TRACING PAPERS

Covey Consulting

A summary of paper industry technical articles from Covey Consulting

March 2007

No 0701

Welcome to a new issue of paper industry abstracts. This issue starts with a couple of articles on steam and condensate management with some tips to reduce steam loss and improve condensate return.

Other articles look at using off-the-shelf image analysis software and a scanner for a low cost approach to analyse hardwood vessel picking, the development of formulae to assess whether it's more economical to improve linerboard strength by refining or increasing grammage and the design of a biotrickling filter to treat waste gases from a brownstock washer.

There are quite a few papers on recycling and deinking in this issue, including automated sorting of recovered paper in Germany; using ozone to increase the strength of OCC, and measuring effective residual ink concentration.

For those going to the Appita conference in May, please do come to our stand and say hello.
Comments and suggestions for improvements are welcome

John Trewick

Covey Consulting

Chemistry, Engineering

HANDLE STEAM MORE INTELLIGENTLY
Risko, J.R
Chemical Engineering Nov 2006: 38-43
0701-1A
As energy prices continue to rise there is increased pressure to either reduce energy consumption or specific energy. Process steam comprises a large portion of the utility used in many manufacturing plants. Improved condensate management provides opportunity for the largest improvements in steam system efficiency. Consequences of poorly managed condensate are discussed and strategies for optimising condensate handling and the steam circuit are examined. Steam trap management is reviewed including the economics of steam trap replacement and monitoring. The advantages of periodic overall steam system audits are also discussed. (7 figs, 3 tables)

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STEAM MANAGEMENT: DON'T SEND MONEY DOWN THE DRAIN
Kimbrough, B., & Ashby, S.
Chemical Engineering Nov 2006: 44-46
0701-1B
Condensate recovery represents a significant supply of recoverable energy in a process plant. It is possible to recover over 60 % of the condensate if the steam and condensate system are designed and managed adequately. Common problems with condensate recovery are examined and aspects of good condensate management such as return-line sizing, steam traps, collection assemblies, and thermal insulation are discussed. A detailed examination of the use and advantages of pump traps with heat exchangers is given. (4 figs)

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Wet End Chemistry, Starches, Additives

INTERACTION OF PRECIPITATED CALCIUM CARBONATE (PCC) WITH STARCH IN DISTILLED AND DEIONIZED WATER (DDW) AND PROCESS WATER (PW)

Modgi S, et al.
Nordic Pulp and Paper Research Journal Vol 21, no 5, 2006: 716 – 723
0701-2D

The colloidal behaviour of precipitated calcium carbonate (PCC) and its interaction with various starches in distilled, deionised water (DDW) and process water (PW) was studied. Tapioca starch and two types of potato starch (with different degrees of substitution) were used to study the aggregation of PCC. All three starches were able to aggregate PCC in DDW at 25ºC and 50ºC and in PW at 50ºC. The tapioca starch aggregated PCC at a faster rate and formed larger aggregate size than the two potato starches. The potato starch with the higher degree of substitution performed better than that with the lower degree of substitution. The study showed that tapioca starch is suitable for paper strength development of mechanical pulp grades and is not deactivated by the presence of anionic trash. (16 figs).

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UNIQUE BEHAVIOUR OF POLYAMPHOLYTES AS DRY-STRENGTH ADDITIVES

Appita Journal. Vol 60 (2), March 2007: 106-111, 128
0701-2E

Polyampholytes yielded superior dry strength increases following their addition to slurries of papermaking fibres. The bionic polymers achieved greater tensile strength compared to similar polymers having ionic groups of only positive or negative charge. Dry strength efficiency increased with increasing charge density of the polyampholyte. Strength results were consistent with turbidity data, showing that the polyampholytes generally became less soluble at intermediate values of pH. In contrast to simple polyampholytes, the absorbed amphoteric macro-molecules imbibed significant amounts of water of hydration. Though high levels of polyampholytes added to the furnish tended to reduce the rate of gravity dewatering, such effects tended to be lower than the drainage inhibition caused by single-charge poly electrolytes. The effects of polyampholytes were achieved without the adverse effects often associated with refining, e.g. decreased dewatering rates, fibre shortening, or changes in the conformability of the fibres.[author abstract] (9 figs, 1 table)

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Paper Structure, Paper Properties, Papermaking

IMAGE ANALYTICAL MONITORING OF PAPER QUALITY – A FEASIBILITY STUDY
Dahl C K et al.
Tappi Journal Vol 5(11) November 2006:18-24
0701-3A
Fourteen selected paper quality parameters were evaluated using new image analytical techniques for characterisation and monitoring of paper quality on 6 major paper types. The following paper quality parameters were modelled successfully with only minor optimisation of the initial experimental parameters: ash, b*C2, bending resistance, brightness, density, gloss, grammage, opacity, roughness, tear strength, tensile strength, thickness and whiteness. This new image technique has potential for on-line monitoring of the specified physical qualities. (11 figs, 2 tables)

