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Vol.64, No.1 Abstracts

## The Summary of Cl & K Removal System Using Ion Exchange Resin
## - Give an Outline of Chloride Ion & Potassium Ion Removal System from Electrical Precipitator Ash Solution-

Tsunenori Okamura
Specialty Plant & Materials Division, Nippon Rensui Co.

In the Kraft Pulp Production Process, the plugging problem of carryover particles and dust at the Recovery Boiler is one of particular issue for Cooking Chemical Recovery Process in many years. This problem is known it caused by decreasing melting temperature of dust along with increasing concentration of Chloride (Cl) and Potassium (K) in the Black Liquor because of Cl, and K entering with raw-material wood chip are gradually accumulated and concentrated during continuous operation. This manuscript provides outline of constituent of “Cl & K Removal System using Ion Exchange Resin” which was developed by Nippon Rensui Co. cooperated with Hokuetsu Paper Mills, Ltd., and installed at Niigata Mill as the first commercial plant, also installed at Nippon Paper Industries Co., Ltd. Iwakuni Mill, Oji Paper Co., Ltd. Tomioka Mill, and awarded “SASAKI PRIZE in 2009”.

## ADC Double Conifiner
## -The Performance & Benefits-

Hideo Mochizuki
Technical Sales Department, AIKAWA IRON WORKS CO., LTD.

Continuous Recycling of used paper is changing the target of Refining not only “Lowering Freeness” but “Keeping Freeness but better paper strength”. Further issue is power saving. In almost all cases, this power reduction could be achieved by optimizing the installed equipments. In this situation, we released “ADC Double Conifiner” in 2002 for energy saving at refining process. Since then, we have been receiving good reputation from our customers and our ADC Double Conifiner is running in lots paper mills achieving energy saving and increase in paper strength at stock preparation process. This paper would report the actual operation and achieved merit in some paper mills with our pilot plant trial results.

## Possibilities of Bio Information Technology to Tree Plantation

Shinya Sasaki
Forestry Research Institute, Research & Development Division, Oji Paper Co., Ltd.

Since 1991, Oji Paper has been advancing the overseas forest plantation business for securing the forest resource and protecting the environment. Generally, one of the main difficulties in the breeding of plantation trees is that tree breeding requires long time. Now, we are challenging to speed up the plantation tree breeding program by new biotechnology.
A biomarker is an indicator of a biologic state of animal and plants. So, we are creating biomarkers to diagnose genetic potential, nutrient, and stress conditions of plantation trees. These biomarkers enable us to predict growth potential and wood quality in the future by measuring biomarkers at the seedling stage. We report our current status of the project.

## Operational Experience of New Chip Feed System

Kazuyuki Kanagase
Sendai Mill, Chuetsu Pulp and Paper Co., Ltd.

The production of the digester at Sendai mill has been increased from 400ADT/D of original production to 750 ADT/D with several upgrades. On the other hand, since the quality of raw materials has been getting worse and worse, it has been getting more difficult to keep the production. In addition, such low quality chips cause the troubles in the chip feeding line. In order not only to solve these problems but also to upgrade the chip feeding line, COMPACT FEEDTM system was adopted. Even it was experienced some unstable operation in the beginning of start up, COMPACT FEEDTM system enables us to solve those problems and to keep stable operation.

## Operating Experience of New Kraft Pulping Plant

Taro Sugiura Niigata
Mill, Hokuetsu Kishu Paper Co., Ltd.

The N 9 paper machine with 350,000t/year of the capacity has been built and has started for the commercial production from September 2008 in The Niigata Mill of Hokuetsu Kishu Paper Co., Ltd. With the plan to install the N 9 paper machine it was investigated that the production of LBKP in the mill has to be increased 500t/day based on the total mill balance.

In order to increase the production rate, the chip handling system and the continuous digester together with installation of a new impregnation vessel were modified, one pressure diffuser was added, and also it was constructed that i) a new fiber line including from the washing plant to the bleaching plant, ii) a recausticizing and kiln plant, iii) a oxygen gas generator (PSA), iv) a new evaporator, etc.. All modifications and constructions were finished in May 2008.

In this paper, it will introduce that the main equipments in the continuous digester, the fiberline, the recausticizing and the kiln as well as how the operation of these systems since start up.

## Effective Peroxide Bleaching of Deinked Pulp Adding Catalase Inhibitor

Masatake Yoshizu
Yufutsu Mill, Nippon Paper Industries Co., Ltd.
Yukitsugu Kado
Technical and Engineering Div., Nippon Daishowa Paperboard Co., Ltd.

Catalase is a common enzyme found in nearly all living organisms which are exposed to oxygen, where it functions to catalyze the decomposition of hydrogen peroxide to water and oxygen. As is generally known, multiplications of aerobic bacteria may lead to increase of catalaze at pulp plant. Large existences of catalase inhibit pulp from bleaching efficiency, and excessive charges of peroxide will required to achieve the expected brightness, which will increase the cost of production. Sterilization of bacteria by the fungicide, inactivation by heat treatment or application of chelating agent, they can inhibit the activity of the catalase. This paper describes results on catalase inhibitor which performed effective peroxide bleaching at HDIP plant In Ishinomaki mill.

## Operating Experience in Cross-direction Moisture Profile Control System for Corrugating Medium on PM7

Tsukasa Chiba
Yashio Mill, Rengo Co., Ltd.

PM7 of Yashio Mill, Rengo Co., Ltd. produces corrugating medium ranging from 115 to 160gsm. Since the commission of the machine in 1991, over 1000tpd of corrugating medium is distributed Japan-wide. In order to meet paper quality requirement and to improve the machine speed with the increased demands of lower basis weight paper, cross-direction moisture profile control system was installed.

Control actuator selection was based on the compact design for the purpose of saving space. Also, cross-direction moisture profile control system supplied by YOKOGAWA Electric Corporation was installed after duly considering effective profile control at dryer rear part. This system by YOKOGAWA is the first to be used in the Japanese paperboard industry.

Outline of the facilities, operational experience and installation achievements will be introduced below.

## Operating Experience of Single Nip Shoe Press

Kazuteru Niida
Kasugai Mill, Oji Paper Co., Ltd.

Oji Kasugai PM4 produces many kinds and grades of paper such as uncoated woodfree paper (joushitsu-shi, chushitsu-shi), base paper for A2, A3 and LWC grade. In recent years, we have increased our production of low-density paper in step with the growth market. In order to produce low-density paper on PM4 with tri-nip press, it was needed to reduce nip pressure and to add lots of chemicals which make paper density lower. It caused decreasing of dryness at press section, rising cost by using chemicals, additional loss time for grade change, and increasing consumption of pulp and energy. As a countermeasure for these problems, we have developed new press type in which we could produce not only smooth wood free paper but also low-density paper with effective dewatering and without such chemicals. And finally we installed 'single nip shoe press and belt-smoother' in January 2008.

This paper will present the outline of 'single nip shoe press and belt smoother' especially about the process of development and selection of fabrics for this press type, challenges in operation and solutions for them. And some results of this project will be shown.

## Measurement and Analysis of Wet-end Section

Tomohisa Gondo and Manabu Yamamoto
Research & Development Div., Pulp and Paper Research Laboratory, Oji Paper Co., Ltd.

In recent years, papermaking conditions have been changed by the use of various recycled paper, high amount of coated broke usage and closed water system in paper mills. These situations cause wet-end problems such as deposition troubles and deteriorating first-pass retention and drainage, which lead to deterioration in runability and productivity. Therefore, papermakers require accurate solutions for wet-end problems urgently, but these situations complicate them.

In this paper, we suggest a process to solve wet-end problems, and show difficulty of their data analysis.

## Operation Experience of Biomass Boiler

Seiichi Mishuku
Iwakuni Mill, Nippon Paper Industries Co., Ltd.

Nippon Paper Industries Iwakuni Mill is rich in water from the Nishiki River and is in a coastal industrial region. Making use of this good location, we have mainly produced coated paper and information paper. And, we introduced 5KP, No.8 Recovery boiler and No.9 machine, and we started operating a biomass boiler, aiming at the post-heavy oil and a decrease of carbon dioxide emission. I will make a report about the experience of building, commissioning and operating a biomass boiler until now, and about a summary of the equipment and an early trouble with operating.

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## Water Removal and the Latest Felt Design

Fumio Sato
Nippon Felt Co., Ltd.

