



# CPPRI

CENTRAL PULP & PAPER RESEARCH INSTITUTE, SAHARANPUR (U.P.)



COTTON LINTER FIBER WITHOUT ENZYME TREATMENT



COTTON LINTER FIBER WITH ENZYME TREATMENT

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News Bulletin on Pulp &  
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## RESEARCH ACTIVITIES

### RAW MATERIAL AND PROCESS RESEARCH

Printing Quality Evaluation - Assessment and Improvement Possibilities for Indigenous Coated Paper and Paperboard

Experiments were conducted on commercial coated paper and board samples collected from different mills in India for the analysis of pore size distribution of coated layer using ultra sonic techniques. Large variation in pore size distribution of coated layer was observed which mainly depends on the coating colour formulation applied on paper board samples. This further depends on pigment shape and size, number of coating layers, coating colour solids and additives used in coating colour. Further experiments are in progress for detailed investigations of the above findings.

Storage and Preservation of Fibrous Raw Materials used in Indian Pulp and Paper Industries

Project activities were completed and Final Draft Report was prepared. Executive Summary on "Storage and Preservation of Fibrous Raw Materials used in Indian Pulp and Paper Industries" was also uploaded on the CPPRI website.

### ENERGY CONSERVATION & ENVIRONMENTAL MANAGEMENT

Integrated Approach for Improving Environmental Status of Pulp & Paper Industry

Under the project study following work was carried out:

- ♦ The wastes generated viz ETP sludge, DIP sludge and Used oil collected from a large integrated mill producing writing & printing paper were analyzed for various parameters including heavy metals & AOX. The results were compiled and communicated to the mill for its management.
- ♦ A RCF based mill producing duplex board was visited to evaluate the adequacy of the existing ETP in order to upgrade it for treatment of mill effluent. Based on the design data collected and pollution load assessed a report with suggestions for modifications in existing ETP to achieve discharge norms was submitted to the mill.
- ♦ A RCF based mill producing newsprint and writing & printing grade of paper and having ETP with diffused aeration system was visited to evaluate performance and adequacy of each unit of ETP, quantification of fresh water consumption, reuse and recycle of back water etc. A comprehensive report has been submitted to the mill.

An Integrated Approach on Application of Biotechnology in Pulp & Paper Industry

The objective of the project is to promote the biotechnological applications in Pulp & Paper Industry in India to improve the energy & environmental status of the mills. The broad areas of the activities include:-

Enzymatic Refining: - Enzymatic refining studies were continued on bleached softwood pulps employing identified

commercial enzymes received from a reputed enzyme manufacturer and results obtained show 20- 30% savings from energy point of view. Also it was explored for optimization of process conditions while improving the refining efficiency for enzyme dose, temperature, retention time and consistency of the pulp samples.

Xylanase and Laccase Bleaching of Pulps: - Various enzymes developed indigenously and procured from reputed enzyme manufactures were utilized to find out the potential for application in wood and non-wood based paper mills. Studies carried out on the hardwood pulps procured from a larger paper mill indicated potential for reduction in chlorine dioxide demand by more than 25% using the cost-effective mediators whereas with the use of Xylanase enzyme, there was an improvement in the brightness and whiteness of the pulp by more than 2% ISO with a potential for saving in the  $\text{ClO}_2$  demand. Pilot scale trials have been conducted using indigenously produced Xylanase and Laccase enzymes which will follow with the commercial scale trial in an identified paper mill. Further the encouraging results have been obtained with a new formulation of enzymes on rayon grade pulp in respect of brightness gain around 1-2 %, and reduction in chlorine demand, extractives and silica, Fe and Ca upto 15%, 30% & 10-20% respectively.

Enzymatic Deinking: - Studies on bio-deinking of laser waste papers with commercial enzyme and cellulase enzyme developed by cellulolytic fungal strain F3 isolated at CPPRI were carried out. The deinking efficiency of cellulase enzyme developed at CPPRI indicated better deinking efficiency compared to commercial deinking enzyme. Brightness could be achieved to a level of 77% with the indigenous enzyme developed at CPPRI compared to control sample whereas the brightness in case of deinked pulp obtained from commercial deinking enzyme was as 74.5% ISO.

Bioremediation of Paper Mill Effluent: - Studies were carried out in the area of bioremediation of effluent, collected from an integrated wood based pulp & paper mill from primary clarifier outlet. Four bacterial consortia selected from secondary screening were acclimatized in the paper mill effluent with varying nutrient doses. Further studies were continued to find out the potential of these bacterial consortia developed at CPPRI in respect of COD, Color, Lignin & AOX removing efficiency.

### CESS FUNDED PROJECT

An Integrated Approach for Utilization of Bagasse Pith for Production of Bio-ethanol and Value added Lignin Products (CPPRI/IIP, Dehradun)

The objective of the project involves efficient utilization of pith, a waste generated during depithing process of bagasse through development of a process for production of bio-ethanol and value added lignin products. Saccharification of prehydrolysed bagasse pith by enzymatic treatment for optimization of enzyme dose, retention time and temperature for maximum yield of hexose sugar (glucose) and proximate analysis of treated raw material like- lignin and ash were carried out during the period. Fermentation

on CPPRI hydrolyzates was done at IIP, Dehradun which showed 90% conversion of total fermentable sugars to ethanol in 456 hrs.

Utilization of Fly Ash for Removal of Color from Paper Mill Effluent (Sponsored by C-FARM, New Delhi)

As a part of sponsored research project from Centre for Fly Ash Research & Management (C-FARM), New Delhi, team of CPPRI scientists visited M/s Madhya Bharat Papers Limited to conduct the pilot scale trials on removal of color using Fly Ash. Based on laboratory studies carried out at CPPRI, the pilot scale experiments were conducted at the mill in order to optimize the process parameters. During the pilot scale studies, the process parameters were freezed in respect of retention time, doses of the fly ash as well as other related requirements and it has been possible to remove the color from paper mill effluent to a level of around 100 PCU from the secondary clarifier outlet of the ETP.

