Research and Development for the Indian Pulp and Paper Industry

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For any industry, economics, energy, and the environments are the important parameters, to gauge its development. There is a growing awareness in the industrial world today, that these parameters can be controlled through suitable Research & Development effort. For a developing country like India, R & D is a must for the healthy growth of our pulp and paper industry. This paper deals with some of the problems and difficulties of our pulp and paper mills and the challenges to the existing R & D units. It is felt that for small and medium pulp and paper mills efforts may be made to start R & D units common to groups of certain mills. to work on important projects like, pollution abatement, search of new raw materials, efficiency of process and equipments, economics etc. This paper briefiy discusses some aspects of the modern R & D management. The part played by the Research Centre of the West Coast Paper Mills, has been described. It has been suggested in this paper to establish close coordination between the R & D unit, the operation personnel, the economists, and the marketing personnel, so that their concentrated efforts could be available for the management, for higher productivity, profitability, improved quality and diversified products etc.

It is said that, for any industry, economics, energy and the environments are the important parameters, to gauge its development. There is a growing awareness in the industrial world today, that these parameters can be controlled through suitable Research and Development efforts. For a developing country like India, it is needless to stress the importance of R & D activities, for the healthy and speedy growth of our pulp and paper industry. India produces varieties of papers like, kraft, white and coloured printing, azurelaid, creamlaid, creamwove, pulp board, maplitho, bond, ledger, security and currency paper, duplicating, tissue, ciggrette paper, varieties of coated papers etc. Apart from these, India also produces newsprint and various kinds of boards. The target for paper production for the year 1976 was 8.75 lakh tonnes. As per the estimate, the demand for paper and boards should amount to 12 lakh tonnes during 1978-79. There is a shortage of bamboo, the major raw material of the Indian pulp and paper industry. Local hardwoods are being increasingly used. However, some species of hardwoods are highly, lignified dense and very difficult to pulp. This is the field where R&D can play its part, and devise suitable methods for pulping and bleaching, to get acceptable pulps from such raw materials. The technology of using hardwoods which exist in large varieties is to be developed in India. Because the hardwoods are short fibred, the runnability on paper machine and strength properties of the papers are to be improved by refining to a higher degree, by the use of suitable chemicals etc. For refining, changes in the design of refiners may be done, suitable to hardwoods. In Japan, it has been possible to use 100% hardwoods for making good writing and printing papers. Some modifications in paper machines, were also made suitable to the use of hardwoods. The necessity of such measures in India, has been already recommended and discussed[1]. Black liquors of these hardwoods also pose problems like pumping, granulation and plugging of the evaporator tubes. These should be tackled through R & D efforts. Non-conventional method,

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NSSC, chemi-mechanical, thermo-mechanical pulping etc. are to be developed, for higher pulp yields, acceptable strength properties and for conservation of raw materials. Energy and environmental protection should also be the important considerations, not only for the future units, but for the existing mills as well Another problem facing the Indian pulp and paper mills is the shortage of water. The average water consumption for a typical mill in India, producing 150 tonnes of paper per day is about 400 m^3 per tonne of paper. However, there are instances, that, the water consumption could be drastically reduced[2]. R & D efforts should be concentrated to economise the water by suitable process changes, and to study the nature of effluents for their maximum reuse. This would result in the saving of heat, chemicals, fibres etc. Moreover, the lower volumes of effluents would result in the lower investment for effluent handling and treating equipment and operating costs as well.