With a technological innovation in press section such as shoe press, paper machine performance has been rapidly improved. At the same time, press felts, a paper machine clothing, has been developed and its function has become higher and higher. A theory of water removal at press section was systematized by the 1980's, and pressure uniformity, rewetting and flow resistance are the key words in the theory. This report introduces Nippon Felt's latest press felts developed in consideration of these key words aiming at performance improvement.

## The Latest Development and Trend for Forming Fabrics
## -The Situation of Latest Triple Layer Fabric-

Koji Ohkita
Albany International Japan Corporation

Paper machine clothing suppliers have experienced greater change in the last few years than at any time since the industry converted from metal to synthetic fabrics. During recent years the share of SSB (Sheet Support Binder) multilayer fabrics has increased rapidly. Nowadays almost all major forming fabric suppliers in the world are selling more SSB fabrics than other styles all together. Depending on the paper grade, for Albany International, the biggest PMC (Paper Machine Clothing) supplier in the world, SSB forming fabrics cover up to 80% of the sales for the segment. Although this rapid evolution has been mainly customer-driven, it has been assisted by development in weaving technology. The latest developments in forming fabric technologies use ULTRAPLANE surface processing, ULTRAPRINT yarn technology (both MD and CD yarns have been reduced to 0.10 mm in diameter) and Inline warp binder concept technology. The focus of Albany International is the continued development of new technologies in both products and processes to target these objectives and provide the highest possible value to the papermaker. This article provides an overview of Albany International's newest SSB and In-line developments.

## Ceramics Applied to Various Formers

Akira Tobita
Technical Department, Horikawa Engineering Works Ltd.

For many years alumina, oxide ceramic, has been mainly used for dewatering blades. However by increased paper machine operating speed in accordance with improvement of plastic wires further anti-ablation and thermal shock resistance properties are required to dewatering blade materials. In case of alumina it has enough anti-ablation property but sometimes major cracks are created by thermal shock at the time of dry run just ahead of stock on wire. Such thermal shock is generated between plastic wires and surface of blades under high speed with high wire tension. Surface of blades are heated up over 180 degree C in a few minutes by dry run condition and they are cooled down suddenly by stock on wire.

To avoid above, numbers and amount of water shower must be increased but depending on design of a former still dry area can be appeared. Therefore, it is essential selecting ceramic material, which has both anti-ablation and thermal shock resistance properties.

HORIKAWA has been working on ceramic blades in different former types over 40 years. A huge applications and data are available. We are trying to standardize such information as far as possible. We wish to contribute to customers for selecting ceramic material and its maintenances.

## Operating Experience of Ishinomaki PM N6
## -Headbox, Former and Press-

Jun Hara
Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

The wet end of a paper machine contains the initial steps of the paper making process, including dispersion of the stock (pulp fibres) by the headbox, dewatering and sheet formation by the forming section, and mechanical dewatering in the press section. This is the part that determines most of the fundamental properties of the paper sheet, such as basis weight, formation, strength, fibre orientation and paper ply structure. The strength of the sheet is at its lowest here due to the high water content, while on the other hand it removes a large amount of water, also containing fibre. Thus, the wet end has the highest number of contaminant sources, and countermeasures against defects and paper breaks are of great importance. Further, aside from mechanical equipment, paper machine clothing is an important factor affecting paper quality and runnability. Since all clothing that runs on the paper machine, apart from dryer canvases, is concentrated in the wet end, it is a section in which clothing design selection and daily management is extremely important.

Ishinomaki PM N6 commenced commercial production on Nov 1st 2007, and since then had a smooth startup to now principally produce LWC and MWC at 1600 mpm. This report gives an outline of the latest equipment, and our recent operating experiences in the wet section of PM N6.

## Operating Experience of Niigata N9 Wet Section

Shingo Yamada
No.7 Production Department, Niigata Mill, Hokuetsu Kishu Paper Co., Ltd.

Niigata N9 has produced A3 grade as the paper machine focused on wide width, high speed and low base weight, since September 1, 2008. N9 has become a competitively cost performed paper machine with its high productivity brought by wide and high speed. Remarkable and distinctive equipments are a gap former which is new for us, tandem shoe press put 2-stacks shoe press in series, 4-stacks hot soft nip calendar bringing us on-line gloss paper, tail threading equipments for steady tail threading with high speed, and so on. This paper reports outline and operating experiences of N9 focused on wet section from headbox to press.

## Operating Experience of Mishima PM N10

Toru Hioki
Mishima Mill, Daio Paper Corporation

N10 paper machine introduced state-of-the-art technologies to realize its design concept of high speed on-machine coater which combines lighter paper with high DIP composition. We began the commercial operation in September 2007.

It can switch the coating process with blade coater and roll coater, and has online multi-nip calender. Therefore our products have higher quality compared with an existing machine and have achieved our first target.

After two-year operation, we report the comparison about quality and runnability with an existing machine, and the improvement of the productivity for lighter paper with high DIP composition.

## Operating Experience of Tomioka PM N1

Tetsuya Takubo
Tomioka Mill, Oji Paper Co., Ltd.

PM N1 in Tomioka mill started the trial operation from November 2008 and has produced commercial paper since February 2009. We successfully achieved the continuous operation at 1,600mpm and the production of 1,000t/day in last June.

This report presents the outline of troubles we experienced since commercial production started and the countermeasures.

## Introduction of Total Tail Handling System for Paper Machine
-From Wetend to Reel-

Shinji Matsui

Paper Machinery Sales Dept., Kobayashi Engineering Works, Ltd.

In recent years, according the speed increase of paper machine, the most reliable paper threading methods are required for entire parts of paper machine from wetend to reel.

The shortening of paper threading time contributes to not only direct reduction of production loss, but also progress of operation efficiency of paper machine. Easier paper threading which everybody can do it without experience, resulting in labor saving which means the reduction of operators who touch the tails of paper threading, offers you finally a great safety.

Considering kind of paper products, operational conditions, machine arrangements, etc., we prepare sophisticated paper threading facilities, coping with the various applications required for each part of paper machine.

Total tail handling system introduced this time, is the result of combination of process know-how, and manufacturing expertise obtained from our long experience in Japanese pulp and paper industry, and those of paper machine, who is a technical licensor in USA, succeed to and developed in the technology of former Beloit Corporation. This combination has succeeded in the epoch making improvement of tail handling system for whole parts of paper machine.

## Board Machine Technology of Andritz
## -New Board Machine Started the Operation in China-

Chiaki Kawakami
Andritz K.K.

Andritz AG (Austria Graz) had manufactured and sold paper machines under license from Escher Wyss until 1995. From 1996 Andritz started to focus on tissue paper machines and from 2000 made joint research projects in cooperation with Voith. Since then, Andritz installed more than forty high speed tissue paper machines mainly in Europe, North America and China. In 2005 Andritz restarted board machine business. As a result, an integrated board production facility that consists of recycled fiber line and board machine were ordered in 2007 by Hebei Yongxin Paper in China and started up in April 2009. The machine type is three-ply Fourdriniers and multi-dryer cylinders. The wire width is 6,200 mm, the design speed is 1,100 m/min and the production capacity is 350,000 ton/year. This paper reports the specifications, the machine concept and the start-up of the recycled fiber line as well as board machine.

## Development of a New Cooking System using Highly Concentrated Polysulfide (II)
## -Application to Modified Cooking with Multi Charges of Cooking Liquor-

Keigo Watanabe, Masahiro Shimizu, Kazuhiro Kurosu, and Yasunori Nanri
Nippon Paper Industries Co., Ltd.
Hiroshi Ohi
Graduate School of Life and Environmental Science, University of Tsukuba

Polysulfide (PS) cooking is one of the most efficient technologies available today to increase pulp yields. The PS has to be produced from Na2S in the white liquor (WL) to keep Na+ and S2- balance in the WL recovery cycle. To produce the PS in high efficiency, a WL electrolysis using ion-exchange membranes has been developed by Nippon Paper Industries CO., LTD.

Modified cooking is characterized by sequential charges of WL to the cooking digester. Recently, Iso-thermal cooking (ITC), which is one of the modified cooking, characterized by low temperatures and long-cooking times has been industrialized and installed in a lot of kraft pulping processes. However, not only NaOH concentrations but also Na2S concentrations at a start of the cooking are decreased, because the initial charge of WL was decreased by the modified cooking.

In this study, the combinatorial use of ITC cooking and PS cooking were evaluated, expecting a process in which the mill scale pilot electrolyzers were installed. A yield gain caused by the PS cooking was decreased in cases of the modified cooking conditions. However, when the PS was produced by the electrolyzers, the yield gain was increased contrary to the case by the air oxidation. By the electrolyzers, the PS concentrations became double and a lack of initial Na2S concentration was minimized.