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USE OF ENZYMES FOR REDUCTION IN REFINING ENERGY – LABORATORY STUDIES
Bajpai, P., et al
Tappi Journal, Vol 5(11), 2006: 25-32
0701-3B
This paper reports both laboratory and process-scale trials of enzyme treatments for reduction of refining energy of several pulps. Two commercially available enzymes were studied namely Biorefine L and FiberZyme LBR. Reductions of between 18 – 45% in refining energy are reported for the laboratory trials. No adverse affects on strength properties as a result of enzymatic treatments are reported. For the three process-scale trials that were conducted in this study, similar reductions in refining energy to that of the laboratory trials, as well as a reduction in steam usage, was reported. The potential benefits of pre-refining enzymatic treatments are also discussed. (2 figs, 10 tables)

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CONTROLLABILITY ANALYSIS OF A TMP-NEWSPRINT REFINING PROCESS

Lama, I., et al

Pulp& Paper Canada, Vol 107(10), 2006: 44-48

0701-3C

A process model of a TMP refining section with a primary and secondary refiner is developed. A controllability analysis was then performed on this model to identify the most important variable interactions that affect pulp quality. The analysis suggests that long fibre is controlled more efficiently in the primary refining stage and freeness in the second stage. Finally a decentralised regulatory control configuration is proposed. (2 figs, 3 tables)

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FAST-GROWN PGW FIBRE FOR SUPERIOR COMMINICATION PAPERS.

Corson, S and Richardson, J

Appita Journal vol 60 (2), March 2007: 144-150

0701-3D

Juvenile radiata pine has been produced with equivalent, or better, tensile strength and optical behaviour to thermo-mechanical pulps of the same wood, and of Scandinavian spruce. The pressurised groundwood (PGW) pulp qualities, in their raw “pit-sample” state meet key current industrial thermomechanical pulp (TMP) quality requirements for semi-calendered (SC) and light-weight coated (LWC) paper and almost satisfy projected “next generation” TMP requirements for SC. The PGW was produced at an energy saving of approximately 2000 kWh/odt relative to the radiata pine TMP and approximately 1200 kWh/odt relative to the spruce TMP. These desirable pulp performance behaviours combine with the low latewood characteristics of juvenile radiata pine to offer an economically-interesting opportunity for the manufacture of high-quality communication papers. Eucalyptus nitens and black poplar PGW do not offer the same benefits as the juvenile radiata pine PGW. [Author abstract, amended] (7 figs, 4 tables).

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Printing, Inks

A NEW ANALYTICAL MODEL FOR IMPACT AND SPREADING OF ONE DROP: APPLICATION TO INKJET PRINTING

Girard F et al.

Tappi Journal Vol 5 (12) December 2006: 24-32

0701-4A

An experimental device was developed to obtain top and side views of the impact of an ink drop onto glass and papers of various porosities. In the short term, no penetration of the porous substrate was observed, and droplet behaviour was similar for both plane and porous substrates. Differences were observed however in the maximal wetted areas. A one-dimensional analytical model was developed to predict the radius of the wetted area shortly after the impact. The dissipation due to the rolling motion near the moving contact line was also investigated. The study has potential application to inkjet printing technology. (12 figs, 1 table)

INK PIGMENT LOCATION MEASURED AS THE POSITION OF CLAY IN YELLOW COLDSET INK

Eriksen Ø and Gregersen ØW

Nordic Pulp and Paper Research Journal Vol 21 (4) 2006: 460-465

0701-4B

Scanning electron microscope surface images showed that there was no significant difference in the migration patterns for clay particles in yellow ink and titanium dioxide pigment particles after printing. The ink pigment penetration is very limited, indicating that this has only a minor effect on print-through in cold set offset printing. Average ink penetration depth increases when the applied printing pressure is increased. (9 figs, 2 tables)

THE DIAGNOSIS OF HARDWOOD VESSEL PICKING IN OFFSET PRINTS
Heintze HU
Pulp & Paper Canada Vol 108 (1) 2007: 34-38
0701-4C
Public domain image analysis software and consumer-level page scanners were used to quantify defects in the offset printing of fine papers containing hardwood fibres. A mill-specific catalogue of defect images was found to be an essential tool in the efficient communication and resolution of picking problems. An analysis of the issues is given, along with typical results. Recommendations are made for the implementation of this low-cost approach. (6 figs)

