

Education, challenges and future technical needs of Indian paper industry

UPADHYAYA J.S.*, DUTT DHARM* and GUPTA GEETA*

ABSTRACT

Many of the forces that will be shaping Indian paper industry in the future will also directly or indirectly affect our academic institutions as well as the quality and quantity of their student bodies. Of basic importance is population growth and its changes in patterns. Of far deeper and greater significance are technological growth, social, economic, political changes and changes in attitudes towards society and its institutions. The educational implications related to the future needs of paper industry will be determined by the nature of the industry in future, the form and character of academic programmes and,—the interaction between these two groups of organisation. Cooperation among educational institutions, research institutions and industry should grow continuously and industry should be a partner with educational and research institutions in planning ways to intersperse formal and informal studies throughout the entire programmes. A strong team work will be essential involving specialist in different discipline, learning to work with each other, in order to solve broad problems, which are so vital for the survival of Indian paper industry.

INTRODUCTION

The education plays a vital role for the overall development of a nation. The importance of education in the progress of a country is clear from the following Chinese proverb, which says :

If you are thinking one year ahead, plant rice,
If you are thinking 10 years ahead, plant trees, and
If you are thinking 100 years ahead, educate the people.

Let us follow this in whatever way we can, as it will solve many problems in every sphere of life, which are essential in making a nation more and more stronger. The education implications related to the future technical needs of the Indian Pulp and Paper Industry will be determined by :

1. The form and character of future educational programmes of our academic institutions/universities.
2. The nature of the industry in future, and

3. The interaction between these two groups of organisations.

In turn, these two groups, the industry and the higher educational institutions, will be molded by many factors that shape the society as a whole. Before a picture of educational implications related to Indian Pulp and Paper Industry can be ascertained, it is necessary to consider and attempt to evaluate the major factors that will impinge upon both the industry and the academic institutions.

Paper plays a vital role in the cultural development of human being. The per capita consumption of paper and board is one of the yardstick of overall development of a country. With the increase in population and literacy, the planning commission has indicated that the capacity creation of paper and board will need to be increased to 42.5 lakh tonnes by 2000

*University of Roorkee
Institute of Paper Technology
Saharanpur - 247001

A.D. The biggest bottleneck in meeting the targetted amount of paper and board requirement by the year 2000 A.D., will be the availability of cellulosic raw material from forest which are already in short supply and are barely able to sustain the present level of production.

To meet the increasing demand of paper and board the requirement of fibrous raw material is increasing day by day, which is affecting the environment and natural eco-system to conserve forest which is essential for a stable eco-balance, it is very much essential that the main emphasis should be given on agricultural residues, waste paper recycling alongwith the concept of whole tree utilization for the production of ultra-high yield pulps which will also help in reducing the environmental pollution load in the biosphere.

The land resources, finance and technology will have to be geared up to meet this challenge through rising of fast growing pulpwood species, otherwise the over exploitation of fibrous raw material will continuously cause a serious threat to the natural eco-system. More than the commercial benefits, the rising of the forest serves the human being by climatic amelioration, checking of soil erosion and desertification, meeting aesthetic and recreational need, checking of flood and siltation of reservoirs.

The user industries should be encouraged to grow their pulp wood requirements by providing land on long term lease. The industry can organise a plantation wing within the same company or can form a separate industrial plantation company as a joint sector venture to undertake plantation of fast growing pulp wood species to the extent of its annual requirements.

PROBLEMS AFFECTING INDIAN PAPER INDUSTRY

Indian pulp and paper industries are facing various problems of different natures, which are affecting the overall growth of the industry. Some of these includes:

- Lack of sustained supply of fibrous raw materials.
- Failure of essential infrastructure (supply of power, coal, water and rising cost of transportations etc.).
- Higher rate of inflation.
- Highly capital intensive nature of industry-leading to low profitability and longer pay back period.