In addition, the electrolyzers, which have a function of electro dialysis using ion-exchange membranes, enabled sulfide elements in WL to be concentrated as PS and Na2S. Consequently, much more yield gain was expected by using the new modified cooking.

Keywords: Polysulfide, Sulfidity, Na2S, Pulp yield, Electrolysis

## Relationship between Hexenuronic Acid and Brightness Reversion of ECF-bleached Hardwood Kraft Pulp Part 1

Ayano Kawae and Yosuke Uchida
Oji Paper Co., Ltd., Pulp and Paper Research Div.

Yellowing of ECF (Elementally Chlorine Free) or TCF (Totally Chlorine Free) bleached pulp has became a significant problem since 1990s. This brightness reversion tends to occur around pH 4.5. Acid-sized paper decreases brightness significantly. Many researchers have studied the causes of brightness reversion of softwood bleached kraft pulp having brightness of around ISO 90%. Affects of cellulose, hemicellulose, hexenuronic acid (HexA) and metal ions were reported. Some factors will probably affect each other. Although the mechanism is still unknown, it has been shown that HexA is a main cause. To remove it, acid treatment, hot chlorine dioxide bleaching, powerful ozone bleaching were introduced. However, they need a huge amount of energy, and decrease pulp yield and strength.

In Japan, brightness of bleached pulp is usually around ISO 86%, and it is rare to produce bleached kraft pulp having brightness of ISO 90%. We have to consider affect of lignin besides HexA. The purpose of this report is making the affect of HexA in Japanese kraft pulp clear, and finding the way to avoid the yellowing by an efficient method.

It was shown that HexA was also a main cause of heat and moisture induced yellowing of Japanese hardwood bleached kraft pulp (LBKP). Compared with reactivity of chlorine dioxide to lignin, that of HexA was low. Therefore HexA tended to remain in D-ECF bleached pulp. We concluded that reducing HexA and lignin ratio of the pulp entering into D-ECF bleaching is important to decrease HexA content of LBKP. The ratio of unbleached hardwood kraft pulp (LUKP) had a maximum value toward kappa number of the pulp. As one of the ways to avoid the yellowing, the cooking kappa number should be fixed higher or lower than the kappa number that gives the maximum HexA content.

Keywords : Hexenuronic acid, Brightness reversion,　Yellowing, Kraft pulp, Hardwood, ECF, ECF bleaching

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## The Roll of System & Control Engineer of Steel Plant and the Recent Technology Trend

Hisanobu Soejima
Systems & Control Engineering Div., Environment & Process Technology Center, Nippon Steel Corporation

The process of steel plant requires the high reliability, which endures the 24hours continuous operation, high responsibility and high accuracy, which realizes the manufacturing at several micrometers accuracy in a high speed, high productivity and high efficiency, which realizes the reduction of labor and energy saving.

In this report, I give an outline about the technique trend of the characteristics such as a training system, software productivity improvement measure and the operation support system realizing the organization of the system and control engineer in the steel industry and a role / personnel training and technique tradition on the basis of the above-mentioned trend.

## Tomioka N-1 Control System

Takayuki Ohkura
Tomioka Mill, Oji Paper Co., Ltd.

PM N-1, which is the All-Online-Concept paper machine, had been built in Tomioka mill. There are two main purposes to build the machine. One is to increase productivity of the LWC which has the growth market; another is to enhance global competitiveness at this market. We started the trial operation of the machine at the beginning of November 2008, and then the commercial operation successfully from the February 2009.

This report presents the outline and the feature of the control system introduced into Tomioka N-1.

## The Introduction Progress and the Future Tasks on Niigata N9 Machine Control System

Kosaku Wakabayashi
Automation Dept., Niigata Mill, Hokuetsu Kishu Paper Co., Ltd.

N9, fourth on-coater machine in Niigata mill, has started commercial production since September 2008. It aimed at high productivity and cost competitiveness as high-speed･wide-width･A3 paper machine, and its right starting up was accomplished.

Formations of machine equipments are separated in the Coating section and other section. Voith-IHI Paper Technology was chosen on the Coating section and Metso Paper was chosen on the Head box to the Pre-calendar and the Reel section.

In this paper, we would like to report the introduction progress and the future tasks about Metso MCS (Machine Control System) which we innovated on N9 operation.

## The World Trend of Drive Systems for Paper Plant

Masahiro Miura
Yaskawa Siemens Automation & Drives Corp., System Application Dept., System Engineering Div.

Yaskawa Siemens Automation & Drives Corporation (hereafter referred as YSAD) was founded in the year 1999 as a joint venture between Yaskawa Electric Corporation Japan (hereafter referred as YEC) and Siemens AG Germany (hereafter referred as Siemens), thus combining Japanese and German know-how systems and solutions engineering. We offer industrial electrical systems in many industry segments except steel and public work projects, and electric and electronics products and after-sales service with YEC products and SAG drives.

In the paper and pulp industry, our products and systems had been applied for many years before YSAD was established and since the establishment we can offer them Siemens products as well as YEC ones to meet the users' need. And our know-how of equipment accumulated through the strong relationship with the paper manufacturing companies and the machine makers in Japan and the overseas drive system technology are combined, which enables us to offer the optimum system with the latest technology.

This time the world top class project was completed in cooperation with Siemens I&S (Industrial Solutions and Services) that is the system engineering section of Siemens. We introduce the idea and the core technology in the paper manufacture machine control of Siemens in a part of SIPAPER CIS.

DRIVE YSAD will play a leading role to develop a new Japanese style and contribute to improve the electricity and the instrumentation technology of the paper pulp industry in Japan in the future, by absorbing the Siemens philosophy to integrate with the technology that we have cultivated in the Japanese market.

## Introduction of the Energy Saving Activity in the Factory
## -Success Key Factors for Energy Saving Approach-

Kazuo Sawauchi
Yamatake Corporation Advanced Automation Company, Sales Headquarters, Sales Engineering

The first period of the Kyoto Protocol committed in 1997 will already have started in 2012- 2008.It aims at 5% reduction compared with 1990 in the entire advanced country and Japan is declaring the reduction the comparison 6% 1990 year. Advancement and a constant effort of a great energy-saving technology, and the amount of the CO2 emission is increasing tendencies in gross weight by a production increase in the unit requirement according to the effort of each enterprise compared with 1990 though conservation of energy is advanced. Conservation of energy is called the one to squeeze a dry dustcloth well. There was a limit in great capital investment and optimization in the energy use by cooperation with the energy-user came to be requested only by the energy-supplier though it had been certainly centered up to now to supply energy and executed energy conservation.

It introduces the case where effective energy saving achieved by the approaching by the cooperation of both the energy supplier and the energy user.

## Use Case of Non-contact Caliper Sensor

Susumu Nozoe and Shingo Totsuka
Fuji Mill, Nippon Paper Industries Co., Ltd.

QCS (Quality Control System), one of the important components for Quality Management of papermaking processes, has been still improving since it was introduced almost half century ago. Recently it picked up to develop new sensors and the most remarkable sensor of those would be Non-Contacting Caliper.

F13M/C-F33C/R at Fuji mill produces Light Weight Coated Paper. The products include more of recycled pulp and the machine speed was increased more than 1200 m/min. Through the above machine operation, the paper damages from pinching actions of Contacting-Caliper sensor would become a bigger problem. Additionally down stream process of F33C/R has a lot of concerns about paper damages by using Contacting-Caliper, so we usually give up its continuous use.

To solve those problems, new Metso QCS with Non-Contacting (One side light-touch) Caliper was installed at F13S/P as a QCS renewal project last August. Also at F13M/C Honeywell Non-Contacting Caliper has been tested since last October.

This paper introduces the results for each of those and issues to be taken.

## Evaluation of DCS for User Engineering

Toshiyuki Murofushi
Otake Mill, Nippon Daishowa Paperboard Co., Ltd.

Distributed Control System (DCS) is necessary for the process industry like oil, chemicals, medicine, steel making, etc. including the pulp & paper industry. DCS is used as a plant monitoring and control tool and it assists the automation, conservation of energy, quality control, etc.

When we evaluate DCS, we focus on price, compatibility, after-sales service, user friendly interface and actual performance. But convenience for "user side engineering" is often overlooked.