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NEW TECHNIQUE FOR MONITORING INK-WATER BALANCE ON AN OFFSET PRESS.
Voltaire, J et al.
Appita Journal vol 60 (2), March 2007: 120-128
0701-4D
An acoustic technique, with microphone placed near the print nip exit on a sheet-fed offset press during trial printing of newsprint, was used to provide information relating to splitting of the ink-fountain solution film. The average acoustic power increased with tack of the ink used and with target optical density. Further, average power decreased during each run, reasonably strongly correlated to increase in fountain solution consumption. This indicates that average power is primarily sensitive to instantaneous tack of the ink-fountain solution film, and can be used to monitor tack and indirectly infer ink-water balance in the nip. Laboratory experiments were also performed using the Hydroscope instrument to simultaneously measure tack and average acoustic power of the splitting of inked rollers during fountain solution titration and evaporation. While these two measured parameters were not directly correlated over all conditions of emulsification, both decreased in tandem over intermediate amounts of fountain solution. [Author abstract] (9 figs, 2 tables)

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Coatings, Coated Papers

THE INFLUENCE OF PIGMENT PARTICLE SHAPE ON THE IN-PLANE TENSILE STRENGTH PROPERTIES OF KAOLIN-BASED COATING LAYERS
Husband J C et al.
Tappi Journal Vol 5 (12) December 2006: 3-8
0701-5A
In-line tensile strength of coating layers was measured as a function of the kaolin particle shape factor. For clays of similar particle size distribution by sedimentation, the in-plane tensile strength and stiffness of the coating layer increased with the shape factor of the kaolin. Conversely, elongation to break decreased. These observations are interpreted in terms of the microstructure of the latex layer. It was also found that elongation increased exponentially with latex level, suggesting that polymer chains are constrained by adhesion onto pigment surfaces and are less extensible than in the bulk latex film. (7 figs)

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SUBSTITUTION OF HARDWOOD BLEACHED KRAFT PULP WITH ASPEN HIGH-YIELD PULP IN LWC WOOD-FREE PAPERS, PART 2: IMPACT ON COATED PAPER QUALITY
Hu K et al
Tappi Journal Vol 6 (1) January 2007:26-32
0701-5B
The effects of high-yield pulp (HYP) substitution on the properties of basestock, coated and calendered sheets were examined, specifically in lightweight coated wood-free papers. It was found that the increased bulk created by HYP substitution is partially preserved after coating and soft nip calendering. There is no significant effect on roughness and gloss at a HYP substitution of below 20%. Above 30%, coated sheets containing HYP have a slightly lower gloss, and a poorer coating coverage, which was attributed to a slight increase in roughness. These effects can be minimised with a higher calendering load. (9 figs, 4 tables)

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Packaging Papers

PRINCIPLES OF MINIMUM COST REFINING FOR OPTIMUM LINERBOARD STRENGTH
Urbanik, T and Won, M J
Progress in Paper Recycling, Vol. 15 (4), August 2006: 13 – 21
0701-6A
The authors have developed a series of formulae aimed at determining the economic relationship between improving strength characteristics of a corrugated medium, linerboard and hence corrugated box, by refining or increasing grammage. The formulae are used in an investigation with recycled fibre to understand how, in a particular geographic location; the optimum strength characteristics are derived from a given set of fibre and energy costs. In this particular investigation, the cost of fibre and refining energy to improve paper performance are of a similar magnitude. (9 figs, 2 tables)

Recycling, Deinking

FULL CHARACTERIZATION OF STICKIES IN A NEWSPRINT MILL: THE NEED FOR A COMPLEMENTARY APPROACH
Blanco, A. et al.
Tappi Journal, Vol. 6 (1), 2007: 19 - 25
0701-7A
One of the main problems during stock preparation of recycled pulp is stickies removal. The paper describes an audit of stickies made at a mill producing newsprint solely from recycled pulp (PM61 of Holmen Paper Madrid). Samples were obtained at 9 sample points in the deinking line. The stickies were characterised as Total stickies (by solvent extraction), Macro-stickies (.>150 µm), Micro-stickies (<150 µm), and Secondary stickies (stickies that precipitate out due to changes in the chemical environment). As the evolution of stickies along the deinking line varies with the type of stickies measured, the authors conclude that a complete characterization is essential. (6 figs)

AUTOMATIC SORTING OF RECOVERED PAPER – TECHNICAL SOLUTIONS AND THE LIMITATIONS
Wagner, J. et al.
Progress in Paper Recycling, Vol 16 (1), 2006: 13 – 23
0701-7B
Presents an overview of the recovered paper sorting in Germany and the technical possibilities of automating the recovered paper sorting process. In the currently widespread manual sorting process, the recovered paper quality is determined by such parameters as quality and singling of the feed material, sorting productivity, experience and motivation of the worker who does the sorting. Various possible automatic recovered paper sorting processes are described, and their effects on the recovered paper quality, cost and efficiency of sorting are examined. (5 figs, 4 tables)

TECHNO-ECONOMIC CONSIDERATIONS FOR DIP PRODUCTION INCREASE AND IMPLEMENTATION OF COGENERATION AT AN INTEGRATED NEWSPRINT MILL
Janssen, M., et al
Pulp& Paper Canada, Vol 107 (9), 2006: 33-37
0701-7C
A hypothetical integrated newsprint mill was used as the basis for a study into the feasibility of having an increased deinked pulp (DIP) process and cogeneration. Details of the methodology of the techno-economic study are given which incorporated a large block analysis of the process. Cost modelling was also preformed including capital, manufacturing and energy costs. A Monte Carlo simulation was preformed for the risk analysis. The study suggests that a 1-loop DIP process was the most desirable option. (3 figs, 7 tables)