- Environmental problems leading to unproductive idle investment in pollution abatement practices.
- Sub optimal sizes.
- Rising cost of production due to higher cost of various inputs including raw material chemicals and energy etc.
- Poor manpower planning.
- Labour Management problems.
- Financial management problems including unfavourable investment environments, resulting in poor response from public and other financial institutions.
- Very poor growth in overall economy.
- Governmental policies and controls including heavy taxations such as excise duty, high royalty rates of forest products, price control on finished products etc.
- Technological obsolescence.
- Excessive competitions from the unorganised sector.

A. EDUCATION AND TRAINING IN PULP AND PAPER

The education and training programmes in any discipline are meant to create a cadre of personnels to meet the various tasks requirements in different spheres of activity. Pulp and Paper industry is a very specialised sector of activity demanding persons with many skills and talents. Pulp & Paper technology is a highly specialised professional area, inter-disciplinary in nature. As the processes are very complex in nature, it would not be possible to make any development or progress without having a deep insight knowledge into the mechanism of the same.

NEED FOR EXTENSIVE CONTINUING EDUCATION PROGRAMMES

In this advanced technological age, knowledge is ever expanding and people will find it difficult to keep pace with the progress. Due to great proliferation of knowledge, it is neither possible nor desirable to cover all the areas in formal college education. The continuing educational programme for practicing professional and technical personnel in industry, who need to acquire

knowledge in specific area, is an important step in maintaining competence at the highest levels. The accelerating growth of knowledge will require greater emphasis on continuing educational programmes, since the education beyond the school has major place in the knowledge arena today.

Continuing education is one of the most important aspect of learning the latest developments to get up-to-date and to know what is going on, and to find out what is new in the scientific world.

There is great need for continuing educational programmes in the future, because of the increasing tempo of change which can bring whole lines of endeavour into obsolescence. There will be a continual need for updating and retraining technical personnels including latest knowledge on recording retrieval and storage of information. Also frequent opportunity should be given to personnel to acquire expertise in a particular field. These programmes should be available to all technical persons during their active working years with all avenues open to the ambitious man. Continuing programmes can either be in-house or extra mural and these programmes should be planned with mutual co-operation among academic institution, research organisations, professional bodies and paper industries. This should be done either at academic institutions or delivering guest lecture at the plant site. These programmes will provide in depth knowledge in specific areas and greater advantage of these programmes should be taken by industries in the future.

B. TECHNOLOGICAL DEVELOPMENTS TO FACE CHALLENGES IN FUTURE.

The progress of an industry rests in the hand and minds of young. Now-a-days, the advancement in the field of technology is so rapid that the things which were seem to impossible yesterday are quite possible today and the things which seem to be impossible today will not be impossible tomorrow or one can say that nothing will be impossible tomorrow. To cope up with the latest development in Science, Engineering and Technology which are occuring so rapidly that only the young graduates can consistently have an up-to-date working knowledge applicable in the technical function of the paper industry must spread into the production, technical sales services and market development areas.

TECHNICAL RESEARCH NEED FOR THE FUTURE

It is evident that the Indian pulp and paper industry is becoming technologically more advanced and sophisticated day by day. This is an evolutionary trend that will bring the industry to a highly automated mechanised and computerised state. The pressures of accelerating changes throughout the world will demand greater efficiency in the industry's operations. Increased pressure for fibre, resulting in changes in fibrous raw material and their sources as well as in improved forest management and harvesting practices will require continued research programmes throughout all operations from forest to finished product. Changes in consumer demands, competition from other materials legal and social requirements with respect to the control and elimination of emissions will also demand intensive research and development programmes for improved and new processes in pulping, bleaching, paper making operations and products developments.

In the present day context, it is very important to look into the various aspects of the industry with a view to cut down the cost of production, to increase the pulp yield, to reduce the cost of various inputs, without disturbing the natural environment. Following aspects should be taken into consideration to face the various challenges, which are affecting the overall growth of Indian Paper Industry.

1. Adoption of high and ultra high yield pulping processes.
2. Extended waste paper recycling.
3. Measure to improve energy saving devices.
4. Improvement in productivity or capacity utilisation.
5. Implementation of various pollution abatement devices.
6. Increased utilization of additives, fillers and other loading materials.
7. Decrease in basis weight and increase in wet strength.