Based on the successful pilot scale trials, it has been proposed to set up a full scale commercial demonstration plant of the capacity of 20m<sup>3</sup>/hr for removal of color.



Dr. R. K. Jain, Dr. A. K. Dixit, Sr. Scientists, CPPRI & Sh. G. K. Jha, Sr. Executive, Centre for Fly Ash Research & Management, New Delhi during the pilot trials on Fly Ash utilization for removal of color from paper mill effluent at M/s Madhya Bharat Papers Ltd, Chhattisgarh

## SPONSORED PROJECTS

Model Based Study to Evaluate Energy Consumption Parameters and Development of Data Sheet Format for Various Categories of Pulp & Paper Mills. (Sponsored by Bureau of Energy Efficiency (BEE), Ministry of Power, Govt. of India, New Delhi).

A team of CPPRI Scientists and Engineers visited a Waste Paper Based Mill (M/s Emami Paper Mills, Balasore) to develop model for setting system boundaries for Energy Consumption. Final Report preparation for submission to BEE is under progress.

Performance Evaluation of Lignin Recovery Process (LRP) including Effluent Treatment System and its Impact in Achieving Discharge Standards in Agro Based Pulp & Paper Industry (CPCB sponsored)

In continuation of the project activities two agro based mills in Chattisgarh were visited for carrying out performance evaluation of Lignin Recovery Plant (LRP) as well as over all Effluent Treatment Plant (ETP). Effluent samples were collected from different stages of LRP and ETP and analysed for various pollutional parameters in order to evaluate the performance efficiency of systems for achieving discharge norms.

Evaluation of Xylanases and Laccases at Pilot and Mill Scale in Pulp & Paper Industry (CPPRI/DUSC/KUK/Department of Biotechnology, New Delhi)

Project is basically aimed to study the potential of Xylanase/Laccase Prebleaching of chemical wood pulp and to upscale the process on pilot scale and commercial scale. Bleaching experiments on hardwood pulp employing laccase enzyme were also carried in combination with different mediator dose under the oxygen pressure. During the pilot studies the reduction in ClO<sub>2</sub> demand were achieved around 20-25% including the brightness gain of 1-2% ISO.

Technological Improvement of a Process of Biological Reduction of AOX, Colour, COD and BOD of Waste Water Emanated from Large Pulp & Paper Industries (CPPRI/IGIB, Star Paper mills Ltd., Department of Biotechnology, New Delhi)

The objective of the project is to mitigate the problem of environmental pollution in Pulp and Paper Industry by way of removal of the major pollutants like COD, colour, lignin and AOX. The pilot trial was initiated in Star Paper Mill, which is the industrial partner in the project. An identified bacterial consortium developed by IGIB, New Delhi has been applied which showed better reduction of pollutional parameters compared to the existing process of the mill. The studies are continued to freeze the parameters and to develop an eco-friendly process to overcome the menace of water pollution. Results of the parameters showed around 70% reduction in COD and 40-45% in terms color & lignin.

## OVERSEAS PROJECTS

Pilot Scale Pulping Trial of EFB Fiber

Pilot Plant trail of EFB Fiber for production of unbleached pulp were successfully completed. Semi pilot scale DEpD bleaching of EFB Fiber pulp was also carried out. The resultant bleached pulp had a brightness of 82% ISO & viscosity 528 cc per gram. The unbleached and bleached pulp were send to EKO Pulp & Paper Malaysia (sponsoring agency).

## INTERACTION WITH INDUSTRY

Dr. R.M. Mathur, Director, Dr. Suresh Panwar, Scientist-E-II and Dr. B.P. Thapliyal, Scientist E-II, attended a meeting of All India Master Printers Associations at Udyog Bhawan, New Delhi.

Dr. Suresh Panwar, Scientist, E-II & Dr. B.P. Thapliyal, Scientist-E-II attended the IPPTA Executive Committee meeting at Bangalore in July 2010.

## VISITS TO MILLS &amp; OTHER ORGANISATIONS

S. No.	Name of the Mill /Organization	Name of Scientists / T.O./J.R.F.	Purpose
1-	Goraya Paper Mills Ltd., Moradabad	Dr. S. Panwar & Dr. S. Mishra	Technical Services
2-	Naini Papers Ltd., Kashipur, Uttrakhand	Sh. R.P. Singh & Sh. N. Mishra	Air monitoring
3-	Madhya Bharat Paper Mills Ltd., Champa	Dr. Nitin Endlay & Mr. N. Mishra	LRP & ETP study under CPCB project
4-	Hanuman Agro Industries Ltd., Raipur	Dr. S. Panwar, Dr. Nitin Endlay & Sh. N. Mishra	LRP & ETP study under CPCB project
5-	Century Pulp & Paper, Lalkuan	Dr. Nitin Endlay & Sh. R.P. Singh	Environmental Monitoring
6-	West Coast Paper Mills Ltd., Dandeli	Dr. S. Mishra & Mohd. Farid	Calibration of Water Flow Meter
7-	Abhishek Industries Ltd., Barnala, Punjab	Mohd. Farid	Technical Services
8-	Star Paper Mills Ltd., Saharanpur	Sh. R.P. Singh, Sh. J.S. Panwar & Sh. M.S. Bhandari	Environmental Monitoring
9-	Deen Bandhu Chottu Ram Thermal Power Plant, Yamuna Nagar	Sh. R.P. Singh, Sh. M.S. Bhandari, Sh. R.L. Gupta, Mohd. Farid & Mohd. Salim	Environmental Monitoring on Weekly Basis
10-	Panipat Thermal Power Station, PANIPAT	Sh. R.P. Singh, Sh. M.S. Pundir, Sh. J.S. Panwar, Sh. M.S. Bhandari, Sh. R.L. Gupta, Mohd. Farid, Mohd. Salim & Sh. Nitin Mishra	Environmental Monitoring on Weekly Basis
11-	ABC Papers Ltd., Saliakhurd Punjab	Dr. M.K. Gupta, Dr. N. Endlay & Mohd. Farid	Studies on impact of treated effluent on soil & ground water properties

