. The largest contributor to imports is the Light Weight Coated Variety.

**EXPORT OF COATED PAPER**

| | *PARTICUALRS* | *YEARS* | | | | |
|---|---|---|---|---|---|---|
| | | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 |
| | | | | | | |
| 1 | COATED ART PAPER (HAVING NO MORE THAN 10% MECHANICAL FIBERS) | 30028764 | 18327314 | 22809170 | 20500176 | 19842454 |
| 2 | [illegible] | | | | | |
| 3 | COATED ART PAPER/PAPERBOARD HAVING MORE THAN 10% MECHANICAL FIBER | 303980 | 333007 | 668848 | 3752999 | 6980117 |
| | | | | | | |
| 5 | PAPER/PAPER BOARD NOT USED FOR WRITING AND PRINTING | 3430738 | 3686214 | 4829734 | 859479 | 1636573 |
| | [illegible] | | | | | |
| | SUB TOTAL, 100 TONS | 34.74587 | 25.083229 | 34.479428 | 29.846133 | 30.385679 |
| | | | | | | |
| 7 | SELF ADHESIVE, GUMMED | 1107065 | 458611 | 787187 | 3366308 | 2474294 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | WAX COATED PAPER | 214031 | 510417 | 1179626 | 503897 | 731699 |
| 11 | MIXED VARIETIES OF COATED PAPER (HAND MADE, IMITATION LEATHER, BASE PAPER, PESTICIDE IMPREGNATED ETC.) | 24447280 | 39569672 | 44410964 | 37617637 | 48125780 |
| | GRAND TOTAL, 1000 TONS | 76.419794 | 82.405001 | 114.934612 | 77.625332 | 84.84843 |

For the purpose of calculating the demand supply scenario only those varieties (S.No. 1-5) have been considered, that are being produced in the country is a significant amount.

## DEMAND AND SUPPLY CALCULATION

All figures in 1000 tons

| KEY STATISTICS OF COATED PAPER AND PAPER BOARD INCLUDING COATED DUPLEX BOARD, 1000 TONS | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | PRODUCTION | IMPORTS | SUPPLY | EXPORTS | CONSUMPTION |
| 2003-04 | 608 | 94 | 702 | 30 | 672 |
| 2004-05 | 906 | 98 | 1004 | 30 | 973 |

THE COATED PAPER SEGMENT

- The total coated wood free paper and board consumption in India stands at about 300,000 tons, out of which about 38% is consumed in the western part of the country.

TWO SIDE COATED PAPER

- Two side coated paper accounts for about half of the total consumption. The demand of this segment of coated paper is likely to rise most in the times to come. Two side coated paper in India is made in the following broad varieties. The distribution of variety wise consumption is also given

    1. 70-100 GSM 37%
    2. 100-130 GSM 42 %
    3. 130-170 GSM 18 %
    4. >170 GSM 3%

- Most of the two side coated paper(nearly half of the consumption) is being used for making promotional material. The other important end users are books and magazines.