The above aspects have been dealt in little details as given below :

1. PROCESS CHANGES

During the present day context, the emphasis on environmental protection which generate much research on modified and new pulping and bleaching processes. This may result in modification of the existing soda and kraft pulping process in combination with delignification by oxygen. Improvements in the quality of ultra high yield pulps will permit their wide usage. The evolutionary changes in the paper making process, both at the wet and dry ends of the machines for more uniform fibre deposition, speedier water drainage and less two sidedness should also be adopted wherever possible. At the same time the four drinier section should also be improved because of its existing large capital investment. New techniques for the drying of papers more uniformly and faster should also be adopted.

2. AUTOMATION AND PROCESS CONTROL

The Indian paper industry should be highly mechanized and automated from wood harvesting to storage and shipment of the final product. Where-ever possible processes should be continuous and fully computerised. Emphasis should be given on closing the loop on all operations to reduce raw demands by reuse wherever possible. The better quality control and greater efficiency can be achieved with the adoption of available computer equipments. The key to computer process control is suitable instrumentation to measure the process variables accurately. Improvements in measuring and sensing technology should be adopted.

3. PRODUCT DEVELOPMENT

The Indian paper industry should give a stress on product development. The paper coating and laminations are becoming more sophisticated and complicated to meet specific functional requirements. Continual improvement in these products can be expected including surface treatments, improved printing and reproduction processes. Major opportunities lie ahead for development of polymers and chemicals for paper treatment as well as synthetic-natural fibre blends to control and improve sheet property. Increased manufacturing costs and postal rates will result in demands for lighter weight papers with retention of good printing appearance and handling properties. The clay coatings may also increase in use, since it often improve

quality and reduce costs. The newer coating techniques make possible use of lighter weights paper without loss of printability and opacity etc. Improvements should also be made in the quality of high yield lignin containing fibre permitting their wider use especially in coated papers and paper laminates. The use of paper and paper board in laminates and composites with other materials to be used in building construction, cabinets, furniture and coffins etc. may also increase.

4. POLLUTION CONTROL

The Indian paper industry has the unfortunate image in many circles of being an irresponsible polluter. Pollution Control requirements have created a drive to investigate and develop new pulping and bleaching processes that have lower or no emission. In near future, the pollution control requirement will undoubtedly increase costs of production. There will be increasing social or legal requirements for higher standard of pollution control of the atmosphere, water and land. This also requires correction by adequate publicity, emphasising the positive aspects of what industry is doing, and good public relations of the right type alongwith putting certain essential equipments for reducing the environmental pollution load in bio-sphere; some of the well established methods of reducing effluent stream for the industry are listed below :

1. Resorting to high and ultra high yield pulping processes.
2. Recycling of various effluent streams within the plant.

Some of the common methods are given below :

- Paper machine white water for reuse in dilution of pulp at broke chest, or at shower water on machine.
- Back water for screening/cleaning plant for pulp washing and for dilution of stock in chest/bleach washers.
- Evaporator condensate for chip washing and make-up for cooking liquor.
- Counter current washing of pulp in multistage bleach plant e.g. the effluent from second hypo stage can be used of first hypo stage etc.

- Cooling water for bearings and glands (in power house and chemical recovery) could be reused by sending the same to a mill water supply storage tank through a water saving pit.
- The lime kiln bearing cooling water could be used as a source of warm wash water in recausticizing plant.

In addition to above substantial savings in water usage can be made with the adoption of following treatment methods :

- a) Separation of fibres and other suspended solids in bar screens and primary classifier.
- b) The make up river water and overflow from primary classifier can be blended and treated further in a reactor classifier for colour and BOD reduction with the treatment of lime. Lime will react with the highly coloured bodies of the effluent consisting mainly of enolic and phenolic hydroxyl compounds and will finally settle as sludge.
- c) The overflow from the reactor classifier will have to be allowed to pass through a flocculation mixer where alum will be added as flocculation aid.
- d) The treated effluent will be sent to secondary reactor classifier. The dissolved calcium in the treated effluent will be removed by CO_2 treatment. The dissolved organics will be absorbed by CaCO_3 sludge and consequently colour, BOD and COD load etc. can be reduced.
- e) The overflow from the secondary reactor/classifier will be filtered through granular media gravity filters with alternate layers of carbon and sand.
- f) The filtered water could be finally decolourised by passing the treated water through activated carbon columns.