12-	Upper Doab Sugar Mills Ltd., Shamli, U.P.	Dr. Nitin Endlay & Mohd. Farid	Calibration of Water Flow Meter
13-	Emami Papers Ltd., Balasore, Orissa	Dr. S. Mishra, Mohd. Farid & Mohd. Salim	Performance Efficiency of ETP & Water Balance Studies
14-	Ministry of Environmental Forests	Dr. S. Panwar	Meeting related to Indo-Swedish Bilateral Agreement on Environmental Control in Pulp & Paper Industry
15-	Central Pollution Control Board	Dr. S. Panwar	Meeting related to review of proposal on Incineration of black liquor from agro residues
16-	The Office of Controller, Printing and Stationary, Haryana Govt., Chandigarh	Dr. Sanjay Tyagi	To attend the meeting regarding tender opening and technical specification of paper
17-	IGNOU, New Delhi	Dr. Sanjay Tyagi	To attend the meeting of TOEC 'Tender Opening & Evaluation Committee' for procurement of paper
18-	BEE, New Delhi	Dr. B.P. Thapliyal	For discussion for implementation of PAT scheme in pulp and paper sector

S. No.	Name of the Mill /Organization	Name of Scientists / T.O./J.R.F.	Purpose
19-	Department of Mathematics, IIT, New Delhi	Dr. B.P. Thapliyal Dr. A.K. Dixit, Dr. Sanjay Tyagi & Sh. Alok Kumar Goel	For preparation of Report on investment & profitability of paper Industry using Statistical Methods
20-	Star Paper Mills Limited, Saharanpur	Sh. R.C. Molasi, Sh. Arvind Sharma	Collection of data regarding Unbleached Pulp Mill.
21-	Indian Institute of Petroleum, Dehradun	Dr. R.K. Jain & Sh. Diwakar Pandey	To attend the quick of meeting of CESS funded collaborated project "An Integrated approach of utilization of Bagasse pith for production of bio ethanol and value added lignin products"
22-	Department of Biotechnology, New Delhi	Dr. R.K. Jain	To attend meeting & present progress of sponsored project activities.
23-	Department of Biotechnology, New Delhi	Dr. R.K. Jain & Dr. Vasanta V. Thakur	To attend the task force review meeting of the project "Technological Improvement of a process of biological reduction of AOX, colour, COD and BOD of waste water emanated from large pulp and paper Industry"

24-	Central Pollution Control Board, New Delhi	Dr. R.K. Jain & Dr. A.K. Dixit	To present a presentation on "Technical prefeasibility report on Incineration of Black Liquor in small agro based pulp & paper mills".
25-	HMPFI (KVIC), Mumbai	Dr. R.K. Jain	On the invitation of Director, HMPFI to review the progress to check-out the action plan under the TIFAC sponsored project.
26-	Department of Science & Tech., New Delhi	Dr. R.K. Jain	For meeting with Dr. Vimal Kumar, Sc. G & Adviser in connection with the Business Model of CPPRI
27-	Indian Institute of Petroleum, Dehradun	Sh. Diwakar Pandey	For sugar analysis of hydrolysates & to discuss the project activities.
28-	KNHPI, Jaipur	Ms. Leela	In connection with the sponsored project for analysis of effluent samples collected from various handmade paper units located in Sanganer cluster as part of TIFAC sponsored project

S. No.	Name of the Mill /Organization	Name of Scientists / T.O./J.R.F.	Purpose
29-	Indian Institute of Petroleum, Dehradun	Dr. R.K. Jain & Dr. A.K. Dixit	For lignin utilization studies.
30-	Indian Oil Corporation Ltd., Gurgaon, Haryana	Dr. A.K. Dixit & Dr. R.K. Jain	For gasification studies
31-	M/s. Star Paper Mills Limited, Saharanpur	Sh. Diwakar Pandey, Sh. Dharmendra & Sh. Vipin	For collection of effluent samples for pilot plant trials of technological improvement of a process of biological reduction of AOX, Colour, COD and BOD of waste water emanated from large Pulp and Paper Industry".
32-	Tamilnadu News Print & Papers Limited, Tamilnadu	Dr. R.K. Jain & Dr. A.K. Dixit	To conduct the Chemical Recovery plant audit under the sponsored project
33-	M/s Biozyme Technologies, Pune	Dr. R.K. Jain	To attend the review meeting among the project partners under the DBT sponsored project.
34-	M/s Madhya Bharat Papers Limited	Dr. R.K. Jain Dr. A.K. Dixit Sh. Aash Muni Singh, Sh. Tarun Sharma & Dr. Rajnish Tandon	To implement the plant scale trials under the C-FARM sponsored project on removal of

			colour using fly ash from paper mill effluent.
35-	M/s. Abhishek Industries Ltd. Barnala	Dr. A.K. Dixit	To conduct studies on NPE and to deliver invited lecture.
36-	M/s. Bindals Papers Limited, Muzaffarnagar	Dr. A.K. Dixit	To study present status future manpower requirement in Indian Paper Industry.
37-	M/s. Agio Papers Limited, Bilaspur	Dr. R.K. Jain & Dr. A.K. Dixit	To conduct study on Lignin utilization
38-	Nikita Papers Limited, Shamli	Dr. R.K. Jain & Dr. A.K. Dixit	To conduct study on Chemical Recovery option for agro based kraft mills
39-	M/s. Enmas GB, Ltd. Yamunanagar	Dr. A.K. Dixit & Sh. R.C. Sharma	For inspection of Units of NPE pilot plants.