The operator interface of the recent DCS is Microsoft Windows. Engineering has become easy. We can draw graphic interface and make control logic by ourselves. This report evaluate “engineering” aspect of several different vendors DCS from user point of view.

## Maintenance and Renewal of Drive Systems for Paper Machines

Tetsuji Shiota
Paper & Material Handling Systems Engineering Department, Industrial Automation & Drive Systems Division, TOSHIBA MITSUBISHI-ELECTRIC INDUSTRIAL SYSTEMS CORPORATION (TMEIC)

Half a century has passed since the first sectional drive was applied to paper machines. Drive units supplied by TMEIC reached 10,000. A lot of main drives have been operated for 20 years or more. Failures of the equipment would be increased. Continuous stable operation of the paper machine is important, however, the failures may cause long down time and less productivity. Therefore, the maintenance and renewal become inevitable more and more for the stable operation of the drive systems. This paper introduces technical points of the maintenance and renewal for the drive systems.

## Long Time Usage of Control Instruments DCS

Akira Takikawa
Lifecycle Solution Center, Yokogawa Electric Corporation, Global Sales Div.

Yokogawa's 5th generation of DCS (Distributed Control System), CENTUM-XL will come to System EOS (End of Support) in September 2010. Maintenance support will have ended in 22 years since it was sold in 1988. Even Yokogawa has provided maintenance support service beyond EOS for customers who wish to continue to use our systems, this CENTUM-XL is hard to continue to support. In this paper, we would like to summarize the situation and let customers understand it.

Also, to get customer's consensus and cooperation, we explain the tasks to solve and some solutions for them for longer usage of our system.

## Introduction and Problem of Valve Deterioration Diagnostic System

Yuta Komagata
TECHNO SUPPORT CO., LTD.

In 2006, Tokai Pulp introduced Intelligent-positioner and Field-care System which enable to accumulate working data of Automatic Control valves in brand-new DIP plant. This is to aim at, by way of utilizing diagnosis technology, grasping the most appropriate timing when to conduct maintenance works,preventing troubles of Automatic Control valves and reducing loss caused by operation stoppage in the plant, and easing worker’s burden coming from excessive maintenance works.

We are to explain up-to-date situation of systems which were introduced in DIP plant of Tokai Pulp on trial basis.

## Control Example of the Biomass Boiler

Tatsuya Sasaki
Kishu Mill, Kishu Paper Co., Ltd.

The biomass boiler at the Kishu mill uses seven types of fuels. The shape and elemental composition vary among those fuels, and such variation is the source of fluctuation in the calorific value and the time of the combustion process. For stable combustion of the biomass boiler, it is necessary to set the furnace temperature set value in the gain adjustment of the control according to the combustion time and the calorific value of fuels; however, the compositional variation of the fuels currently in use at the Kishu mill is beyond the adjustability of the conventional PID control system of DCS.

Therefore, at the Kishu mill, we have installed and tested an additional control system with which the DCS would be able to adjust to the various fuel compositions. This paper describes the outline of the system and the test results.

## The All New kajaaniPaperLab Automated Paper & Board Testing System with Completely New Generation for Off-line and At-line

Haruto Kondo and Masanori Shimozaki
Process Automation Systems, Metso Automation

After 25 years experiences and close co-operation with the customers, there has been launched new generation automated laboratory paper and board testing system comes from a completely new generation PaperLab to better match the needs of paper making today. The kajaaniPaperLab gives you freedom to move - from the lab right out next to the line - to give you the instant interactivity and real-time communications you need for faster results. You get answer without having to wait. Additionally, kajaaniPaperLab brings other unique features. By being designed in a highly modular manner, you have the Flexibility to personalize it to your own mill environment - to make it a member of your paper making team. All modules work together as a seamless package, ensuring the highest level of productivity. And we have built in the lowest cost of ownership so that you are free to move ahead and focus on improving your production performance.

## Analysis of a Delignification System Using tert-Butoxide as a Base

Kineo Takeno, Tomoya Yokoyama and Yuji Matsumoto
Laboratory of Wood Chemistry, Department of Biomaterial Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo

The -O-4 bond cleavage of dimeric non-phenolic lignin model compounds, 2-(2-methoxyphenoxy)-1-(3,4-dimethoxyphenyl)ethanol (3) and 2-(2-methoxyphenoxy)-1-(3,4-dimethoxyphenyl)propane-1,3-diol (4), was examined in potassium tert-butoxide/tert-butanol (KOtBu/tBuOH) and potassium tert-butoxide/dimethylsulfoxide (KOtBuDMSO) systems. The -O-4 bonds of (3) and (4) cleaved in both systems under conditions, 0.5 mol/l KOtBu at 30oC, which are much milder than those in general alkaline based pulping processes. The yields of an identified reaction product, 4-acetyl-1,2-dimethoxybenzene (acetoveratrone, (5)), in both systems were different from each other. This result suggests that the mechanism of the -O-4 bond cleavage is dependent on the solvents. The disappearance of (4) was faster than (3), suggesting the participation of the -position of (4) in the -O-4 bond cleavage. The degree of delignification was also examined in these systems using beech wood meal and chip. When the wood meal was applied, delignification was sufficiently attained in the KOtBu/DMSO system under conditions, 0.5 mol/l KOtBu at 110oC, while the KOtBu/tBuOH system did not work well. Neither system attained delignification, when the wood chip was cooked. A mild soda cooking as a post-treatment and a soaking in DMSO at room temperature for 2 weeks as a pre-treatment did not improve delignification. These results suggest that the insufficient delignification is probably attributed to the difficulty in the penetration of KOtBu into the chip.

Keywords: carbohydrate, DMSO, lignin, pulping, tert-butanol, tert-butoxide

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Vol.64, No.4 Abstracts

## An Afforestation of Northern District of Brazil
## -The Operation of AMCEL-

Akiyoshi Kawaoka
Forestry Science Research Laboratory, Nippon Paper Industries Co., Ltd.
Hiroshi Tachikawa
Research and Development Department, Amapa Florestal e Celulose S.A. (AMCEL)

Amapa Florestal e Celulose S.A. (AMCEL) is carrying out the eucalyptus afforestation which the total area is approximately 300,000 hectares in the savanna zone of the southwestern Amapa state, northern Brazil. The features of outstanding AMCEL are the flat and collected landed property, the distance to port, abundant precipitation, and warm temperature. However, the growth rate of the clones which was introduced from the other companies in early stages of the eucalyptus plantation of AMCEL was very poor, because those clones could not adapt greatly to different environment from a original district.

Therefore, AMCEL began the original selection breeding program and started development of the clone which was adapted for the environment of the landed property. The parent population of a breeding consists of two groups, one is the individuals which showed growth superior in a own plantation by seeds, and the other is the clone which brought by exchange from other afforestation companies. The clone which was excellent in tolerance for disease or growth was selected from these. And all were changed to a new clone from 2007, and growth improved greatly.

AMCEL continues development of a selection breeding and forestry technology, and aims at improvement in an amount of growth further.

## The Operating Experience after Continuous Digester Improvement

Masami Furui
Hachinohe Mill, Mitsubishi Paper Mills Limited

Hachinohe Mill, Mitsubishi Paper has the capacity 900,000 ton of papers per year. We have one continuous digester and four batch digester to produce kraft pulp in Hachinohe Mill. The continuous digester can supply about 80% of the kraft pulp produced at the mill.

We improved the continuous digester to increase production in August, 2007 and introduced the new chip bin and other equipment.

This report is described about the operating experience after continuous digester improvement.

## The Control Technology of Ishinomaki PM N6 Drive

Toru Ikeuchi
Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

The PM N6 at Ishinomaki Mill, Nippon Paper Industries started up on November 1, 2007 and has been producing LWC and SLWC (Bitokoshi). This machine has 1,600m/min maximum wire speed and 9,450mm of wire width with on-line blade coater and calender. The machine is composed of the equipment of domestic and overseas manufacturers. And main supplier for the PM is Metso which has good reputation with large coated paper machines all over the world. With Cutting edge technology of the manufacturers and production experience of us, we achieved high speed operation earlier than planned. It should be considered that drive control system contributed to this successful and stable operation; auto tension control system at all part after pre-dryer, stability of tension by speed responsiveness improvement of coater backing roll after starting coating, speed fluctuation control which reduces paper break after the coater blade is touched or opened during high speed operation.

On PM N6, Nippon Paper introduces the first all Siemens driving system as domestic paper manufacturer. This report describes latest Siemens drive control system technology and its contribution for steady operation of PM N6.