Thus it is possible to obtain sufficient pure water for reuse in the plant. It may however be noted that the cost of putting up such a plant would be substantially high. The necessity of reuse of water would ultimately decide whether such a plant is required or not.

5. MATERIAL AND ENERGY CONSERVATION.

The conservation of materials and energy is one of

the most important aspect to meet the various challenges. The maximum and the quality production with a minimum of materials and energy inputs is essential to improve the economic condition of an industry. Paper production is a highly energy intensive process. The scope of energy conservation in Indian paper industry is quite good since :

- The degree of obsolescence in technology in our industry is likely to be higher than that of industrial advanced country.
- There lies scope for improvement in our capacity utilization from the existing level of 60% upwards to 90%.
- Possibilities of increased use of low energy consuming materials such as agricultural residue and waste paper.
- Possibilities of increased co-generation in large mills as well as in small mills from the existing level.
- Possibilities of water conservation potential.
- Possibilities of improving in plant chemical production.
- Possibilities of viable recovery unit for small mills.

Some of the suggestions for receiving better heat/energy economy are given below :

- a) As low a cooking temperature in digester, as possible.
- b) Low liquor to wood ratio.
- c) Presteamng of chips by flash steam from blow tank etc.
- d) Suitable lagging/insulation of digester and associated equipment.
- e) Use of steam accumulator for steam supply to digester to eliminate fluctuations in steam drawn from boiler.
- f) Development of continuous digester which require a steady flow of steam and help in elimination fluctuations in the steam consumption rates.

- g) Excessive steam consumption in evaporators and heat exchangers can be reduced by using chemicals such as octa decylamine to increase heat transfer coefficients, eliminate fluctuations in steam drawn from boiler.
- h) Indirect steaming should be done in digesters to obtain clean condensate. This would also result in strong spent liquor.
- i) Improving the efficiency of pulp washers and press section.
- j) Installing closed and well insulated dryer hoods with heat recovery.
- k) Closed loop water system.
- l) Installation of improved/high pressure boiler with more efficiency.

6. ECONOMICS, EFFICIENCY AND CHANGES IN STRUCTURE OF THE INDUSTRY

Rising costs of input materials and energy affect the economics of the pulp and paper industry, particularly the low margin of profit. Prices instability and low profit have made difficult to finance capital improvements and new construction. This position can be improved upto somewhat extent by improving internal operating efficiency as well as material and energy conservation devices. Economic problems will have a strong influence on the adoption of new technology leading to high priority efforts to develop maximum efficiency and productivity in order to lower manufacturing costs. The economics and efficiency of the Indian Paper industry can be improved with the adoption of following devices :

- (i) Increasing production with the adoption of latest technologies.
- (ii) Greater mechanisation in wood harvesting, chipping and transportation.
- (iii) More efficient and complete utilization of forest resources including residual wastes and agricultural residues.
- (iv) By setting an integrated complex of sugar and paper industry so that the surplus bagasse can be used for pulp and paper making.

- (v) By attaining maximum possible yields of pulps.
- (vi) By improving the quality of high lignin content pulps.
- (vii) By improving the brightness of the unbleached pulp to avoid or minimised subsequent bleaching cost.
- (viii) By improving the quality of paper with adoption of chemical additives and treatments to control retention, formation, drainage rate and realize closed paper machine systems.
- (ix) By recycling more and more waste paper and maintaining closed loop systems.
- (x) By adopting continuous improvements in paper machine that operates at high speed, smoothly without breaks and with near perfect formation.
- (xi) By conglomeration of all small units situated in a particular zone. to form a large unit for :
 - (a) reducing over head expenditure.
 - (b) better control and to improve economics with elimination of duplication of experts.
 - (c) more efficient use of production facilities.
 - (d) central purchasing.
 - (e) Centralisation of research and development activity.
 - (f) Efficient single sales force.
 - (g) Better use of forest resources.
 - (h) Access to larger markets and exchange of technical information.