Sh. N. K. Nayak and Sh. Akhil Naithani visited following Paper Mills for collection of data to prepare model system boundaries. These will be used to evaluate Energy Consumption in major processes / plants/ Auxiliaries /equipments and to identify the Process parameters for monitoring by the energy auditors.

- ♦ Mohit paper Mills Ltd, Bijnore (U.P.)
- ♦ Shreyans Industries Limited, Ahmadgarh, Punjab
- ♦ ABC Paper Ltd., Punjab
- ♦ Satia Paper Mills Ltd., Muksar, Punjab
- ♦ Abhishek Industries Ltd., Barnala, Punjab
- ♦ Sainsons Paper Industries Ltd., Pehawa, Haryana
- ♦ Shree Shyam Pulp & Paper Mills Limited US Nagar, Uttranchal
- ♦ Cheema Papers Limited, Kashipur, Uttranchal

- ♦ Century Pulp and Paper Mill, Lal Kuan, US Nagar, Uttranchal
- ♦ Khatema Fibres Ltd., US Nagar, Uttranchal
- ♦ BILT, Yamuna nagar, Haryana
- ♦ Rama Paper Mills Ltd., Bijnore (U.P.)
- ♦ Shakumbhari Straw Products Limited, Moradabad (U.P.)
- ♦ Genus Paper Mill, Moradabad (U.P.)
- ♦ Sardhana Paper (P) Limited, Meerut (U.P.)
- ♦ Sangal Papers Limited, Meerut (U.P.)
- ♦ Garg Duplex Papers Mills Limited (U.P.)
- ♦ Rana Paper Mills Limited (U.P.)

### VISITS OF EXPERTS/OUTSIDERS

Dr. Rita Kumar, Scientist- G, IGIB, New Delhi, visited CPPRI to discuss the Plant trial related to sponsored project- "Technological Improvement of a process of biological reduction of AOX, Color, COD and Waste water emanated from large Pulp and Paper Industry".

## TECHNICAL/CONSULTANCY SERVICES

- ♦ Evaluation of Reed and Matured Eucalyptus was carried out for Emami Paper Mills Ltd, Balasore (Orissa)
- ♦ Evaluation of Cooking Aid LDA 3600 for Eucalyptus, Bagasse & Wheat Straw was carried out for Aditya Trade, Ahmedabad (Gujarat)
- ♦ Evaluation of Cotton Pulping for Better Economy and Effluent Quality was carried out for Bhartiya Reserve Bank Note Mudran (P) Limited, Bangalore.
- ♦ 45 no. of samples of Pulp, Paper & Paper Board were analyzed for fibre furnish analysis.
- ♦ 90 no. of samples of different raw materials were analyzed for moisture content and proximate chemical analysis.
- ♦ 8 no. of samples of non fibrous raw materials like TiO<sub>2</sub> and Liquid Rosin and white liquor were analyzed for purities of these samples.
- ♦ 25 no. of Pulp samples were analyzed for shives and a dirt count, kappa number, soda loss
- ♦ Consultancy service on refining of hardwood pulp for M/s Parason Machinery (India) Pvt. Ltd; Aurangabad.
- ♦ Macro stickies counts in sorted office paper & white cuttings for M/s Elof Hansson India Pvt. Limited, Chennai.
- ♦ Evaluation of Wet strength in coated stock and multi-grade paper for M/s Shastri Associates, Brown Group, Mumbai.
- ♦ Evaluation of barrier coating in imported waste paper for M/s N R Aggarwal Industries Ltd; Mumbai.
- ♦ 120 no. of Waste Water/ ETP Sludge/Air Monitoring studies carried out for various pollution parameters for different P&P mills

- ♦ Drinking water samples were analyzed for microbial quality (Total coliform bacteria, fecal coliform bacteria and total microbial count) for routine analysis.
- ♦ Chemical characterization was carried out for 11 biomass samples received from Shell Technologies Ltd., Bangalore and Indian Institute of Petroleum, Dehradun.
- ♦ Chemical characterization was carried out for ten biomass samples received from Lignoil Technologies Pvt. Ltd., Mumbai.
- ♦ 68 no. samples of Drinking water, Black liquor, Green liquor, White liquor, Deposits in rotary lime kiln, Fly Ash, ETP & DIP sludge, Process water, Pulp, Smelt, Soda Ash, Coal, CaCO<sub>3</sub> and Alum were analyzed for Cr, Cu, Ca, Mg, K, Na, Fe, Cd, Pb, As, Zn, Al, Hg, Ni, Ti, Carbon, Hydrogen, Nitrogen and Sulphur Content.
- ♦ Technical services were provided to Kumarappa National Handmade Paper Institute, Jaipur under the TIFAC sponsored project entitled "Technology Gap Analysis Study in Handmade Paper Cluster at Sanganer, Jaipur".
- ♦ 684 no. of different paper & paper boards samples received from various mills were analyzed for Cobb Test.

## WORKSHOP/SEMINAR/TRAINING

### SEMINAR

Dr. S. Panwar and Dr. B.P. Thapliyal attended IPPTA Zonal Seminar on "Indigenous Capability for Pulp & Paper Machinery and Services" held at Bangalore in July 2010.

### WORKSHOP

Miss Amita Kumari attended National Workshop on Innovative Ideas "Krescent", held at Indore in July 24, 2010

### TRAINING

Training Conducted in CPPRI

- ♦ Shri. Aamir Zia, M.Sc student from Punjab Technical University, Jalandhar was provided three months training in "Application of micro-biology & Biotechnology in pulp & paper Industry" from June 01, 2010.
- ♦ Shri Zia Ul Islam Khan student of Lovely professional University, Pagwara, Punjab was provided one month training in "Application of micro-biology & Biotechnology in pulp & paper Industry" from July 06, 2010.
- ♦ Ms. Suhavani Jain student of Lovely professional University, Pagwara, Punjab was provided one month training in "Application of micro-biology & Biotechnology in pulp & paper Industry" from June 26, 2010.
- ♦ Shri. Raghav Tripathi student of Shri Guru Ram Rai Institute of Technology & Science, Dehradun was provided one month training in "Application of micro-biology & Biotechnology in pulp & paper Industry" from July 06, 2010.