UPGRADING OCC AND RECYCLED LINER PULPS BY MEDIUM-CONSISTENCY OZONE TREATMENTS
Zanuttini M et al
Tappi Journal Vol 6 (2) February 2007: 3-8
0701-7D
Low levels of ozone were applied at medium consistency to improve the properties of old corrugated container (OCC), kraft liner and corrugated medium pulps. There was a reduction in kappa number, proportional to ozone charge, but the surface charge of the fibre did not change. Ozonation increased the relative bonded area in sheets made from treated fibres. Papermaking properties like tensile strength, internal bond strength, compression strength and Concora medium test were significantly increased, even at the lowest charge applied. For OCC pulp, similar improvements can be achieved by refining and alkali treatment. (11 figs, 4 tables)

ON MEASUREMENTS OF EFFECTIVE RESIDUAL INK CONCENTRATION (ERIC) ON DEINKED PAPERS USING KUBELKA-MUNK THEORY

Vahey, DW et al

Progress in Paper Recycling Vol 16 (1) November 2006: 3-12

0701-7E

For opacities less than 97%, the method of measurement of effective residual ink concentration (ERIC) is based on the Kubelka-Munk theory. At above 97% opacity, the reflection values with a black backing agent are statistically indistinguishable from those obtained with a thick backing of the same papers. A new approach to ERIC avoids both uncertainty and approximation by using the measurement of diffuse reflection and transmission in single sheets. The calculation of ERIC values is thus valid at any opacity for which the percentage transmission through the sheet is accurately determined. (4 figs, 3 tables)

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TOWARDS EVALUATING RETENTION AID PERFORMANCE FOR DEPOSIT CONTROL IN NEWSPRINT FURNISHES CONTAINING RECYCLED PAPER

Allen L and Lapointe C

Nordic Pulp and Paper Research Journal Vol 21 (5), 2006: 710 – 715

0701-7F

A method was developed to measure the retention of styrene butadiene rubber (SBR) in newsprint furnish which contained recycled deinked pulp (DIP). Retention measurements were done in a dynamic drainage jar using a selection of commercially-available retention aids. The pulp used in the study was collected from the headbox of a newsprint machine which was using a mixture of mechanical pulp and 27% DIP. The procedure involved the measurement of the first pass retentions of SBR and of dispersed resin particles. The retentions of fines and ash were also measured. The trends in retention aid performance for SBR were similar to the trends for ash retention because most of the SBR was attached to coating clay. Results suggested that the DADMAC-CPAM retention aid system was an effective retention aid system for newsprint mills using a significant amount of DIP. (2 tables, 4 figs)

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EFFECTS OF RECOVERED PAPER QUALITY AND DEINKING PROCESS PARAMETERS ON DIRT LEVELS IN NEWSPRINT
Fairbank, M et al.
Pulp and Paper Canada Vol 107 (12), Dec 2006: 64-67
0701-7G
Abitibi-Consolidated, a manufacturer of newsprint paper out of recycled paper and magazines developed a standardized and repeatable method of measuring dirt content of their product. Using a flat bed scanner, they tested and reported 2 measurements: TAPPI dirt (>0.04 mm2) and “visible dirt,” >0.1 mm2. By tracking these numbers, they were able to determine trends due to quality of recycled paper, and its effects on process and final client product. (8 figs, 1 table)

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LABORATORY PAPER PULP DEINKING: AN EVALUATION BASED ON IMAGE ANALYSIS, ISO BRIGHTNESS AND ERIC
Pala, H et al.
Appita Journal vol 60 (2), March 2007: 129-135
0701-7H
Image analysis, Effective Residual Ink Concentration (ERIC) and ISO brightness measurements were used to evaluate the effectiveness of laboratory deinking assays. The accurate measurement of the residual ink amount is difficult and the results depend on the methodology used. The three techniques correlate only when the same paper pulp sample is analysed and when the ink particle size distribution profile is similar. As the relative amount of each particle size depends on the deinking protocol used, the ink removal effectiveness is measured differently according to each test method. Image analysis was shown to be the most reliable method. [Author abstract, amended] (6 figs, 4 tables)

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Paper Machines, Maintenance

PRESSURE SCREEN CAPACITY – CURRENT FINDINGS ON THE ROLE OF WIRE WIDTH AND HEIGHT
Jokinen, H et al.
Tappi Journal, Vol. 6 (1), 2007: 3 – 10
0701-8A
The influence of wire geometry parameters on pressure screen capacity and accept quality was studied. The furnish used was news-grade TMP. Contrary to common belief, the open area of the screen plate does not always indicate its capacity. Capacity gain is achieved if the open area is increased by widening the slot, but if it is done by decreasing the wire width excessively, there may be a loss of capacity. Other factors that increase the capacity are increased profile height and lower wire height. However, none of the parameters studied affected the general negative correlation between screen capacity and separation selectivity. When optimizing, the robustness of the screen plate needs to be considered as well. (11 figs)

