

Pulp and paper technology inputs in a changing scenario

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ABSTRACT

Programmes in Pulp and Paper Technology are designed to meet a very specific industry demand. In a typical undergraduate Pulp and Paper degree course, the inputs in Pulp and Paper form about 30 percent of the total. The major criticism against the programmes are related to lack of flexibility, practical inputs and apparently limited job opportunities. Conventional teaching methods perhaps do not take into account emerging areas of technology, constraints faced by industry with respect to raw materials, energy and environment. The conduct of technology courses in lectures rooms, tutorial halls, laboratories and in mill have lacked the punch to make them interesting, upto-date and challenging to meet the motivational needs of students and aspirational demands of industry. The new thrust in teaching should be based on basic fundamentals/engineering foundations on which modular flexible technology components should be super-structured. Thus emphasis areas like pulp and paper science, Polymer Science, pulp and paper Engineering or Environmental Engineering should be available with other options through electives. The demand is for new courses/infrastructural facilities in areas like advances in pulping and bleaching, nonwoods, printing, energy management, speciality papers, packaging, newsprint, high yield pulping, Biological process and Process Management, Environmental Management, Secondary fibres, application of cybernatics. The Institute should have to live up to these challenges to make the pulp and paper course relevant.

Introduction

Pulp and paper Technology/Engineering is an industry specific course. Unlike the other branches of Engineering or Science, this course is expected to fulfil the demands of this industry. It is obvious that the pulp and paper industry has the immense expectations for the right professionals in this field having exposure in frontier areas of specific production technology. Present on going courses designed have met the above challenges with partial success. There is a need to re-examine and to remodel the curriculum to make it more attractive to students and hence to become more relevant to profession.

Inputs in degree course in Pulp & Paper :

Present inputs in the Bachelor Degree of

Engineering programme in Pulp & Paper is comprising of the following major break-ups :

Area	Units	Contact hours, %
Sciences including		
Mathematics & Humanities.	13	26 50
Engineering.	18	39 90
Pulp, Paper, Recovery & Pollution Abatement	14	28 80
Final project.	3	4 80
Total	48	100.00

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The relative weightage in the class room lectures to tutorials to practicals is 51% to 24% to 25% with an average contact of 31 hours per week. Similarly in terms of marks, practicals constitute 21.9% while theory examinations contributes 52.3% with the rest coming from tutorial component. The courses, while have inputs in mill training to the extent of 3 hours every week for thirty weeks alongwith six weeks mill training, are considered inadequate by industry as far as practical inputs are concerned. The courses have rather weaker inputs in areas relating to humanities, instrumental techniques, management oriented courses and process control. It appears that the present inputs in these areas including the laboratory practicals need a detailed analysis. Similarly the stress on problem solving also requires review.

The pulp and paper inputs in a degree course include 4.5 units in pulping, 5 units in papermaking, 4.5 units in recovery and environment. These include the elective components as well. The contact hours are about over a thousand hours in these courses excluding projects.

The design and energy based courses like process equipment design, process engineering & plant design, process utilities are given as compulsory inputs before pulp and paper equipment design courses are taken up. Apparently the pulp & paper technology based courses have large contact hours in laboratory and the tutorial components are weak. The utilization of the above cited contact hours of laboratory work is again pivoted on mainly the physical labour based exercise rather than relating to cultivating of analytical mind. These therefore calls for a new strategy for designing the practical experimentation with revamping.

Critical analysis of the inputs in pulp & paper area :

The criticism on the current programme in B.E. (Pulp & Paper) essentially centres around the following :

- (a) Lack of flexibility.
- (b) Courses do not motivate students.
- (c) Industry finds pulp & paper inputs partly inadequate and partly irrelevant.

Before dwelling on the above, it should be noted that the universities' academic system imposes some broad guide lines/limitations on course structure and scheme of teaching. The students enter after +2 stage through a difficult competitive examination. Their first exposure to pulp & paper programme at the Institute of paper technology leaves them rather disillusioned due to job opportunities being limited to one industry and superior infra-structure for personality development at the main campus of Roorkee University. In order to have a responsive motivated student community, the entire issue of students selection, course structure and infra-structure facilities need review and change. These aspects are beyond the present text.

Flexibility of the programme is a must to give students wider job opportunities. The manpower demand pattern in pulp, paper and allied industries in a changing raw material, energy and environmental scene should act as a guideline in choosing the core courses and electives. The practical components in the programme can be strengthened only through a very active and appreciative industry-academic interface. These issues have been dealt in detail in other papers. The relevance, of practical inputs, the mode of conduct, development of skills and evaluation-methodology should be worked out on a continuing basis with industry partnership. The weaknesses in practicals in a professional course reflects the failure on the part of industry alongwith teaching faculty. Practical exercise should be such that it should have a thought provoking interpretation, develops the power of analysis in the mind of students. And at the same time the implications to the industry will motivate the students to easily grasp the ideas. The contents in pulp and paper courses from various disciplines should not form disjointed components lumped together. The integration of different inputs into the system is a first-priority in any curriculum. This demands an enlightened faculty appreciative of inter disciplinary inputs.