- Ms. Aditi Sharma student of Shri Guru Ram Rai Institute of Technology & Science, Dehradun was provided one month training in "Application of micro-biology & Biotechnology in pulp & paper Industry" from July 06, 2010.
- Shri. Abhishek Kumar, Mechanical Engineer, Nav Bharat, Jabalpur (M.P.) was provided five days training on "Assessment of Different Grades of Paper for Quality using Standard Testing Methods" and "Evaluation of properties of various grades of paper" from August 09, 2010.
- Shri. Atuheire K. Godfrey Wood Scientist from Uganda Industrial Research Institute (UIRI) Kampala Uganda was provided fifteen days training on Pulp & Paper Making with Specific Reference to Utilization of Banana Fiber Grown in Uganda from August 23, 2010
- Shri. A. K. Choudhary and Shri. B. K. Mohanty, Scientific Assistant Office of the Senior Scientific Officer, Testing Laboratory, Cuttack (Orissa) was provided four days training on "Paper Quality Assessment using Standard Testing Methods" and "Quality assessment of paper" from September 27, 2010.

Treatment Plant for Treatment of Mill Effluent at Emami Paper Mills, Limited Balgopalpur, Balasore , Orissa )- Report submitted to mill

- Performance Evaluation of Lignin Recovery Process (LRP) including Effluent Treatment System and its impact in Achieving Discharge Standards in Agro-based Pulp & Paper Industry (Interim Report of CPCB Sponsored Project)
- Executive Summary - Performance Evaluation of Air Pollution Control Systems in Pulp & Paper Industry (CPCB Sponsored Project)
- Draft Final Report - Performance Evaluation of Air Pollution Control Systems in Pulp & Paper Industry (CPCB Sponsored Project)

## LECTURES AND PRESENTATIONS

- Dr. M. K. Gupta delivered a lecture on "Handling Management and Disposal of Hazardous Materials".
- Dr. Priti S. Lal delivered a lecture on "Chemical Safety issues at CPPRI Laboratories".
- Miss Renu Tyagi delivered a lecture on "An overview of Paper Appearance".
- Shri. Aash Muni Singh delivered a lecture on "Black Liquor Evaporator".

## PUBLICATIONS

- R.M. Mathur, R.K. Jain, B.P. Thapliyal and A.K. Dixit, "Desilication of Bamboo and Straw Black Liquor" paper presented in IPPTA Zonal Seminar at Bangalore in July, 2010.
- Arun Gupta, Meenakshi Gupta, B.P. Thapliyal, R.M. Mathur and Sharad Bhartiya: "Modelling of Wheat Straw pulping in a Pandia Digester and Inferential Estimation of Kappa Number using Irregularly sampled and delayed Measurement" has been published in the Journal of Control System, 2010, Sweden.

## REPORTS AND PUBLICATIONS

### REPORTS

- "Investment and Profitability Assessment of Technology Up-gradation Fund Scheme (TUFS) in Pulp & Paper Sector" submitted to DoIPP, Ministry of Commerce & Industry
- "Storage & Preservation of Fibrous Raw Materials used in Indian Pulp & Paper Industries" - RAC project report
- "Pilot Scale Pulping Trial of EFB Fiber" submitted to EKO Pulp & Paper, Malaysia
- Evaluation of Natural Products in Reducing Pollution Loads of Pulp and Paper Mill Effluent Product Developed by Chemistry Division ICFRE Dehradun
- Modification of Existing Effluent Treatment Plant for Treatment of Mill Effluent at Goraya Straw Board Mills Pvt. Limited , Kashipur (Uttarakhand)- Report submitted to mill
- Proposed Effluent Treatment System for Treatment of Mill Effluent at Sapphire Paper Mills, Vidhannagar, Distt. Darjeeling, West Bengal) - Report submitted to mill
- Fresh Water Audit & Adequacy Assessment of Effluent

## STAFF NEWS

Retirements during July-September 2010

Name	: Shri. H.K Pathak
Designation	: Manager (Finance & Admn.)
Date of Joining	: 17.02.1982
Date of Retirement	: 30.09.2010

## INDUSTRY NEWS

### ITC EYES ACQUISITION IN PAPER SECTOR

Cigarette-to-hospitality major ITC is eyeing an acquisition for its Paperboards and Speciality papers divisions to add capacity to its paper production. This will be the company's second acquisition in this space, with the earlier one being the Kovai recycled boards unit of BILT a few years ago.

#### Demand To Pick-up

The acquisition will form part of the Rs. 4,000 crore expansion plans lined up by ITC's paperboard and speciality papers division for the next two-to-three years to add a capacity of over four lakh tones to its existing capacity of 5.7 lakh tonnes annually through its existing four units, in view of the brisk pick-up in demand for paper, with India clocking a healthy GDP rate and literacy levels rising.

#### Capacity Enhancement

ITC is in the process of doubling the capacity of its kovai unit from the present one lakh tonnes at a cost of Rs 500 crore.

This is totally wastepaper-based plant. Another Rs 400 crore investment has been lined up for its Tribeni unit, near Kolkata, to add about 10,000 tonnes of capacity to the existing 30,000 tonnes in the speciality paper segment. ITC is betting big on this division, with estimates indicating that the domestic paper market will see a 6 percent growth and board market 8 percent in the next four years. Industry sources project that the paper market, including coated and uncoated varieties, will grow from the present 30 lakh tonnes to about 35 lakh tonnes by 2012-13.