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EFFECT OF BAR GEOMETRY ON SCREEN PLATE PERFORMANCE – A LABORATORY STUDY ON PRESSURE SCREENING
Jokinen H et al
Nordic Pulp and Paper Research Journal Vol 21 (4) 2006: 451-459
0701-8B
Ten different bar geometries were tested at various slot velocities using water and TMP pulp, and laboratory equipment. Screen plate performance can be influenced by the slot width and bar geometry: bar width, height, profile and shape. However these parameters do not affect the general negative correlation between screen plate capacity and separation selectivity in probability screening. The results can be used for designing bar geometries and for choosing the optimal screen basket for a screening position, i.e. for given capacity and quality requirements. (15 figs, 1 table)

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CALCULATIONS RELATING TO WEB BUCKLING RESULTING FROM ROLLER MISALIGNMENT

Good J K & Beisel J A

Tappi Journal Vol 5 (12) December 2006: 9-16

0701-8C

Earlier work on the causes of web buckling is expanded in this study to include the orthotropic properties of many webs. The effects of web shear stiffness, web tension, and the traction between webs and rollers on troughs and wrinkles were also examined. Generalised expressions for the levels of roller misalignment were used to determine what levels of misalignment are acceptable in each span of a process machine for a given web material. These expressions will be useful in process machine design, roller maintenance, and in troubleshooting web buckling and coating problems in the machinery. (14 figs, 1 table)

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DYNAMIC MODELING OF A PAPER MACHINE, PART 1: PROGRAMMING AND SOFTWARE DEVELOPMENT

Barber VA and Scott GM

Tappi Journal Vol 6 (1) Jan 2007:11-17

0701-8D

A dynamic modular paper machine simulator package was developed using Matlab® and Simulink®. The construction of the model in modular block form allows the user to reconfigure the machine in a variety of ways, allowing for greater versatility when modelling different systems. Changes can be made to the model configuration as well as to the user-defined parameters, enabling the user to see the effects of system changes as they occur without the time or cost necessary for a trial paper run. (5 figs, 2 tables)

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DYNAMIC MODELING OF A PAPER MACHINE, PART II: EVALUATION OF WET-END MODEL DYNAMICS
Barber VA and Scott GM
Tappi Journal Vol 6 (2) Feb 2007:18-22
0701-8E
In this study, the performance of a simulator package developed by Matlab® with Simulink® for modeling the wet-end of a pilot paper machine was evaluated. Pulse additions, step additions and step reductions in lithium chloride, and the measurement of lithium concentrations in the headbox, mixing chest and white water trough were used to quantify the errors incurred in the model. Some of the discrepancies in the results may be reduced by optimising the user-defined model parameters or by creating more sophisticated models of the paper machine components. (7 figs)

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OPTIMAL OPERATION OF TMP-NEWSPRINT REFINERS
Lama, I et al
Nordic Pulp and Paper Research Journal Vol 21 (4), 2006: 534-541
0701-8F
Any TMP-refining plant must satisfy constraints on pulp quality, in particular, long fibre content (LF) and freeness (CSF) as these two properties affect the strength of the pulp and ultimately the runnability of the paper machine. This paper presents a model-based optimization approach to operate TMP refiners in the face of plate wear and seasonal changes in wood quality. Specifically, to minimize energy consumption while keeping pulp quality (LF and CSF) under constraints. The model describes the relationships between the standard manipulated inputs affecting both refiners and the quality of the pulp leaving the latency chest. (6 figs, 2 tables)

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FEED CONSISTENCY AND ROTOR EFFECTS ON PULP SCREENING MECHANISMS AND REJECT THICKENING.

Walmsley, M and Weeds, Z

Appita Journal vol 60 (2), March 2007: 136-143
0701-8G

Mechanisms are proposed to explain reject thickening behaviour of wood pulp fibre suspensions in a fractionating screen with 1, 1.6 and 2.4mm smooth holes under conditions of increasing feed consistency using a step and bump rotor. Sub-mechanisms which rely on flocculation effects and aperture flow changes induced by the screen rotor are explained. A semi-empirical assessment using two fibre passage ratios (forward passage from feed to accepts and reverse passage under back-flushing flow from accepts to feed) identifies the most probable effect of feed consistency and rotor type on overall fibre passage ratio and hence reject thickening. Reject thickening factors and overall fibre passage ratios were obtained from experimental trials screening radiata pine and eucalypt kraft fibre at feed consistencies ranging from 0.001% to 2.5%. Characteristic curves became evident when the overall passage ratio was plotted against feed consistency. The general shape of these curves was mainly dependent on the rotor used and was much less dependent on fibre length, aperture size and rejects rate. The differences in shape are accounted for by the existing of different amounts of back-flushing flow induced by the rotors and the consequences of this. [Author abstract] (12 figs)