ONE SIDE COATED PAPER

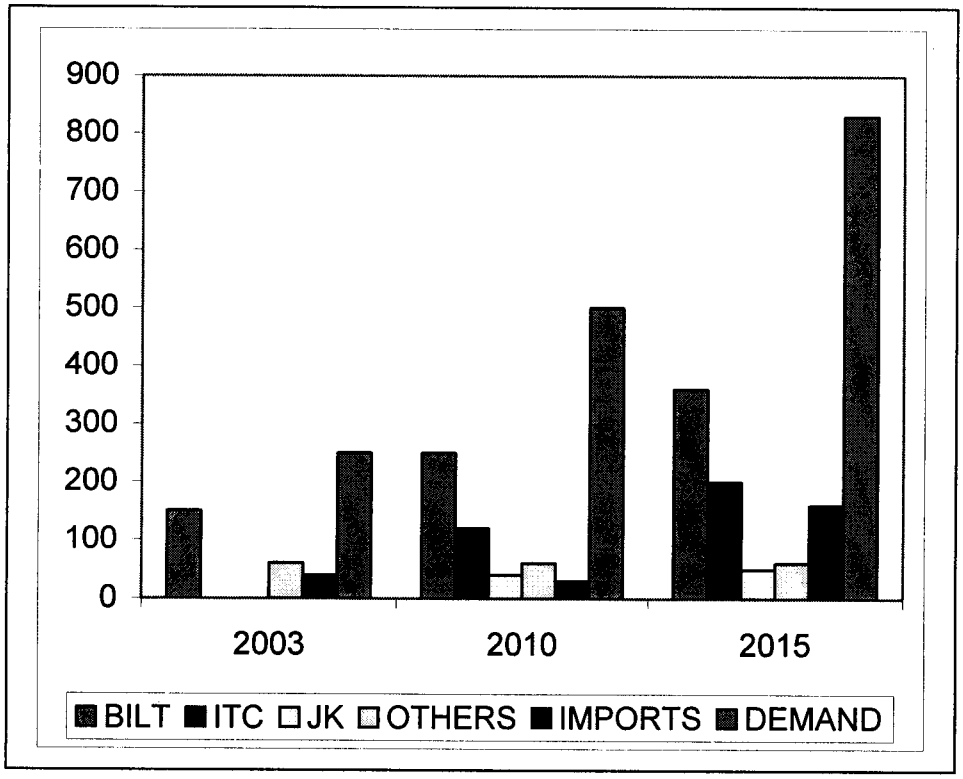
- One side coated wood free paper accounts for about 30% of the total consumption (ca about 73 thousand tons). The variety wise distribution of consumption is as follows

| | DISTRIBUTION, % |
|---|---|
| UP TO 70 GSM | 37 |
| 70-90 GSM | 22 |
| 90-100 GSM | 26 |
| 100-120GSM | 6 |
| MORE THAN 120 GSM | 9 |

- A little more than half of the one side coated paper is consumed in labels while about 20% is consumed in posters and stickers. The rest of the consumption is accounted by packaging, covers, promotional material etc.
- The one side coated paper market has many players who carry out the offline coating as separate unit.
- The coated paper segment is expected to grow at about the rate of nearly 11% over the next few years. Two side coated high basis weight paper however, is likely to grow at a marginally lower rate of about 8%.

**PROJECTIONS FOR COATED WOOD FREE PAPER**

The demand for coated wood free paper is expected to be about 500,000 tons by the year 2010. As per one estimated, this figure is likely to become over 800,000 tons by 2015. The expected demand is depicted hereunder with the approximate contributions from the major players in the field of coated wood free paper.




**MARKET PRICE RANGE (DELHI, 2004-05)**

The market price range of the main varieties of coated paper in India are as follows:

**CHROMO PAPER (PAPER COATED ON ONE SIDE)**

The price range for this type of paper is large, falling between 42-55 Rs. per kg. Thus Master cote is the low priced brand at Rs. 43 per kg whereas the price leader in this category is the product of BILT, (BILT Royal,) priced at Rs. 55 per kg.

**COATED ART PAPER (PAPER COATED ON TWO SIDES).**

The price band for this type of paper is slightly narrow, falling between Rs. 44-50 per kg., the price leader being BILT, whose product is priced at Rs. 51 per kg.

**COATED ART BOARD (HEAVIER PAPER, COATED ON BOTH SIDES). This is the costliest** type of coated paper in the market, with many international products available in a price range of Rs. 53-60 Rs per kg.

## MAJOR FUTURE EXPANSIONS IN THE FIELD OF COATED PAPER

### BALLARPUR INDUSTRIES LTD.

BILT was one of the major players in the coated paper segment till 2004, producing 125 thousand tons of coated paper. BILT plans to increase its capacity to nearly double by 2010.

### ITC

ITC, which had its major presence in the coated paper board business, is likely to come in to the coated paper segment, producing about 140 thousand tons of the said variety. In the last year ITC produced a simlar amount of coated paper board and chromo paper.