### **BILT TO SET UP PULP MILLS IN MALAYSIA, BALLARPUR**

BILT will fully integrate its paper operations by expanding pulp capacity for raw material security. The Avanta Group Company also plans to diversify into new product lines in the next couple of years. Expanding its pulp mill capacity to fully meet its requirement is necessary to protect its margins, which were under pressure last year because of its dependence on imported pulp. The company which produced 8 lakh tones of printing and writing paper with net sales of Rs. 3,795 crore, is among the largest in India. BILT would put up two pulp mills, one in Malaysia, where work is now on, and another at Ballarpur. The 40% shortfall in pulp self sufficiency resulted in its margins of 26-27% dropping to about 22% because of non integration. BILT focus on the market end and expand paper output first, since it did not have adequate resources to simultaneously expand raw material capacity. In 2009-10 it produced nearly 2 lakh tonnes more than previous year. But now the short fall will be bridged in two years. BILT has five paper units in India and one in Malaysia, which it acquired in 2007 for over \$260 million. It had then announced it would double pulp capacity to 2.40 lakh tonnes. The expansion plan slowed down in the international finance crisis of 2008-09 and came back on track last year. Another area of interest will be in the high growth tissue paper segment. The company now is building a brand with outsourced product.

## **ABSTRACTS**

**Title:** A Study of the Formation and Elimination of Chromophores in Wood under Mechanical Pulping Conditions using Spectroscopy.

**Author :** Louise Logenius, Roland Agnemo and Hans Høglund

**Abstract :** Thin sections of wood, i.e., shavings, were used in spectroscopic measurements studying the formation and elimination of chromophores under mechanical pulping conditions. Light absorption coefficients, light scattering coefficients, and brightness were monitored.

The method was applied to study how temperature in the absence of mechanical energy affects wood brightness. An increase in absorption coefficient at 420 nm indicates formation of ortho-quinone structures. By applying mechanical pulp processing conditions, the light absorption coefficient increased in the 400-500 nm wavelength region, probably due to the formation of chromophores in the

lignin. Comparison of heat treated wood shavings with mechanical pulps indicated that additional chromophores were created during the mechanical pulping processes.

The method was also used in studying how high-temperature hydrogen peroxide bleaching of the wood shavings affects the light absorption coefficients. The light absorption spectra reveal information about chromophore elimination in wood chemical components during hydrogen peroxide bleaching at slightly pressurized conditions. This is relevant to processes, such as the alkaline peroxide mechanical pulp process, in which the wood chips are impregnated with bleaching chemicals before refining. The easy penetration of chemicals into the wood shavings ensures rapid and even distribution of the treatment chemicals. A change in light absorption coefficient at shorter wavelengths (400-500 nm) was observed.

**Source :** Paperija Puu, Vol. 92 No. 5, 2010, Pg. 35 - 39.

**Title :** The Effect of Centre Plane Resistance on the Drainage and Sheet Forming.

**Author :** Jhon Xu, Roger Danby, Dale Johnson, John Vanderkolk, and Bruce Janda.

**Abstract :** The 3D structures of three different types of triple layer fabrics are investigated based on X-Ray microtomography and 3D modelling. It is found that the sheet support binder (SSB) fabric and the warp tied fabric have a very open structure between the top layer and the bottom layer of the fabric. In a warp integrated sheet support (WISS) fabric, however, all MD yarns pass from the top layer to the bottom layer and thus create a unique centre layer between the paper side and machine side of the fabric.

Laboratory drainage testing indicates that, compared to SSB and warp tied fabrics, the WISS fabrics drains slower at low sheet basis weights (<15 ~ 20 g/m<sup>2</sup>). However, the WISS fabric drains faster when sheet basis weight is higher than 20 g/m<sup>2</sup>. It is found that the resistance created from the centre layer retards the initial impingement drainage which leads to a slower drainage of the WISS fabric at low sheet basis weight. On the other hand, because of the higher centre plane resistance, fibres have less tendency to plug the drainage holes in a WISS fabric, which leads to a high drainage rate at higher sheet basis weights.

A Pilot papermaking trial confirms that, because of the centre plane resistance, the WISS fabric will retard the initial high impingement drainage and shift the drainage downstream on the forming table. Field trials indicated that, because of the centre plane resistance and reduced impingement drainage, sheets formed on the WISS fabrics have better formation and fines/filler retention.

**Source :** TAPPSA, Vol. 5, 2010, Pg. 20 - 33.

**Title :** The Optimization of Sheet Transfer from the Forming Section into the Dryers.

**Author :** O. Kaapa and J. Maenpaa.

**Abstract :** The job of the press section is to create maximum sheet dewatering with the best sheet characteristics and first class runnability. When future paper machines are designed for even higher speeds, when "more difficult" raw materials

are used and paper grades become ever lighter, then the operation of the "zone between pickup from the forming section up to the pick-up into the dryer section" will determine to what extent success is achieved in protecting the sheet.

Modem press sections will increasingly be planned under those conditions which enable a significantly improved sheet transfer. But also in existing machines sheet transfer conditions can be substantially improved as shown in this report.

Source : TAPPSA, Vol. 4, 2010, Pg. 36 - 42.

Title : Pilot Paper Machine Production of Newsprint Using High Filler Loads and Dry Strength Technologies

Author : F. Brouillette, J. Paradis and S. Lafreniere.

Abstract : The introduction of filler in newsprint is a valuable cost alternative for fibre replacement and energy savings. The introduction of fillers is beneficial to many sheet properties such as brightness and opacity, but it is detrimental to strength, liting and dusting properties. In consequence, papermachine and printing press runnability can be adversely affected. In attempt to understand the impact of kaolin-filler introduction in newsprint in the North American context, pilot plant runs were conducted on the new CIPP pilot papermachine using different filler loads and a 45-gsm sheet. Selected dry strength additives were also added in order to minimize the loss or improve physical properties of the sheet. Our study reveals that some technologies can maintain the dry strength of papers while others will be more useful at maintaining parameters such as papermachine and pressroom runnability and printing quality which may all be affected by filler increases.

Source : Pulp & Paper Canada, Vol. 111 No. 5, 2010, Pg. 38 - 42.

Title : Z-Direction Fiber Orientation in Paperboard.