Pulping, Bleaching

MAGNESIUM-BASED ALKALIS FOR HYDROGEN PEROXIDE BLEACHING OF MECHANICAL PULPS
Wong D F, et al.
Pulp and Paper Canada Vol 107, no 12, 2006: 68 – 73
0701-9A
The use of magnesium oxide and magnesium hydroxide as alkali sources in hydrogen peroxide bleaching of Balsam fir TMP was studied. A maximum brightness of 78% ISO was obtained with the application of 6% peroxide with both magnesium bases. The optimum charges of the magnesium bases were lower than that of sodium hydroxide. The yield after bleaching was higher than with sodium hydroxide and this resulted in an effluent with a lower COD and a lower cationic demand. The strength properties of pulp bleached with the magnesium bases was lower than that of pulp bleached with a liquor containing sodium hydroxide. The choice of the use of magnesium oxide or magnesium hydroxide at a particular mill would be determined by cost and handling equipment. (6 figs, 5 tables)

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BLEACH PLANT AND SCREEN ROOM MODERNIZATION
Bennett, J. and Garant, L.
Pulp & Paper Canada, Vol 107, (9), 2006: 27 – 32
0701-9B
A softwood Kraft paper and pulp mill was modernized with respect to the bleach plant and the brown stock screen room because of customer requirements and effluent treatment restrictions. The bleach plant portion consisted of re-routing stock and filtrate flows to enable the operation of bleach plant in a 3 stage / 2 stage split configuration. The screen room portion involved in replacing obsolete screening system with a single line pressure screening system to improve pulp cleanliness and reduce fibre and BOD losses to the effluent system. The project was completed on schedule with an excellent performance: the bleaching cost was reduced by 14% on average, the total shive count in unbleached pulp was halved, and the operational consistency has been dramatically improved. (10 figs)

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RECENT ADVANCES IN THE COMMERCIALIZATION OF NIR (NEAR-INFRARED) BASED LIQUIR ANALYZERS IN THE PULPING AND RECOVERY AREA
Hodges R et al
Tappi Journal Vol 5 (11) November 2006: 3-10
0701-9C
NIR spectroscopy technology developed by multiple investigators has been demonstrated to be a quite effective method for the analysis of white, green and black liquors. Recently developed commercial analysers are currently running at different mill sites and are proving to be superior to alternative technologies in that they are accurate, simple in design and installation, low in total installed cost and low in maintenance. (15 figs, 1 table)

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SPECTROSCOPIC METHODS FOR MONITORING PULP BLEACHING PROCESSES
Yuan H, Garver T and Sedgwick G
Pulp and Paper Canada Vol 107 (10), 2006: 49 – 51
0701-9D
Raman spectroscopy has been used successfully for six months to measure continuously the residual hydrogen peroxide in process streams in a BCTMP mill. The intensity of the peak at 877 cm-1 in the Raman spectrum has a linear relationship to the concentration of peroxide in the liquor. In kraft pulp bleaching, Raman spectroscopy was used to measure the chlorine dioxide and sulphate ion concentrations in liquors. UV spectroscopy can be used to determine the chlorine dioxide and dissolved lignin concentrations. The colour of the dissolved lignin can be determined by the use of a combination of different UV absorbance measurements.(5 figs, 1 table)

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THE BEHAVIOUR OF CHROMOPHORIC STRUCTURES IN SOFTWOOD MECHANICAL PULP ON BLEACHING WITH ALKALINE HYDROGEN PEROXIDE
Svensson R E et al.
Nordic Pulp and Paper Research Journal Vol 21, (3), 2006: 359 – 364
0701-9E
The reasons for the large consumption of hydrogen peroxide during bleaching of mechanical pulp and the limited increase in brightness were investigated using a commercial TMP and the corresponding isolated milled wood lignin. Methylation or oxidation of the phenolic groups in the lignin did not result in an appreciable increase the brightness ceiling. The excessive consumption of hydrogen peroxide and the formation of stable chromophoric groups in the lignin were a consequence of the decomposition of the peroxide. The highly-reactive radicals formed from the decomposition react with lignin to produce coloured structures which are not degraded by peroxide. The authors concluded that one way of minimizing these problems is to remove more of the transition metals from the pulp prior to bleaching to reduce the decomposition of the peroxide. (8figs).