## Operating Experience of Niigata N9 Paper Machine
## -Shifting from Solving Problem to Stable Production-

Hitoshi Kuwano
No.7 Production Department, Niigata Mill, Hokuetsu Kishu Paper Co., Ltd.

Hokuetsu Kishu Paper N9 had started trial run since June 2008 and has started commercial production since September 2008. N9 has reached the original production plan 1000t/day and the operation has been quite smooth as the A3 paper machine.

N9 is the A3 paper machine as an on-machine coater based on the on-machine coater technology of our experienced N6, N7 and N8 in Niigata mill and a new on-machine calendar technology.

We reported our operating experience just after the start-up at last annual meeting., then this time, would like to report our knowledge we have got form our experience since commercial production.

Although big reduction of the number of running days by the late-2000s recession in the world, we have taken measure to solve primary problems and get stable operation. This paper reports our successful case studies so far.

## A Summary and Start-up Experience of Biomass Boiler

Syohei Hirase
Takaoka Mill (Nomachi), Chuetsu Pulp and Paper Co., Ltd.

We Takaoka (Nomachi) mill produce fine paper, coated paper, coated board and Kraft paper from our own making KP and DIP by operating 5 paper machine and 1 off-coater machine. We also dedicate in energy conservation and environmental preservation accordance with the ISO 14001 environmental management scheme. Main power sauce was RB generation and electricity purchasing from Hokuriku Electric Power Company. RB fuel is only fuel oil and black liquor. At this stage we have installed up to dated biomass boiler in June 2009 to achieve oil-less operation, converting from fossil fuel to reduce CO2 gas emission and energy cost.

Now let me introduce the summary of equipment and our installment experiences.

## Biomass Boiler Commercial Operating Report

Takehiro Kawamoto
Kishu Mill, Kishu Paper Co., Ltd.

Kishu-Factory has been promoting energy saving from the first. Furthermore, we are making a concerted effort to control emissions such as greenhouse gas and so on by improving saving energy and production efficiency after the division of Kyoto Protocol. However, we have not achieved the goal, reduction of greenhouse gas, due to increasing energy consumption of environmental equipment such as Elemental Chlorine Free (ECF) plant, waste paper treatment plant and so on. It is reported by Measures for Controlling Global Warning Plan.

Wind power generation, geothermal power generation and biomass gas turbine are remarkable technology for reduction green gas. The target date of 2010 is coming soon, however, there are many issues in running factory and profitability.

Kishu-Factory pays attention to waste wood, bark and waste plastic that have been scrapped. We planed a sharp cut of greenhouse gas by placing biomass boiler and stopping existing oil boiler. This is a report of biomass boiler commercial operating since July 2008.

Our biomass boiler has achieved 39% reduction in CO2 generated by fossil fuel in Kishu-Factory from previous year in spite of some troubles. From now on we will make greater efforts on reduction of CO2 generated by fossil fuel and on reduction in cost by making of ash soil and reducing of coal consumption.

## Technical Approach to Resolve Soot and Smoke Issues

Kazuki Yamaguchi
Environment & Safety Dept., Nippon Paper Industries Co., Ltd.

From June to July 2007, a voluntary internal investigation carried out at Nippon Paper Industries Co., Ltd., revealed that soot and smoke emissions at six mills exceeded the standards of the Air Pollution Control Law.

This issue was announced by Nippon Paper, on July 2, 2007. Since then, the company has worked to strengthen environmental management and regain trust by implementing measures to prevent recurrence. To prevent such problems from happening again, extensive preventive steps were taken with both facilities /management and compliance aspects.

The status of facilities /management aspect is reported below this time.

## Progress in Recycling by the New Classified Documents Process Facility in Soka Mill

Masaki Taguchi
Soka Mill, Nippon Daishowa Paperboard Co., Ltd.

From the resource utilization point of view, the paper manufacturing industry tackled the wastepaper recycling for a long time. Recycling applications of the wastepaper in Nippon Paper Group have improved day by day in various wastepaper grades of use.

To achieve further improvement of the utilizing rate, Soka mill of Nippon Daishowa Paperboard started the new recycling facility processing for classified documents from the various offices. Being equipped with the high consistency pulper, the facility including storage space is perfectly isolated with solid walls and PIN-code doors to keep its confidentiality. This paper shows the feature of the facility and the recent operation results.

## Creation of Fine Paper from Hardwood Bleached Sulfate Pulp (Part I)

Tsuneaki Kijima

This report is a brief history about the creation of the fine paper from hardwood bleached sulfate pulp. Although the sulfate process (KP) was introduced into Japan in the middle of the 1920s, the research and development efforts had been concentrated on sulfite process (SP) during the war. However, the members of Kyoto University found advantageous nature of KP over SP and announced it to the world through the journals and the patents. After the World War II , in order to reestablish Yufutsu factory (Kokusaku Pulp Ind. Co., Ltd.), Mr. Shigeo Mizuno decided to introduce a evolutional plan, in 1948, to produce the fine paper from the hardwood bleached pulp through the sulfate process. In those days, the hardwood was not used as the raw material for the fine paper, because the paper from the hardwood was thought to have insufficient strength for printing and wrapping. However, Mr. Bunzou Shimura, the partner of Mr. Mizuno, thought that, if prepared properly, the hardwood sulfate pulp would make the paper excellent in its properties. Although the authorities of GHQ insisted to introduce the semichemical process which was valued highly in the U.S. at that time, Mr. Mizuno and his partner persisted on introduction of the initial plan regarding the pulping process. As a result of painstaking efforts, industrial scale production employing hardwood bleached KP without any softwood pulp started for the first time in the world at Yufutsu mill in April 1952.

## Estimation of Kraft and Acid Sulfite Cooking Methods as Processes of Bioethanol Production

Shiho Takahashi, Keishi Tanifuji, Akiko Nakagawa-izumi and Hiroshi Ohi
Graduate School of Life and Environmental Sciences, University of Tsukuba
Keiichi Nakamata
Technical and Development Division, Hokuetsu Kishu Paper Co., Ltd.

We estimated the carbon content of softwood black liquor during kraft cooking to calculate its higher heating value and compared it with that of hardwood liquor. The bioenergy obtained from the black liquor of softwood chips consisting of Japanese red pine (Pinus densiflora) and Japanese cedar (Cryptomeria japonica) was 12.4 MJ/kg wood, which was approximately 3 MJ/kg wood higher than that of acacia (Acacia mearnsii) wood.

For Japanese larch sapwood, acid sulfite cooking had a better cooking response than alkaline cooking. The resolution ratios of the acid sulfite pulps obtained by enzymatic treatment were higher than those of the alkaline pulps, and were independent of the kappa numbers. The glucose yield from an acid sulfite pulp with a kappa number of 64.3 was much better than those from alkaline pulps. When acid sulfite cooking was carried out for a longer time at a low pH, the cellulose in the pulp degraded into spent sulfite liquor (SSL). Monosaccharide, mainly consisting of glucose (7.2% on wood weight), were obtained from the SSL. Therefore, it was shown that acid sulfite cooking was a more appropriate method for easily producing glucose and ethanol from both pulps and SSL than alkaline cooking.

Keywords: glucose, ethanol, cellulose, lignin, softwood, hardwood

Papermaking of Disintegrated Fibers of TEMPO-mediated Oxidized Pulps

Masanori Ishizuka
Technical Division, Yamashin Filter Corp.
Tsuguyuki Saito, Toshiharu Enomae and Akira Isogai
Department of Biomaterial Sciences,Graduate School of Agricultural and Life Sciences,
The University of Tokyo

When a hardwood bleached kraft pulp (HBKP) was oxidized by the TEMPO (2,2,6,6-tetramethylpiperidine-1-oxy radical)-mediated oxidation system under aqueous conditions, carboxylate groups were formed by the oxidation of the C6 primary hydroxyl groups. Aqueous slurries of partly fibrillated fibers could be prepared by disintegration of the oxidized pulps in de-ionized water using a domestic blender. After the disintegration, the mean fiber width of the pulp was unchanged, but the mean fiber length was decreased with the increase of NaClO added in the oxidation. Handsheets were prepared from disintegrated fibers of the TEMPO-oxidized pulps using tap water. The handsheets prepared from the oxidized pulp with NaClO of 5 mmol/g-pulp had low thickness and high paper density compared with the reference sheets prepared from the original HBKP, and had quite low air permeability. The diameter size distribution of micro pores in the handsheets measured by using a capillary flow porositmeter corresponds to the result of density measurement of the handsheets. The sheet formation became more heterogeneous by accelerated flocculation in papermaking, when the TEMPO-oxidized and then disintegrated fibers were used with tap water. Scanning electron microscopic observation combined with an energy dispersive X-ray analyzer revealed that the handsheets prepared with tap water contained significant amounts of calcium by ion exchange from sodium carboxylate groups in the oxidized fibers during the papermaking process with tap water.