### JK PAPER

The installed capacity of JK with respect to the coated paper is 46,000 tons per annum. This plant was commissioned in 2004-05 at its Rayagada (Orissa) unit. The production started in later part of the year 2004-05, which was 3694 tons. An expansion of 60,000 tons in coated duplex is proposed in the JK CMP Unit (Sonegarh, Gujarat). This capacity is likely to be commissioned in early 2007.

### ANDHRA PRADESH PAPER MILLS

APPM, which till now was concentrating on the writing and printing segment is planning to come in to the coated segment with a production of around 45,000 tons in the next 4-6 years.

## CHEMICALS USED IN THE PAPER INDUSTRY

The pigments used in the paper industry in the world are dominated by the leading multinational chemical companies.

| *CHEMICAL* | *COMPANIES* |
|---|---|
| *SB LATEX* | DOW |
| | CIBA |
| | BASF |
| | OMNOVA |
| | APCOTEX |
| | EKZO NOBEL |
| | L.G. CHEMICALS |
| *OTHER LATEXES* | BASF |
| | CIBA |
| | OMNOVA |
| *POLY VINYL ALCOHOL* | CIBA |
| | KEMIRA |
| *STARCH* | CIBA |
| | PENNFORD |
| | ANIL STARCH |
| *DISPERSANTS* | BASF |
| | EKA |
| | KEMIRA |

Mainly, the same companies command appreciable market share in India for the specialty chemicals.

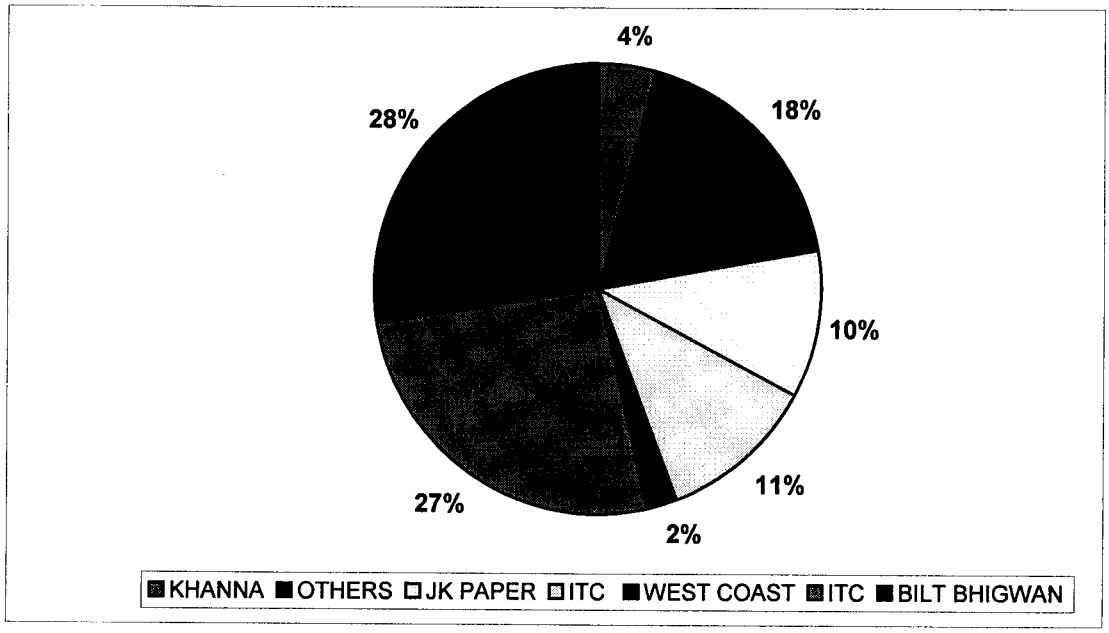
### STYRENE BUTADIENE LATEX

The Indian paper industry manly uses mainly SBR binders are used in Indian paper industry. The major suppliers for the SBR binders are Dow Chemicals, CIBA, Pidilite , LG Chemicals, Apcotex, BASF and Akzo Nobe (Eka Chemicals). The table gives the estimated amount of SB marketed by these companies

| COMPANY | AMOUNT OF SBR (TONS/LAST YEAR) |
|---|---|
| CIBA | 4000 |
| LG CHEMICALS | 5000 |
| APCOTEX | 5000 |
| BASF | 8000 |
| EKZO NOBEL (EKA CHEMICALS) | 3000 |
| DOW | 4000 |
| OTHERS | 2000 |
| TOTAL | 31000 |

## ESTIMATED CONSUMPTION DISTRIBUTION OF SBR

The approximate usage distribution for SBR in the Indian paper Industry is as follows.