The present courses in pulp and paper area have emphasis on the following major areas, starting with a course on chemistry of fibers. The pulping courses concentrate on alkaline pulping, sulphate pulping, mechanical pulping like RMP, TMP, chemi-mechanical and semi-chemical pulping. The washing and bleaching, courses deal on conventional bleaching, washing &

screening/ cleaning techniques with exposure to such topics like oxygen and displacement bleaching processes.

The papermaking courses start with a course in paper physics, move to stock preparation which focusses on refining parameters and stock cleaning. The sheet forming and consolidation course deals with headboxes, fourdrinier and cylinder mould machines and pressing. The drying and finishing course focusses on multicylinder Yankee driers, hoods, surface sizing etc.

The recovery course embraces characteristics of sulphate black liquors, black liquor oxidation and desilication, concentration and incineration with introduction to causticizing and lime recovery. The second course goes into more detailed calculations and design considerations of MEE, Recovery boilers and accessories, causticization & mud washing. An introduction to recover of sulphite liquor is given. The courses have the necessary inputs and mill training.

A course on pollution abatement is given in final year indicating the primary and secondary treatment of liquid effluents, Introduction to air pollution control is also given.

A final course on pulp and paper mill equipment is given emphasising the design considerations in centrifugal cleaners, refiners, chippers, approach flow, head boxes, wires etc. The students have an option to pick up one elective in their final year from such topics like fibre blending, non-wood fibre pulping and printing papers.

The major criticism in the curriculum is the need of integrating engineering, operational parameters, energy, environment considerations and safety aspects into technology. This lack causes major problems relating to class room interests. The curriculum will have to be trimmed to create space for additional courses relevant to today's needs. Basic engineering courses and science courses which are the foundations of technology should not be weakened to introduce new-technology courses.

Proposed Structural Changes :

The pulp & paper inputs should be on a modular elective based, structures. After the general inputs in basic sciences, engineering and mathematics, the pulp and paper inputs should start. The core science,

and engineering inputs include engineering materials, physical/organic chemistry, optimisation techniques, computer programming. material and energy balance, thermal science, transport phenomena, instrumentation and process control, newer separation processes, design, economics and management courses. About 12 to 15 units equivalent time should be made available to student for pulp and paper inputs. The course in pulp and paper could be with emphasis in the following major areas. Paper Science/polymer science, pulp and paper engineering and environmental engineering. This would necessarily mean core pulp and paper course of 5 to 7 units with 5 to 7 units of speciality electives. The present courses in raw material preparation, chemical pulping, high yield pulping, conventional and modern bleaching techniques, washing & cleaning, stock preparation, paper making, finishing & speciality papers, chemical recovery and pollution abatement should be suitably remodelled. The present weaknesses of energy, environment, design consideration should be strengthened. The stress on non-wood fibres must be increased. The new courses in areas of relevance like printing, packing, speciality papers, newsprint, secondary fibre processing, advances in pulping & paper making, and recovery, high yield processes, energy conservation, environmental management, newer analytical techniques, cybernetics, process simulation and modelling be added. The economics, management aspects be brought into the curriculum with greater emphasis. These would require significant improvement in laboratory facilities in the areas of secondary fibres, bio processes, membrane techniques, process synthesis & simulation laboratory and energy laboratory

Similarly, the teacher quality improvement should receive greater attention. This aspects is discussed elsewhere. The need for greater exposure and flexibility requires divergent inputs which can not be put in a structured programme. It is proposed that the concept of non-credit contact be introduced. Inputs in divergent areas like forest management, bio engineering, industrial relations, project engineering, history of culture, philosophy, communication, general education, physical education etc. be considered for non-credit contact. A student be required to attend 200 hours of non-credit contacts before being eligible for a degree. It is hoped that this will broaden the horizon of the young graduate and make him a motivated professional.

Conclusion :

The product from an Institute like IPT after 4 years of training is assigned a routine production job. The in-action and the routine nature of job sets in the young man a state of mental revolt. He tends to be frustrated and less useful to his employer. This recognised situations is rarely admitted. There is an urgent need to remove this mismatch. The need for technology absorption and modernisation in the industry should act as catalyst in recruiting graduates and training for these jobs. The challenges posed will act as a stimulant for the young graduates to be motivated. These need reflections in the teaching programme.

The institute is at cross roads where some major changes must be brought. These will address to students entry, motivational factors, course curriculum and industry interaction, teacher-quality-improvement, emerging technology inputs and infra-structure development. The concept of non credit contact should be examined. The modular elective based structure with greater flexibility be scrutinised. Self introspection of the programme and brain storming in company with users is a desirable activity. The challenges of the academic programmes are dynamic. The solutions have to be appropriate to meet the needs of society.