Author : John M. Considine, David W. Vahey, Roland Gleisner, Alan Rudie, Sabine Rolland Du Roscoat, and Jean-Francis Bloch

Abstract : This work evaluated the use of conventional tests to show beneficial attributes of z-direction fiber orientation (ZDFO) for structural paperboards. A survey of commercial linerboards indicated the presence of ZDFO in one material that had higher Taber stiffness, out-of-plane shear strength, directional dependence of Scott internal bond strength and directional brightness. Laboratory handsheets were made with a specialized procedure to produce ZDFO. Handsheets with ZDFO had higher out-of-plane shear strength than handsheets formed conventionally. Materials with high out-of-plane shear strength had greater bending stiffness, and compressive strength because of their ability to resist shear deformations

Source : TAPPI, Vol. 9 No. 10, 2010, Pg. 25 - 32.

Title : Topochemical Investigation into the Delignification of Eucalyptus Globulus Chips During Semi-Chemical Sulfite Pulping.

Author : Mathias Rahbein, Miguel Pereira, Gerald Koch and

Othar Kordsachia.

Abstract : The course of delignification of Eucalyptus globulus fibers during neutral semi-chemical sulfite pulping (NSSC) was studied by universal microspectrophotometry (UMSP 80, ZEISS). UV-investigation into a cellular level enables the topochemical analyses of delignification within individual cell wall layers during cooking. Cooks were carried out in a laboratory seven liter digester with liquor circulation and electrical heating device. Chip samples were taken throughout the cooking for chemical and UV microscopic analyses. UV microscopy analysis revealed for Eucalyptus globulus chips a preferred lignin removal during NSSC cooking in cell corner and compound middle lamella regions.

Source : Wood Science & Technology, Vol. 44 No. 3, 2010, Pg. 435 - 449.

Title : Analysis of a Biorefinery Integration in a Bisulfite Pulp Process.

Author : Z. Perin-Levasseur, F. Marechal and J. Paris.

Abstract : Process integration techniques have been applied to study a bisulfite mill which produces pulp and three additional by-products: bioethanol, lignosulfonate and yeast. Particular attention was devoted to the integration of the chemical recycling loops which have a significant impact on the process energy balances and therefore influence the choice of biorefinery integration strategies. This analysis illustrates the trade-off between conversion of materials and of energy and shows the importance of considering simultaneously the heat recovery through heat exchangers and the combined heat and power production.

Source : Pulp & Paper Canada, Vol. 111 No. 3, 2010, Pg. 31 - 33.

Title : Optimization of Elemental Chlorine-Free Bleaching for a Softwood Kraft Pulp Part 2: Economic Analysis of Chemical and Steam Consumption.

Author : Brian N. Brogdon.

Abstract : Our previous investigation [1] re-analyzed the data from Basta and co-workers (1992 TAPPI Pulping Conference) to demonstrate how oxidative alkaline extraction can be augmented and how these changes affect chlorine dioxide consumption with elemental chlorine-free (ECF) sequences. The current study manipulates extraction delignification variables to curtail bleaching costs with a conventional U.S. Southern softwood kraft pulp. The economic advantages of ~ 0.35% to 0.65% H<sub>2</sub>O<sub>2</sub> peroxide reinforcement in a 70°C (EOP)-stage versus 90°C (EO)-stage are predisposed to the brightness targets, to short or long bleach sequences, and to mill energy costs. Minimized bleaching costs are generally realized when a 90°C (EO) is employed in D0(EO)D1 bleaching, whereas a 70°C (EOP) is economically advantageous for D0(EOP)D1E2D2 bleaching. The findings we disclose here help to clarify previous ECF optimization studies of conventional softwood kraft pulps.

Source : TAPPI, Vol. 9 No. 9, 2010, Pg. 47 - 53.

Title : A Comparative Evaluation of Explosion Hazards in Chemical and Mechanical Pulp Bleaching Systems.

Author : P. W. Hart and A. W. Rudie.

**Abstract :** Three pulp mills in North America using 50% hydrogen peroxide have suffered explosions of pumps, mixers, and tanks. In two instances, alkali-catalyzed decomposition of peroxide is implicated in the explosion. Although many mechanical pulping facilities use hydrogen peroxide to bleach pulp, no alkali-catalyzed explosions have been reported. This research uses a kinetic model of peroxide decomposition to explain why the peroxide bleaching process used for mechanical pulps has lower risks than processes used to bleach chemical pulps.

**Source :** Pulp & Paper Canada, Vol. 111 No. 4, 2010, Pg. 19 - 22.

**Title :** Influence of Oxidation and Cationization on the Properties of Thermomechanical Pulp Fibers.

**Author :** Pu Ma, Huamin Zhai, Kwei-Nam Law, and Claude Daneault

**Abstract :** Thermomechanical pulp (TMP) fibers were separately oxidized using 4-acetamido-2,2,6,6-tetramethylpiperidyl-1-oxyl (4-acetamido TEMPO) and cationized by 2,3-epoxy-propyl-tri-methyl ammonium chloride. The goal was to evaluate the influences of the interaction of oxidized, cationized, and untreated fiber components on paper properties. TEMPO-mediated oxidation can enhance interfiber bonding potential of mechanical long fibers. Cationization can improve the interfiber bonding only when the cationic charge density is lower than 400 mmol/kg; the bonding capacity drops off with increasing cationic charge density. However, as these modified long fibers were mixed with untreated long fibers and short fibers, the interaction between these fibers affected the paper sheet strength. The addition of oxidized fibers improved the sheet density remarkably, but it only had apparent effect on tensile strength when the carboxyl group content was less than 500 mmol/kg; higher carboxyl content did not enhance the sheet properties. The addition of cationized fibers had no positive effect on sheet density, and when they were mixed with other fiber fractions the interaction between positively charged and negatively charged fibers resulted in poor paper structure with rough surface and decreased tensile strength. Both oxidation and cationization had adverse influence on intrinsic fiber strength and tear index; either high carboxyl content or high cationic charge density could lead to remarkable decrease in these two properties. The side reactions, such as  $\beta$ -elimination and alkoxy fragmentation during TEMPO-mediated oxidation and alkaline degradation during cationization, which degraded the cellulose, were responsible for the drastic decrease in zero span tensile strength and tear strength.