## MARKET PRICE

The prevalent market rate for the imported SBR binder ranges between 55-60 Rs/kg excluding excise and sale tax ( which is 16% and 4% respectively) whereas the price of the local products varies from Rs. 50-55 per kg.

## STYRENE ACRYLIC LATEX

This product is used in very small quantity in the Indian paper industry and as per estimate only about 1500 tons of the product is being used in the Indian industry mostly in the off line coating operations.

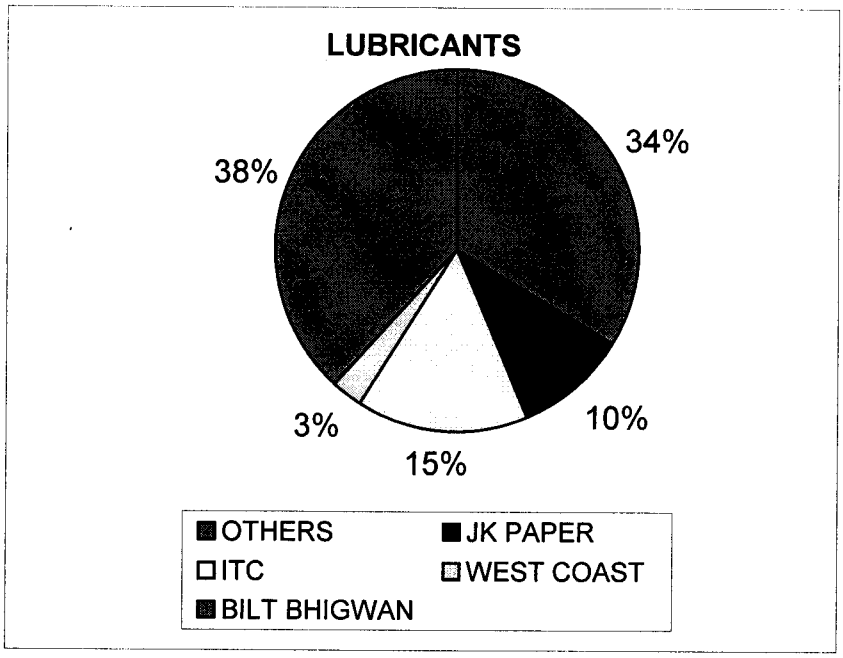
## LUBRICANTS

Lubricants are used to impart lubricity and plasticity to wet pigment coatings and to cerate smoothness and gloss development during calendaring. Most coating lubricants belong to one of the following groups:

- water solunble sops
- Sulfated and or sulfonated opitsl,
- Esters
- Waxes,
- Insoluble soaps etc.

The Indian paper industry uses calcium stearate of M/S Auchtl ( an Italian Company) as lubricant for paper coating, which is sold as emulsion or in powder form. The estimated consumption of the lubricants is nearly 1000 tons

## ESTIMATED CONSUMPTION DISTRIBUTION - LUBRICANTS




BILT and ITC are the major user of the lubricants along with all the offline coaters put together.

## CROSS LINKERS

Water resistant paper coatings are important for many commercial applications. Coated paper for multi color off set printing require a moderate degree of wet rub resistance. Container board often require a high degree of water resistance to withstand wet handling and exposure to outdoor conditions. This water resistance can be achieved by stabilizing the coating binder using certain insolubelisers acting as cross linkers. The ease, degree and method of insolubelization vary with different types of binders.