Recently many Indian pulp and paper mills have been adversely affected by the energy crisis. Efforts are to be made to economise energy as far as possible. The steam and electric power requirements per tonne of product are different from mill to mill, depending on the type of product and the conditions of the mill, however, as per literature, the energy costs range from 10% to 25% of the cost of production. R & D efforts should be directed towards studying the possibilities of using solid wastes of this industry like bamboo dust, wood dust, barks etc. for generating steam and power by burning in suitable boilers. Solid waste disposal technology is to be developed, which has been discussed in a recent paper[3]. The production of steam and its economic use, is also an important aspect of energy conservation, since, pulp and paper mills need large quantities of steam for processing. These aspects have been discussed in earlier publications [4,5]. There are several other important points, which need attention. The cost of corrosion is heavy and the problem of minimising corrosion is to be studied. Suitability of corrosion resistant material like FRP, for different equipments is to be investigated. Some mills have difficulties of making kraft paper for corrugating medium, of acceptable strength. This is to be tackled by proper choice of raw materials, treatment of the stock and using wet end additives etc. Refining of pulp requires significant amounts of power, so studies should be conducted to minimise the power consumption, while producing pulp of good strength properties[6]. Similarly wet pressing and drying are the other areas, which need study to reduce energy consumption. Chipping, chip transportation, dilution factor for brown stock washing, are fields where power and steam consumption could be reduced. In a pulp and paper mill mixing, agitation and pumping of liquids or pulp stock, need fair amounts of energy and efforts should be made to reduce the same, without any adverse effects on the process.

Western countries like, U.S.A., Scandinavia etc. are spending good amounts of money on research in tree improvement, for getting fast growing well adopted, pest resistant, and well formed trees[7]. Small increases in wood density can cause significant effects on pulp mill operation and profitability etc.[8]. This is a good example for us to follow, as India has a shortage of pulping raw materials.

Along with stream pollution abatement and solid waste disposal, we will have to take steps to check and control air pollution caused by our pulp and paper mills. Some work done in Japan on the use of soil beds, for reduction of maloderous gases has been reported[9].

Thus, there are great challenges and numerous possibilities for promoting R & D activities in our mills, wherein chemists and engineers of various branches may collaborate in the interest of the progress. Although, it may not be possible for us to have in near future, zero-discharge mills, ultra modern and automated machines etc , but developments in process modifications, equipment etc. can pay handsome dividends. The growing industrialisation of our country would necessitate R & D measures not only for economy but for environmental care as

well. It will not be possible for a small mill, to start its own R & D unit for economic reasons, however, it is felt that, efforts may be, made to establish R & D units common to groups of small mills, to study some important projects like pollution abatement, search of new raw materials, efficiency of process and equipment etc. For small mills, the margin of profit is low, because of the rising costs no provision for the recovery of pulping chemicals. The problem of recovery of chemicals for small mills has been discussed, but so far no satisfactory solution has been found [10,11].

The objectives of industrial Research and Development, has been given at the outset, it will be interesting to discuss briefly some aspects of modern R & D management. It has been reported that, some industries spend as much as 10% of their sales on Research and Development[12]. As the management spends large sums of money for such activities, it is quite logical for them to expect that, the projects should be result oriented. The selection of project is a very important job. At the Pulp and Paper Research Institute of Canada, the choice of the problems, which are most likely to be economically successful, is being wrestled with by the individual research workers, the division directors and the Institute Officers at every stage in the process of proposing new projects and choosing which ones will become part of the Institutes programme[13].

Inspite of careful planning and sincere efforts on work, the project may become failure ultimately. R & D persons should always be in touch with the management and its approval should be taken for all the work. They must know what the managements expect of them. As marketing is an important part of the industry, it is always better to try that marketing and technology operate together. R & D persons should be interested in knowing the difficulties in selling the products and should make efforts in collaboration with the process personnel, to overcome these difficulties.

Any management should appreciate any commercially successful projects and should give full credit to the persons concerned. Some feelings have been expressed that the management should not allow the research people to become victims of staff quandary[14]. Proper information should be passed from R & D people to the process and other persons concerned, without delay. This is an extremely important point, as the success of their efforts depends on information transfer. In the opinion of Dr. O.L. Forgacs (Manager, Product Development, Domtar Pulp and Paper Products Ltd., U.S.A.), Ph.D's are not generally well prepared for the transfer of communication[14].