**Source :** TAPPI, Vol. 9 No. 10, 2010, Pg. 36 - 43.

**Title :** Turning Waste into a Resource.

**Author :** Ulrich Leberle.

**Abstract :** One of the major environmental success initiatives over the last decade has been the rate at which a host of 'waste' materials have been diverted from landfill into a feedstock for many different industries. Of these, recovery of paper and board probably accounts for the largest

volume of material saved from disposal via landfill.

Until today recovered fibre had few uses outside the paper and board industry, so it was returned if it was collected. However, in recent years a new industry has developed which threatens to consume significant proportions of the fibre which hitherto went solely to the paper and board industry. As the threat posed by energy generation from recovered paper becomes ever more prominent, the paper and board industry has devised a number of ways to safeguard this important feedstock from incineration.

This article describes how the industry is targeting the status of recovered fibre, in particular having its definition tightened, standardising its quality, and finally, improving its traceability.

**Source :** Paper Technology, Vol. 51 No. 2, 2010, Pg. 22 - 23.

**Title :** In-Furnace Temperature and Heat Flux Mapping in a Kraft Recovery Boiler.

**Author :** Anders Brink, Tor Lauren, Mikko Hupa, Ralf Koschack and Christian Mueller.

**Abstract :** Gas temperatures, incident heat flux, and surface temperatures were measured in a large kraft recovery boiler. The measurements were a part of an extensive campaign planned and carried out to support validation of models based on computational fluid dynamics. The gas temperatures were measured with three different techniques: infrared (IR) pyrometer, suction pyrometer, and unshielded thermocouples. In addition to the temperature measurements, the radiative heat flux was measured in a number of locations in the boiler using a portable heat flux probe, and the surface temperatures inside the boiler were measured using a portable single-band IR camera.

**Source :** TAPPI, Vol. 9 No. 9, 2010, Pg. 7 - 11.

**Title :** Co-Firing Black Liquor and Biomass in a Laboratory Single Droplet Reactor effects on Emissions and Combustion Characteristics.

**Author :** Nikolai Demartini, Esperanza Monedero, Patrik Yrjas and Mikko Hupa.

**Abstract :** Mills having recovery boilers with excess capacity can potentially mix other biofuels into the black liquor to produce more electricity from biomass. This work is a laboratory study of the effect on combustion of mixing other biofuels with black liquor. The four fuels mixed with softwood black liquor were bark, wood chips, peat, and bio-sludge (which some mills already burn with black liquor). Droplets of the mixed fuels were burned at 1100°C and 3% O<sub>2</sub> in a single particle reactor. Video and on-line gas analyzers for CO, CO<sub>2</sub> and NO were used to measure swelling, combustion times, carbon evolution (CO+CO<sub>2</sub>), and NO formation tendency. We found changes in swelling, Charburning, and NO formation, but the results indicate that mixing biofuels with black liquor may be a reasonable method of producing additional electricity.

**Source :** TAPPI, Vol. 9 No. 9, 2010, Pg. 29 - 34.

## राजभाषा समाचार

15 अगस्त 2010 को स्वतंत्रता दिवस की 63 वीं वर्षगांठ पर संस्थान के निदेशक डॉ. आर.एम. माथुर ने संस्थान के प्रांगण में ध्वजारोहण किया।

इस अवसर पर निदेशक महोदय ने अपने संबोधन में कहा कि भारतीय कागज़ उद्योग देश की 35 उच्च प्राथमिकता वाले आर्थिक उद्योग में सम्मिलित हैं जबकि विश्व स्तर पर भारतीय कागज़ उद्योग पहले 15 उद्योगों में एक है। भारतीय कागज़ उद्योग की क्षमता 9.5 मिलियन टन है। यह उद्योग लगभग 15 लाख लोगों को रोज़गार उपलब्ध कराता है तथा सरकारी खज़ाने में लगभग 3 हज़ार करोड़ रुपये का भुगतान करता है। फिर भी देश में प्रति व्यक्ति खपत अभी तक केवल 7.0 ग्राम है। जो वैश्विक खपत 45 किलो ग्राम प्रति व्यक्ति से काफी कम है।

संस्थान ने अपने प्रयत्नों में कागज़ मिलों की प्रमुख समस्याओं को चिन्हित करने के प्रयास किये हैं, जिसमें मुख्यतः कच्चे माल के उन्नयन एवं भण्डारण, गुणवत्ता उन्नयन, ऊर्जा प्रबन्धन, पर्यावरण सुरक्षा एवं मानव संसाधन विकास के द्वारा उद्योग की कार्यक्षमता को बढ़ाना प्रमुख है। इसीलिये 11 वीं पंचवर्षीय योजनाओं में प्रमुखता से इन्हीं विषयों पर परियोजनाओं को केन्द्रित किया गया है।

उन्होंने यह भी जानकारी दी कि संस्थान की वार्षिक आय पहली बार 244.55 लाख तक पहुँच गई है और संस्थान लगातार अपनी क्षमताओं और विश्वस्तरीय विस्तारीकरण के लिए प्रयास कर रहा है।

## राजभाषा पखवाड़ा

संस्थान में 1 सितम्बर 2010 से 14 सितम्बर 2010 तक राजभाषा पखवाड़ा मनाया गया। इस अवसर निदेशक डा. आर.एम. माथुर ने संस्थान के कर्मचारियों को संस्थान के दैनिक कार्यों को हिन्दी में करने के लिए प्रेरित किया।

Address for Communication

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We welcome suggestions & comments for further improvement of this News Bulletin