The amount of cross linkers used in the Indian pulp and paper industry is very low. The main chemical used as a cross linker is Melamine Formaldehyde. However, very few players use MF in the Indian paper industry. A solution of about 70% solids costs around Rs. 70 per kg in the market. The main suppliers of MF in the Indian paper market are Saharanpur Polymers Ltd., Saharanpur/New Delhi, Vipul Chemicals (Ahemdabad, Gujarat) ( dealers for Nippon Chemicals, Japan)

## DISPERSANTS

The dispersants serves to aid in the wetting of the pigment particles, adjust the surface charge of the pigment particles to present flocculation and reduce the viscosity. The dispersents usually are anionic polymer, the polyphosphates, the alkali silicates, alkali or non ionic polymer dispersants. The Polyphosphates are mainly used in Indian paper industry. CIBA, Pidilite , BASF, Indofill are the manor players supplying dispersants to the Indian paper industry . Nearly 400 tons of the same was consumed last year.

## RHEOLOGY MODIFIER

Rheology modifier are probably the most important coating additives which are used to control and stabilize the viscosity of the binder and in turn, the flow characteristics of the cating mixture. As per estimates, the consumption of the rheology modifier was nearly 400 tons and the major supplier is Ivax Chemicals, Hydreabad.

## POLYVINYL ALCOHOL

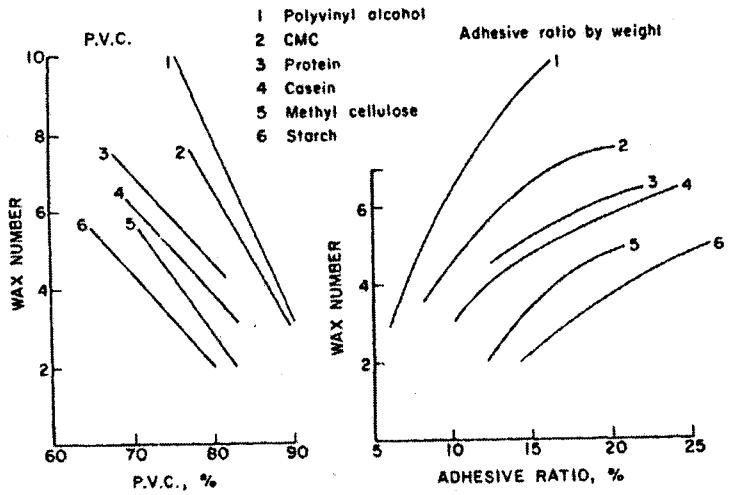
A few mills also use polyvinyl alcohol. Where ever used, an amount is very low. The usage of this is to the tune of 2 kg per 8 tons of paper. The estimated consumption of PVA is about 250 tons per annum. The price of PVA is about Rs. 130 per kg.

## CHINA CLAY

As per estimated 22500 thousand tons of china clay is used by the industry in India. The cost of the china clay (high brightness) varies from Rs. 6000-7000 per ton and the major suppliers are English India Clay Company, Golcha Group of Companies, Jaipur besides may other small players based in Udaipur and Haldwani.

## Binder Demand of Coating Clay

The binder demand is the amount of adhesive required to adequately bind the pigment particles together and to the base sheet. Compared to most other coating pigments, clays have a low binder demand. There are so many factors that dictate the amount of binder required.




*Strength of clay coatings shown as Dennison wax number plotted against weight of binder used and against pigment volume concentration that a set figure does not apply. A general relationship prepared by Hunger using data from Casey is presented in Figure.*

## Coated Paper Properties Affected by Clay

The properties of the coated paper that are most affected by the coating clay are brightness, opacity, gloss, smoothness, and ink receptivity. Clay brightness has only a minor effect on the brightness of the coated paper. Clay brightness differences of one point may result in only 0.2 percent or less in coated paper brightness. Coating structure has a more significant influence on the brightness. Since light scattering is dependent upon the difference in refractive index between the various coating components, it is important to have adequate spacing between clay particles in the coating. An excessive amount of binder will reduce brightness.