Keywords: TEMPO-mediated oxidation, papermaking, hardwood bleached kraft pulp, disintegration, nano-fiber, permeability

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Vol.64, No.5 Abstracts

## Soda Pulping Technology as a Pretreatment of Enzymatic Saccharification for Ethanol Production
## -Problems during the Operation of a Pilot Plant-

Kengo Magara, Tsutomu Ikeda and Masanobu Nojiri
Forestry and Forest Products Research Institute

In 2007, Japanese government proposed to use gasoline containing 10% ethanol from domestic biomass for all vehicles in the country, which should be achieved by 2030. To support this proposal, Forestry Agency at Ministry of Agriculture, Forestry and Fisheries suggested that approximately 30% of the ethanol is produced from woody biomass. Assuming that 10% of gasoline consumption corresponds is 6 million kL, ethanol from woody biomass is required to be 2 million kL. For this large ethanol production, it is necessary to have approximately 4 million tons of cellulose as a raw material. To prepare such amount of cellulose, an application of alkali cooking technology is ideal, which have been used in pulp and paper industries such as Kraft and Soda cooking processes.

In recent years, we have already succeeded to convert alkali-cooked woody biomass, i.e. pulp, to ethanol by saccharification and fermentation at laboratory scale. Following this achievement, we designed a pilot plant for the production of ethanol from SUGI (Japanese cedar), which includes a continuous Soda-AQ cooking apparatus with the production of 0.7 t per days and a 5 m3-fermentation tank for the saccharification and fermentation with cellulose and yeast. The plant was built in Kita-Akita, Akita, and has been operated occasionally since June 2009. During the operation, it was found that there are several problems in the saccharification and fermentation processes for an efficient ethanol production, whereas no serious problem in the pulping process. These problems occur mainly during the transference and mixing of pulp suspension.

Keywords: ethanol, Soda-AQ cooking, woody biomass, plant operation

## Consideration of Causticization Technologies without Heavy Oil
## -Direct Causticization Technologies of the Past and the Present-

Tokiya Yaguchi
Kashiwa Laboratory, Biomaterial in Tokyo Co., Ltd.

Instead of the causticization process using lime has been applied as the chemical recovery process of the kraft pulp production, we have been studied about the causticization processes without heavy oil consumption from the past. We have developed the ferric oxide process, titanates process, borate process and etc. and tested many pilot plant tests and mill trials with some successful results. Because some merits and demerits about energy, economy and ecology in these processes, there have been no commercial processes until now. But, new interests about the causticization processes without heavy oil consumption have been formed by the black liquor gasification technologies for the effective energy use. As over 50% of sulfur compounds in black liquor were changed to H2S and leaved to the gas phase by the black liquor gasification, the causticization demand was increased. And then, the causticizing processes using titanate and borate have been studied. Another interests have been formed by the avoiding warming climate has been occurred by increasing CO2 concentration in atmospheric air. For CO2 absorption by NaOH from atmospheric air, NaOH was changed to Na2CO3 , and then Na2CO3 need to change to NaOH for the chemical recycling. The causticization using lime and titanate have been studied. It was recognized causticization using titanate require about 50% less heat energy and about 50oC lower reaction temperature than using lime.

## The Progress in Recausticizing Technology of Kraft Pulping Process

Motohiro Matsumura
Technology Div., Oji Paper Co., Ltd.

The progress of recausticizing, one of the most important processes in Kraft pulp mill, has played a large part in the development of Kraft pulping. This paper provides outlook of trends and challenges of recausticizing process in Japan by recapitulating the role of recausticizing process in Kraft pulp process and the transition of recausticizing technologies.

## Andritz Latest Recausticizing Plant Technology

Isao Samejima
Capital Systems Sales Group1, Andritz K.K., Japan

Since 1990, the capacity of the pulp production process has become bigger and bigger and therefore the white liquor plant capacity has also become bigger. In the recausticizing process operation, the heavy metal compounds have been built up in the liquor cycle. As a result, the white liquor quality becomes low, water in the lime mud cannot be removed easily, the lime kiln fuel consumption becomes higher. More strict environmental countermeasures will be required for the treatment of the green liquor dregs. Andritz Oy has been tackling and solving the above problems. This paper will describe the Andritz latest white liquor plant technology.

Keywords: LimeGreenTM, LimeFreeTM, LimeWhiteTM, LimeDryTM, LimeKilnTM

## Opportunities for Improvements in a New White Liquor Plant Project

Jiro Nakamura
Metso Paper Japan KK
Marcia Loutfi
Poyry Tecnologia Ltda.
John Middelhede
FLSmidth A/S
Alessandra Labigalini Baranovsky
Metso Paper South America
Anita Markusson
Metso Fiber Karlstad AB

During the recent years several new mills/lines have been built in Brazil. In these projects more strict requirements have been added in White liquor plant projects. These requirements include saving in power and fuel, better working environment and lower emissions. Selected concepts from some of these projects plus possible improvements are presented in this paper such as DNCG collection, zero liquid effluent, higher lime mud dryness, advanced control system and effect of bio fuel systems. A white liquor plant for a pulp mill designed for 1.5 MADt/year, using the opportunities for improvements is described. Additional items are discussed in the study such as lime kiln cooler types and lining configuration.

## The Consideration of Troubles in Recovery Process to Convert Smelt into White Liquor from the Viewpoint of Water Analysis

Hirotaka Ogasahara
Technical Section, Pulp & Paper Industry Department, Chemicals Division, Kurita Water Industries Ltd

Kraft pulping plant has several mutual processes: pulp production, energy recovery as black liquor and chemical recycle. Therefore, if one process is in trouble, it influences the whole plant.

Especially, it is important that the operation control of recovery process that converts smelt into white liquor. The troubles in recovery process result in decrease of pulp productivity with white liquor decrease, increase of heavy oil consumption in the lime kiln with deficient lime mud dewater, thus cause increase of CO2 discharge and production cost.

In addition, the green liquor process operation is the most important because it is the first process of recovery process and is influenced directly by the smelt productivity and the recovery boiler efficiency with pulp productivity fluctuation.

In this paper, we introduce the troubles and the treatments in green liquor process.

Keywords: green liquor, flocculation, scaling

## Saving Heavy Oil on the Lime Kiln System with Wood Pyrolysis Gas

Yasuhiro Miyagoshi
Bio Gas Engineering sec. Eco-Power Engineering Dep., JFE Engineering Co. Ltd.

The shift from fossil fuel to biomass for energy production is expected as promising measures to curb global warming. Firing heat recovery boilers is the most common application of woody biomass today. However, there are not many other practical uses of woody biomass because of some major limitations. One example of such limitations may be that the woody biomass heat recovery system requires specifically designed boilers, and thus existing fossil fuel fired boilers are not suitable for using biomass. Another example may be that the energy recovered from woody biomass is in the form of steam, which can be utilized only in a limited number of ways.

Biomass gasification is to expand the usage of woody biomass by converting it to versatile gas and tar through pyrolysis -thermal decomposition- process. With this process, woody biomass can be used in existing furnaces that are unsuitable to solid woody biomass.

The biomass gasification system of JFE Engineering Corporation, named JFE-Vlund Woody Biomass Gasification System, has its basis on the technology by Babcock & Wilcox Vlund ApS. As of today, three plants in Japan have installed the system. This article first introduces the system's features and then discusses a case study on the application of woody biomass to an existing lime kiln.

Keywords: Biomass, Woody biomass, Gasification, Lime kiln

## Production of Precipitated Calcium Carbonate in a Causticizing Process

Haruo Konno
Pulp and Paper Research Laboratory, Nippon Paper Industries Co., Ltd.

Precipitated calcium carbonate is produced as a by-product in the causticizing process of the kraft pulping process. Nippon Paper Industries Co., Ltd. started to use this calcium carbonate by the causticizing process (CCC) as filler and coating pigment over 25 years ago. One of the advantages to use CCC as filler and coating pigment is that filler and coating pigment can be produced on-site in a pulp mill with pulp production. Other advantage is that the lime kiln operation can be reduced or eliminated, resulting in the reduction of fuel oil consumption in the calcination of calcium carbonate. Furthermore, the accumulation of non process elements (NPE) in the lime cycle, which has recently been the big problem, can be avoided. Nippon Paper Industries Co., Ltd. has established the technology to use this CCC as paper material throughout the research and the technical development for many years.