At some places, projects, which have immediate applications on the plant, are preferred. In Japan, the national policy on science and technology involves a balance between basic research developmental work and continued addition to a pool of scientific and engineering expertise. In 1969, Japan spent $ 3.0 billion on R & D, constituting 1.8% of GNP. Canada in the mid sixties was devoting slightly more than 1% of GNP for R&D, and the U.S. about 3.0%. Russia appears to have higher share than this. The Japanese industry is deeply involved in R & D spending and while favouring applied and development work, is also doing considerable domestic basic research[15]. Five Japanese major paper industries have planned to build, a large and most uptodate Research Centre, the construction of which is to be started in 1978. The subjects of research works in the Centre are expected to be centred on basic and common problems of the industry, such as improvement of yield, fundamental study of paper physical characteristics and rationalisation of cost, in addition to pollution abatement problems, now underway, involving Holopulping process[16].

Industrial research needs a sound management. In the opinion of Mr. K. Patrick, Associate Director of Research, Pulp and Paper Research Institute of Canada, research has a much higher element of risk, hence there is a need for elaborate early project evaluation and frequent in-depth reviews of relevance and technical and economic validity[17]. A review committee, formed for this purpose, has very important tasks to do.

It is appropriate at this place, to describe briefly, the part played by the Research Centre of the West Coast Paper Mills. This institution, the first of its kind in the country, was started in 1970, with total capital investment of Rs. 22 lacs. The Research Centre is housed in a separate building in the mill premises. We have most modern and uptodate instruments and equipments to carry out research work in pulp, paper and allied branches. These instruments and equipments were imported from Sweden, Germany, Finland, U.K, Austria, U.S.A. etc. Some more instruments are to be imported shortly. Our Research Centre has well equipped laboratories and is recognised by the Department of Science & Technology, Government of India. On account of this recognition, we can import every year, the necessary spare parts and attachments or new instruments as well. We have a team of well qualified and enthusiastic researchers. Most of our projects are plant oriented and hence we have often to conduct detailed discussions with plant personnel, regarding the difficulties in the process, our approach to solve them and further development work, that could be done. There are also projects on surface sizing to improve varnishability of paper, development of coating formulations, use of wet end additives to improve strength properties of paper, retention aids to reduce through fraction etc. The results of the experimental work done in Research Centre are used on the plant and during plant trials, research people work in shifts on plant, in collaboration with plant people. We also participated in the water conservation programme of our mill. Bleach plant washing studies and reuse of backwaters etc. resulted in significant economy of water and reduction in effluent volume. Considerable work has also been done on effluent treatment and disposal, which has helped in the pollution abatement programme of our mill. Evaluation of local hardwoods for their pulping and papermaking properties has been extremely helpful in selecting these for commercial use and optimising their pulping conditions etc. Based on our studies, pulping of eucalyptus hybrid with bark has been started on plant. We have also done work in areas like, the use of solid waste, product development etc.

Our Research Centre has also a well equipped Library for which we subscribe renowned Journals and periodicals on pulp and paper technology, engineering etc. from the advanced countries in the world. The Library also has a good collection of books on pulp and paper technology, engineering etc. Thus, the Research Centre Library is not only useful to research personnel, but to the other employees of the mill as well. The Research Centre brings out two quarterlies for internal circulation namely 'WCPM Research Centre News' and 'WCPM Research Centre Abstract Bulletin'. 'WCPM Research News' gives the abstracts of research and development work done during the period, important events, and latest developments in the field of pulp and paper in the advanced countries. 'WCPM Research Centre Abstract Bulletin' gives the abstracts of the papers and articles on various subjects from the Journals and periodicals, which we recieve for the Library.

Conclusions

In India, our pulp and paper industry is facing many difficulties and problems, as pointed out in this paper. We should not expect that the situation would improve in future. Various techniques in pulp and paper technology are to be developed and some new techniques are to be devised to make this industry progressive and modern taking environmental care, to suit the economy and conditions of our country. It is suggested that close coordination should be established between the Research and Development unit, operation personnel, the economists, and the marketing personnel, so that their concentrated efforts could be available for the management for higher productivity, profitability, improved quality and diversified products etc.

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