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REMOVAL OF METAL IONS FROM WOOD CHIPS DURING ACIDIC LEACHING 1: COMPARISON BETWEEN SCANDINAVIAN SOFTWOOD, BIRCH AND EUCALYPTUS
Saltberg A, et al.
Nordic Pulp and Paper Research Journal Vol 21, (4), 2006: 507 – 512
0701-9F
Metal ions were removed from Scandinavian softwood, birch and eucalypt wood samples by acidic leaching. Experiments with wood powder showed that the extent of leaching increased as the pH decreased. Potassium ions were released to a higher degree than the divalent ions manganese and calcium. Calcium was more easily removed from the softwood and birch samples than from the eucalypt sample. Industrial wood chips from the same wood samples were used to study the influence of temperature and the wood source. Leaching at a pH of about 2.5 improved with increasing temperature. The Scandinavian softwood and birch wood chips had similar leaching patterns whereas with the eucalypt wood chips the release of calcium was lower than for the other two woods. Further investigation showed that the calcium in the eucalypt wood was present mainly as the oxalate salt. There were large variations in the oxalate content of eucalypt wood samples.(8 figs, 2 tables).

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MODELING LEACHING OF CALCIUM IONS FROM SOFTWOOD CHIPS
Saltberg A, et al.
Nordic Pulp and Paper Research Journal Vol 21, (4), 2006: 513 -519
0701-9G
A model was developed to describe the leaching of calcium from industrial softwood chips under acidic conditions. Initial experiments utilized sawn wood samples with a well-defined geometry and a liquor of pH 2.5 at 60oC. The results showed that the leaching could be described with a model assuming that the wood is semi-homogeneous with different diffusion coefficients in different directions. The diffusion coefficient in the longitudinal direction and the coefficient across the grain (in the radial and tangential direction) were determined. A chip model for industrial wood chips was developed taking into account the inhomogeneities by using surface area enlargement. Batch leaching was simulated and showed acceptable agreement with experimental data. (10 figs, 2 tables).

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MODIFICATION OF PRECIPITATED KRAFT LIGNIN THROUGH THE ADDITION OF CALCIUM – REDUCTION OF SO2 EMISSION
Moosavifar A, et al.
Nordic Pulp and Paper Research Journal Vol 21, (4), 2006: 493 – 495
0701-9H
Lignin precipitated from black liquor has been used successfully as a fuel but its sulphur content results in unacceptable levels of SO2 in the flue gases after combustion. This study investigated the effect of addition of calcium (0-20% w/w) to precipitated lignin on the amount of SO2 in the flue gas after combustion at 700oC. The results from the combustion tests indicated that about 50% of the SO2 was removed from the flue gas by addition of calcium. Analysis of the residual ash by X-ray diffraction showed that the sulphur in the lignin was converted to calcium sulphate during combustion. (5 figs, 1 table).

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INCREASED CAPACITY IN KRAFT PULP MILLS: LIGNIN SEPARATION AND REDUCED STEAM DEMAND COMPARED WITH RECOVERY BOILER UPGRADE

Axelsson E, et al.

Nordic Pulp and Paper Research Journal Vol 21, (4), 2006: 485 – 492

0701-9I

This study investigated two ways of eliminating the bottleneck caused by the recovery boiler when the production of a kraft pulp mill is increased. The reference approach involved upgrading the recovery boiler as well as the turbine system so that the production of electricity was increased. The other approach was to maintain the same load on the boiler by removing lignin from the black liquor as well as implementing steam-saving measures to ensure that the boiler could supply the required amount of steam. It was concluded that if the lignin price was about 15 Euro/MWh, lignin separation would be an economically attractive alternative for debottling the recovery boiler. However, in a situation where electricity prices are high, upgrading the boiler and turbine can give the same or better profitability. (8 figs, 7 tables).

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RECENT DEVELOPMENTS IN THE STABILIZATION OF HYDROGEN PEROXIDE BLEACHING OF PULPS: AN OVERVIEW

Wuorimaa A, et al.

Nordic Pulp and Paper Research Journal Vol 21, (4), 2006: 435 – 443

0701-9J

This paper reviews recent studies of the stabilization of hydrogen peroxide during pulp bleaching. The mechanism of the decomposition of peroxide by metal ions depends on the particular metal. With manganese ions, redox mechanisms are the most important whereas radical mechanisms are the dominant mechanisms with copper and iron. Magnesium salts are used to stabilize alkaline peroxide solutions but the precise mechanism has not been determined. Silicate has been used as a stabilizer and deactivates transition metal ions by forming the silicate salts. If magnesium is also present the complex magnesium-metal-silicate salt can be formed. Environmental pressures to close water systems have led to the development of new polymer-type stabilizers to replace silicates which can cause precipitation problems. The most effective organic chelating agents are DTPA, EDTA and organic phosphonates but they do not have any complexing ability above pH 10. (7 figs).

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ADSORPTION BEHAVIOUR OF CATIONIC FIXATIVES AND THEIR EFFECT ON PITCH DEPOSITION.

Maher, L E et al.

Appita Journal, vol 60 (2), March 2007: 112-119, 128.