In this paper, the outline of CCC technology is shown first. Then, filler and coating pigment production technology and the morphology-control technology developed in our company are presented. Subsequently, the influence of the implementation of CCC technology on the reduction of fuel oil consumption in the lime kiln operation and the reduction of NPE accumulation in the lime cycle and are discussed with the literature and the results of our research.

Keywords: Precipitated Calcium Carbonate, Causticizing Process, Fuel Oil Consumption, Non Process Element

## The Keenest AIKAWA Energy-Saving Technology for Deinking Plant
## -Re-pulping, Contaminant Removing, Upgrading-

Kazumi Fujita
Technical & Engineering Dpt., AIKAWA IRON WORKS CO., LTD.

In accordance with argument of Energy Saving Technology for Deinking Plant, the effort of AIKAWA Iron Works Co., Ltd. is presented as outlined in the AIKAWA's standard low cost DIP system for newsprint paper.

The AIKAWA's standard low cost DIP system for newsprint paper is the basic system of the lineup of AIKAWA low cost DIP system series for the most general DIP system for producing newsprint paper from ONP and OMG. The target of this system is to reduce the power consumption from the traditional 400-500kWH/T to 250kWH/T, to improve the yield, and to reduce the dosages of chemicals.

In this report, AIKAWA's high consistency pulping system, ultra low power consumption MaxFlow screen, and the keenest UV-Breaker & ConiDisc hot dispersion systems, for the AIKAWA's standard low cost DIP system for newsprint paper is presented. And also, for paper strength characteristic improvement, double conical refiner type ADC with low power consumption is presented.

Keywords: High Consistency Pulper, HeliDisc Rotor, Double Dumping Screen, Drum Type Continuance Pulper vs. High Consistency Batch Operation Pulper, MaxFlow Screen, GranFlow Screen, Two-Inlet Technology, Stock Dilution Part, NW Super-1&2 Screen Cylinders, Gladiator HC (GHC) Rotor, UV-Breaker, ConiDisc Hot Dispersion System, ADC Double Conical Refiner, Finebar

## Andritz Energy-saving Technologies for Deinking Process

Yosuke Takeshita
Capital System Sales Group 2, Andritz KK

This report introduces modern energy-saving technologies for deinking system of Andritz.??At the same time, we explain the energy-recovery technology of the DIP process.?New innovated technology of fractionation of fiber is abele to reduce too much power consumption by dispersion and other energy.

Andrizs Fibre-flo drum pulping technology has reduced the power-consumption compared with conventional high consistency pulping. And we select very low energy-consumption equipments, such as screen, disperser, cleaner for modern deinking process.

Also now, Andritz is trying to introduce the waste, such as sludge and reject generated from all kind of deinking process, to power technology. Hereby, the amount of carbon dioxide will be able to decrease to a large extent.

## Latest Technologies of Saving Energy for Deinking Process

Masakazu Eguchi
Stock Preparation Engineering Dept., Voith-IHI Paper Technology Co., Ltd.

In Japan, recycled paper handling is getting worse. In addition, increase of energy cost and moderate increase of paper demands of both graphic and brown paper industry, caused by economy crisis, puts all papermakers in much difficult position than before. Therefore, we can assume that achieving two contradictive challenges, that is, further reduction of production cost and sustaining the same quality level, would be a significant target for papermakers.

A DIP production process is a treasure of cost down-raw material, energy, and chemical costs are variable by the technology of each component. In this paper, we will introduce latest technologies for energy savings related to each component and system.

## Outlook of World Paper Industry and Challenge of Japanese Paper Industry

Kunitaka Toyofuku
JAPAN TAPPI

The production of paper and paperboard in the world was 390,910,000t (RISI) in 2008. Production volume was 62,310,000t in 1956, and the current production volume would increase more than about 6 times in half a century. The production volume in 2009 will largely decrease by this economic crisis. Nevertheless, from the long-term viewpoint, the demand for paper will continue to increase led by a developing country even if there is temporary recession. About world paper circumstances, I show an outline from the viewpoint of resources, energy, environment, population. At the same time, while catching a characteristic of each country, I introduce about the pulp and paper industry of various countries in the world, as the result of really visiting, hearing and seeing the spot.

In addition, on the basis of this situation, I mention about the challenge of Japanese paper. That is to say, technological expertise which makes the industry competitive internationally is needed. At the same time, there is need to satisfy Japanese customers who demand quality.

## A Report on 42nd ABTCP International Congress & Exhibition
## -October 26-29, 2009 at Sao Paulo, Brazil-

Kunitaka Toyofuku
JAPAN TAPPI

The 42nd ABTCP Pulp and Paper International Congress & Exhibition was held in Sao Paulo, Brazil on October 26-29, 2009 co-hosted by ABTCP and PI.

There were 5 special presentations as sector overview; Crisis Impact on the Global Pulp & Paper Industry and 65 general presentations on 6 sessions.

Reflecting of positive overseas activity of ABTCP and growth of Brazilian pulp & paper industry, there were many presentations from foreign countries. In this year affected by the economic crisis, the participant is reduced to half in comparison with the average year.

Special mention is enormousness of the attached exhibition. In the area of 5,600m2, 165 exhibitions were performed. When it compares the scale of the exhibition area in 2006, it decreases to half area.

After the congress, I visited Jacarei mill of Fibria just born by merger of Votorantim and Aracruz in Brazil and the production mill of bioethanol from sugar cane in Brazil.

## A Report on the 22nd ISO/TC6 Meeting

Takayuki Okayama*1, Toshiharu Enomae*2 and Kyoji Kishi*3
*1 Tokyo University of Agriculture and Technology
*2 The University of Tokyo
*3 JAPAN TAPPI

ISO/TC6 meeting was held on November 16-20, 2009 in Berlin, Germany. The number of registered delegates representing eighteen countries was seventy four.

Three delegates representing Japan attended WG meetings, plenary meetings of SC2 and SC5, and TC6 plenary meeting.

## Investigation of Adsorption Behaviors of Amphoteric Polyacrylamide on Pulp Fiber

Takashi Yamaguchi
Nippon Paper Industries Co.,Ltd.
Martin A. Hubbe and Orlando J. Rojas
North Carolina State University

Adsorption behaviors of an amphoteric polyacrylamide (PAM) with and without polyaluminum chloride (PAC) on pulp fiber were studied using model surface by QCM-D (quarts crystal microbalance and dissipation monitoring) technique. Because changes in frequency (f) of QCM-D data indicate the adsorbed mass values and those in energy dissipation (D) correspond to viscoelastic properties of the adsorbed materials on the surfaces in the QCM-D apparatus, adsorption behavior of PAM and related compounds on the model surfaces, the viscoelastic nature and conformational changes of the adsorbed PAM molecules were evaluated from the f and D values of the QCM-D data. The results obtained showed that conformational changes of the PAM molecules adsorbed on the model surfaces occurred, depending on both the material of the model surfaces and PAM-related compounds added. The amounts of adsorbed PAM reached a maximum around pH7-8, which was consisted with the isoelectric point of the PAM. The f and D values revealed that the PAM molecules had extended conformation around these pHs. Although detailed and accurate interpretation of the QCM-D data obtained was difficult, the model experiments obtained in this study provided significant information concerning adsorption behavior of PAM molecules on pulp fibers in papermaking process.

Keywords: QCM-D (quarts crystal microbalance and dissipation monitoring), amphoteric polyacrylamide, paper strength

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## Energy Saving by Changing Control of Cooling Tower Fan

Yoshitaka Aoyagi
Kanto Mill (Katsuta), Hokuetsu Kishu Paper Co., Ltd.

The reduction in the greenhouse gases emission is more important according to measures for controlling global warming. Therefore, the reduction in the amount of the fossil energy use and the approach on energy conservation are pressing needs. Our company also has executed various energy conservations enumerating all companies.

In Kanto Mill (Katsuta), the commercial operation of the biomass power plant was begun from the purpose of reduction of CO2 emissions, the energy cost reduction and a superannuated update of the existing oil fired boiler in September, 2006. As a result, it greatly contributed to the reduction of CO2 emissions.

To work on further reductions which pay attention to incidental facilities changed control of cooling tower fan. As a result, energy conservation became possible, it is introduced in here.