7. SOCIAL CHANGES AND HUMAN FACTOR

The fast changes are taking place in social attitudes towards the concept of ownership, ethics, morality, motivation, initiative and responsibility. These will affect worker attitudes and productivity, bargaining, rights of control and the general psychological behaviour in personnel relationship. These changes in social attitudes will need careful and continuous scrutiny and increased skill insolving human problems on the part of managements.

8. ROLE OF MAN POWER PLANNING.

Effective development policies and methods are needed to encourage professional personnel to acquire a better and more up-to-date knowledge of scientific and technical know-how. By cataloging and categorizing individual capabilities, specific skill may be subsequently assembled on a crash basis to solve a specific problem or on a longer range basis to approach more formidable problems. Periodic updating of information with respect to the interests and knowledge of scientists and engineers provide management with an excellent opportunity to check on the current progress of each individual. This interest in turn usually motivates the professional employee to improve himself.

Following are the some important points which plays an pivotal role in planning for future use of technical man power :

- The kind and nature of future projects and work programmes planning and control of work assignments, placement and utilization.
- The disciplines and levels of education needed and how additions will integrate with present staff composition and qualification of the work force.
- Time schedules and size of technical force assigned to projects with attendant problems of turnover selection and training.
- Organisation and policies for most effective output.
- Environmental factors for optimum stimulation of creative production and research morale-motivational planning and
- Budgets and costs control etc.

C. CO-OPERATION BETWEEN INDUSTRY AND EDUCATIONAL INSTITUTIONS

It is clear that the Indian paper industry is moving towards greater production more automation and computer control away from the art of the process and towards greater technical refinement and efficiency towards empathy with social environmental needs. These factors all emphasize the necessity for intensive research and development within the industries and co-operation with other pulp and paper industries for joint efforts with chemical, instrument and machinery manufacturer and with universities and research institutions Team work will be essential, involving specialist in different disciplines, learning to work with each other to solve broad problems which are so vital for the survival of Indian paper industry.

Co operation between educational institutions and industry should grow continuously and industry should be a partner with educational institutions in planning ways to intersperse formal and informal studies throughout the entire courses.

CONCLUSIONS :

The role of education and especially the technical education in particular is to provide the highest level of technically skilled manpower and other professionals of technical excellence for managing the challenging needs of the country. There is no end of education. Knowledge has no boundary and no man is ever perfect but his hard work is immortal. Pandit Jawahar Lal Nehru had rightly said that "No man ever died of hard work".

A true educationist has a learning tendency throughout his life as quoted in Rig Veda which says :

AA NO BHADRA KRATAVO YANTU
VISHVATAH

Meaning "let noble thoughts and wisdom comes to us from all the sides".

Excellence in the scientific disciplines and technical subjects must remain a major objective of the future pattern of education in our technological society. The technocrats must understand and appreciate the latest concepts and methods of conservation of materials and energy, biological base of renewable forest resources, environment and eco-systems along with economic, social and mutual relationships between workers and management. The Indian paper industry is passing through a period of crisis and facing various problems beyond its control and in present circumstances its future has become blurred. A very challenging tasks lies in front of young scientist, engineers and technocrats associated with Indian paper industry, to improve the present situation, which is so vital for its survival.

The future state of the industry will depend upon the health of our forest crops and how well we manage them, the industry will also depend upon the suitability of its conversion systems in terms of economics, energy supplies and the environment. Its success will also depend upon how well it adapts to social and technological change and development of human relationship. The future training of our man power will need to be directed with these considerations in mind. The good inter-relationship among the academic institutions, research institutions and industry is essential to becoming a good team worker and ultimately task force leader.