0701-9K

The behaviour of the four different polymeric fixatives in the presence of wood extractive components with and without fibres was investigated. Cationic polyacrylamide (CPAM) and high and medium charge co-polymers of polyacrylamide and poly(diallyl-dimethyl ammonium chloride (polyDADMAC) were found to stabilise the wood extractive colloids in solution, as well as to attach the wood resins to the fibre. Polyethylenimine (PEI) was shown to cause non-selective deposition onto both fibre and non-fibre surfaces, as well as reduce the amount of wood extractives in the dissolved and colloidal phase. PEI was also found to preferentially interact with triolein and the medium charge co-polymer exhibited preferences in fibre attachment of oleic acid [Author abstract] (8 figs, 3 tables)

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MODIFIED ECF BLEACHING SEQUENCES OPTIMIZING THE USE OF CHLORINE DIOXIDE

Hamzeh, Y et al.

Appita Journal vol 60 (2), March 2007: 150-154

0701-9L

Novel ECF sequences using split application of chlorine dioxide have been designed and optimised. The application of low charges of chlorine dioxide on each D stage allows selective reactions on free phenolic groups and avoids waste of ClO2 in secondary reaction. Applying this new concept allowed a 30-35% reduction of ClO2 during prebleaching. Rapid DR and ER stages involved rapid mixing and low retention times (2 mins) were also successfully tested at low ClO2 charges. Avoiding additional washes can be obtained by suppressing washing between D and E. This was shown to be a good strategy provided an additional amount of sodium hydroxide to counterbalance the acidic carry-over of the D stage was added. As a result, the AOX release was significantly reduced compared to conventional DOE prebleaching. [Author abstract] (4 figs, 4 tables)

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A FTIR/PLS METHOD FOR DETERMINING VARIATIONS IN THE CHEMICAL COMPOSITION OF BIRCH (Betula pendula/B. pubescens) STEM WOOD

Toivanen T-J and Alen, R

Appita Journal vol 60 (2), March 2007: 155-160
0701-9M

The feasibility of using DRIFT (diffuse reflectance infrared Fourier transform) spectroscopy combined with a multivariate analysis method (a projection to latent structures determination, PLS) for predicting the distribution of the main organic constituents (cellulose, xylan, lignin and extractives) within the birch stem wood was examined. PLS calibrations were carried out to establish a mathematical correlation between the data sets of conventional (wet-chemistry based) wood analysis and the DRIFT spectra of the corresponding wood samples. Based on this approach, different surface within-stem wood maps on variations in the content of the main constituents were shown. [Author abstract, amended] (3 figs, 3 tables)

Environmental, Effluent, Emissions

IDENTIFYING ENVIRONMENTAL IMPROVEMENT OPPORTUNITIES FOR NEWSPRINT PRODUCTION USING LIFE CYCLE ASSESSMENT (LCA)
Salazar, E. et al.
Pulp & Paper Canada, Vol 107, (11), 2006: 32 – 38
0701-10A
Life Cycle Analysis (LCA) was used to assess the potential environmental improvements of newsprint production along its entire life following ISO1040 standards, which consist of four phases: goal and scope definition, inventory analysis, impact assessment, and interpretation. A baseline model employing the LCA methodology was developed for the newsprint production from an integrated TMP/DIP mill. From the study, 20-40% reduction in global warming potential was achieved, the eutrophication potential could decrease by 50 to 60% with a tertiary treatment, and the electricity mix was found a critical non-process factor affecting the model results. (17 figs, 4 tables)

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PROGRESSIVE SYSTEM CLOSURE AT TEMBEC'S SHOOKUMCHUCK KRAFT PULP MILL, PART 1: PROJECT DESCRIPTION AND ANALYSIS
Paleologou, J.N. et al.
Pulp & Paper Canada, Vol 107, (11), 2006: 23 – 31
0701-10B
Progressive system closure entails the reduction of pollution at the source through a step-wise implementation of several existing and new cost-effective technologies and strategies to recover and/or re-use more of the water, fibre, chemicals and energy in the waste streams. The technologies and strategies identified for the application of the progressive system closure program in a pulp mill were described in the paper. This program is expected to reduce the impact of the effluent from the mill to a local river, save chemical cost, and address the environmental risk. (13 figs)

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CONTROL OF REDUCED SULPHUR AND VOC EMISSIONS VIA BIOFILTRATION
Lau, S. et al.
Pulp & Paper Canada, Vol 107, (12), 2006: 57 – 63
0701-10C
A biotrickling filter was introduced to treat the odour and waste gases released from the brownstock washer in Domtar's Cornwall pulp and paper mill. This paper presents the design of the biotrickling filter, its operational guidance, environmental impact assessment and economic analysis of using this biofiltration technology. The trickling water system allows for control over temperature through the addition of readily available steam. The biomass level and pH can also be easily controlled, and the conditions are finely adjusted to respond instantly to the mill and environmental circumstances. (13 figs, 4 tables

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