Opacity of the coating, like brightness, is strongly influenced by clay particle packing and void volume. Particle size, particle size distribution, and aspect ratio are the major clay properties that control opacity. Increased pore volume is beneficial to opacity. Particle orientation and increased packing, while desirable for some other properties, have an adverse effect on opacity. To the extent that the binder fills in and reduces void area, it tends to lower opacity. Calendering reduces opacity and overcalendering can produce a blackening effect as the result of transparentizing.

Gloss of coated paper has been generally accepted to be directly related to the particle size of the clay, the finer the particle size the higher the gloss. Some hold a somewhat different view and consider gloss to be dependent upon minimizing or completely eliminating the presence of coarse particles. In their opinion, the coarse fraction in clay has more of an effect on lowering gloss than the fine fraction has on raising the gloss. It so happens that the increase in clay particle fineness almost invariably is accompanied by the decrease in the coarse particle content so in most cases the question is academic. However, the fact that undispersed particle clusters that result from poor dispersion tend to lower gloss seems to support the minority view. In any event, the fine particle size clays, properly dispersed, provide the highest gloss. Gloss is partially dependent upon high pore volume; for this reason, raising the binder level lowers gloss.

Smoothness can correlate with gloss, but there are many exceptions. Smoothness is not dependent upon optical phenomena. The delaminated clays, which provide greater coverage of the base stock than do regular clays, normally produce higher smoothness. This is especially true for lightweight coatings or when coarse fibers are present in the base stock. Normally smoothness and uniformity of coverage are directly related. Low gloss and matte finish coatings can be very smooth.

Ink receptivity can differ greatly between coatings made from different grades of clay. This is related to film permeability as influenced by pore volume. Small-diameter clay particles, randomly oriented, give good ink receptivity. The ink receptivity of a clay coating is more strongly influenced by the binder level. As a general rule, as clay particle size decreases ink holdout increases. Bundy points out that the properties of clay that give good optical characteristics, gloss, and ink holdout generally are diametrically opposed to the properties that promote good rheology, film strength, and ink penetration. The choice of coating clay must, therefore, involve some compromise; it is dictated by the properties that are most desired in the finished coating.

**STARCH**

Mainly the modified (oxydixed/esterfied ) starches are being used in the Industry for most coated operations. Modified starches with little low viscosity are utilized in Indian paper industry

which are mainly produced from potato and tapioca . The estimated consumption of starch is about 20,000 ton.

The price of the starch in the market ranges from 15 –16,000 per ton of product. The main suppliers of starch include Anil Starch, Bharat Starch, Saurastra Chemicals, Hindustan Lever Ltd etc. Pidilite was also selling the modified starch, a product of M/S National Starch, USA.

## TECHNOLOGICAL STATUS

| *Sr. No.* | *Name of the Mill* | Technology |
|---|---|---|
| 1 | BILT (SHREEGOPAL UNIT) | Knife coater |
| 3 | ITC Ltd. | On line/blade coater |
| 5 | SESHASAYEE PAPER & BOARDS LTD. | Air Knife |
| 7 | MULTIWAL PULP & BOARD MILLS LTD | Knife coater |
| 9 | NATH PULP AND PAPER MILLS LTD | Air Knife |
| 11 | SHREE KRISHNA PAPER MILLS & INDUSTRIES LTD. | Air Knife |
| 13 | SOMA PAPERS & INDUSTRIES LTD | Air Knife |
| 15 | HANUMAN CHROMOCOATES LTD | Air Knife |
| 17 | SUDHIR PAPERS LTD | Air Knife |
| 19 | RAINBOW PAPERS LTD. | Cast Coating |
| 21 | GAYATRI SAKETI PAPER & BOARDS LTD | - |
| 23 | SARADHAMBIKA PAPER AND BOARD MILLS LTD. | Knife coater |
| 25 | SHREE SWAMI HARIGIRI PAPER MILLS LTD. | Knife coater |
| 28 | SURYA COAT (P) LTD. | - |

The data goes to indicate that most of the mills use the classical air knife coater for producing the product with three exceptions, where ITC, BGPL and JK used a blade coater.