## Anaerobic Treatment of KP Evaporator Condensates with UASB Process

Tomohiro Kiyokawa and Takaaki Tokutomi
Kurita Water Industries Ltd.
Ichirou Umeda and Hiroshi Ougiya
Mitsubishi Paper Mills Limited

In field of wastewater treatment, anaerobic treatment is gradually introduced to reduce energy consumption and excess sludge. One more benefit is energy recovery as methane gas which can be used as energy source. The anaerobic treatment is introduced to treatment condensate from kraft pulp process, which contains high concentration of methanol. Methanol is easily biodegradable, but there are difficulties in stability of granule. In this work, pilot scale test with condensate from kraft pulp process was performed, and stability of granule was improved by new chemical addition.

## Approach to Energy Saving by Gas Turbine Introduction

Makoto Hayakawa
Gifu Mill, Oji Paperboard Co., Ltd.

The Nakatsugawa Mill is located in Gifu Prefecture, which stands for center of Japan and is manufacturing containerboard.

We concluded agreements on pollution prevention with Nakatsugawa City. To keep agreements we are actively involved in environmental preservation, such as acquisition of ISO14001 certification, reduction of waste, prevention of air and water pollution, prevention of noise and vibration.

Here, we introduce two energy saving examples. One is to replace fuel oil boiler and steam turbine to gas turbine co-generation system on June 2007. The other one is renewal of dryer hood on PM1.

## Energy Saving by Improvement of Flow that Dissolves Dust

Satoru Suzuki
Asahikawa Mill, Nippon Paper Industries Co., Ltd.

For the recovery boiler, it is preferable that black liquor is as high dry solids as possible, but the higher dry solids, the higher viscosity of black liquor and brings some problems such as plugging issue or unstable operation. In order to solve these problems, and to decrease power consumption, we had changed to dissolve the dust into 55% solids black liquor instead of heavy black liquor. As a result of it, we can keep the heating surface area more cleanly in the vacuum evapolater as well as energy saving in the black liquor process. In addition, dry solids of heavy black liquor has been improved.

## Energy Saving of the Fan by Flat Belt Drive System

Kenichi Minowa
Mitsuya Fan Mfg. Co., Ltd.

ECOFAN is new series of Mitsuya belt-driven fan. ECOFAN reduced 6-11% power in comparison with the V-belt driven fan by using the hyper flat belt drive system. ECOFAN has many merits（Ecology clean）else not to mention energy saving. Mitsuya introduce ECOFAN and example of the energy saving remodeling construction of fan in operation.

## Electricity Saving Work

Masanori Azumano
Takaoka Mill, Chuetsu Pulp & Paper Co., Ltd.

Recently, as environmental and global warming issues progress seriously, it is important for us to reduce the green house gas emission and as a company, energy cost saving is important issue as well. We are making effort to achieve high efficiency of using oil, steam, electricity and water by checking total unit cost. Accordingly we also established internally Energy managing committee which hold monthly meeting, site patrol and search energy site matters then settle the every kind of energy saving issues. Now taking this opportunity, we would like to introduce our Inverter frequency control system reported as QC activity together with operating site staff.

## Saving Energy by Innovative Machines of Pulping and Screening System

Sumio Ito
Akita Mill, Nippon Daishowa Paperboard Co., Ltd.

Our stock preparation system produces recycled pulp for liner board machine.
After No.1 line was installed in 1981, we have reinforced it to 1991 while recycled pulp increased and increased production of liner board machine. Today, we produce about 80% of recycled pulp for liner board machine. Our stock preparation system has three lines which are No.1 and No.2 line used 100% JOCC and No.3 line used JOCC and mixed waste paper. Then No.1 and No.2 line pulper was integrated in 2004 and this pulper was distributing recycled pulp to two lines of screen system.
In this time, we introduce the case that we could achieve saving a big energy such as improving pulper outlet quality, reducing a number of screens afterward, stopping auxiliary equipment by simplification of the system flow and so on by introducing innovative machines between pulper and screen system in No.1 and No.2 line.

## Energy Saving by Screen Upgrade in the OCC Process

Reiri Koga
Yodogawa Board Mill, Rengo Co., Ltd.

Rengo established Eco Challenge 009 in 2001 as the companys environmental objective and has strenuously worked on energy saving, reduction of wastes and effective utilization of resource toward the year 2009, the 100th anniversary of the company.

In order to strengthen the activity and set new environmental objectives, Eco Challenge 020 was established in 2009, the final year of the activity. In Eco Challenge 020, one of the targets is to reduce carbon emissions which is considered to have severe impact on the environment among the greenhouse gases. The goal of the company is to reduce the CO2 emissions level by 32% by year 2020 compared to the 1990 levels.

The paper will introduce a case of energy-saving and industrial waste reduction at Yodogawa mill by installation of reject screen (HD screen supplied by Satomi Co., Ltd.) to upgrade the fine screen process of JOCC line.

## A Report on Visit Pulp and Paper Industry in Europe after ABTCP Congress

Kunitaka Toyofuku
JAPAN TAPPI

I went across to Europe after participation for ABTCP Pulp and Paper International Congress & Exhibition was held in Brazil on October 26-29, 2009 and I visited the pulp and paper technology associations and the paper mills in Spain, Austria and Russia.

The pulp and paper industries in these countries are unfamiliar for Japanese in comparison with Nordic countries and Germany, but there was characteristic in each country. I report about the contents.

## Creation of Fine Paper from Hardwood Bleached Sulfate Pulp (part II)

Tsuneaki Kijima

It will be covered in this latter part of the report, why has the paper from hardwood pulp become the main stream of the fine paper production.

In April in 1952, the paper from the hardwood bleached sulfate pulp without any softwood pulp was produced for the first time in the world at Yufutsu mill in Hokkaido, overcoming lots of conventional beliefs. It had been thought for long time that the paper should be made from softwood pulp. But Mr. Mizuno and his partner Mr. Shimura believed to be able to make the paper from hardwood sulfate pulp excellent in its characteristics, in respects of those other than strength, if prepared properly in preparation stage of the pulp. As well known, in view of composition of the wood, the hardwood contains much hemicellulose which will behave as binder of the interfiber bonding that contributes to strength of the paper, and if cooked in sulfate process, much more hemicelluloses would remain in the pulp than cooked in sulfite process. In other words, the hardwood is able to put forth his value by the combination with the sulfate process. So, the paper from hardwood showed the strength equal to the paper from softwood sulfite pulp, in spite of its short fiber length. In addition, as expected by Mr. Shimura, shortness itself of the fiber length has brought to the paper many excellent characteristics, for instance sheet formation, bulkiness, stiffness, opacity and so on. Therefore, the paper from hardwood has earned high reputation in the market for usage of printing, wrapping and others. It was not long before this method started to be adopted actively in Japan, followed by the rest of the world. In addition, generally speaking, hardwood grows much earlier compared with softwood. Therefore, many large paper making companies are developing the afforestation estate aiming for self-sufficiency of the raw materials of the paper. It might be said that pulp and paper industry is on its way to sustainable ecological model attached with the progress of the biotechnology together.

## Strength Restoration of Paper from Recycled Pulp by an Addition of a Polyacrylamide Dry Strength Resin and Its Distribution within a Fiber Wall

Takushi Sakaemura
R&D Department, Paper Chemical Division, Arakawa Chemical Industries, Ltd.
Graduate School of Agriculture, Kyoto University
Tatsuo Yamauchi
Graduate School of Agriculture, Kyoto University

In order to study the mechanism of strength restoration of paper from recycled pulp by means of an addition of a dry strength resin and its distribution within a fiber wall, papers with or without a commercially available cationic polyacrylamide resin (PAM) were prepared from hardwood and softwood bleached kraft pulps which were recycled through drying, rewetting and disintegrating up to 30 times. The increment of tensile strength caused by addition of PAM steeply increased up to 3 times recycling in spite of the almost same PAM content. And then the increment became nearly constant with a further increase of recycle number, although the total PAM content within the recycled sheets gradually decreased. Measurement of PAM content at the exact surface of fibers was determined with an electron spectroscopy for chemical analysis (ESCA). Further depth profiles of PAM within a fiber wall were determined by an attenuated total reflection Fourier transform infrared spectroscopy (ATR/FT-IR) combined with a sputter etching method. These results obtained by ESCA and the ATR/FT-IR with etching indicated that the PAM tended to be distributed nearby the fiber surface more than inner fiber wall with increasing recycle number. A decrease in scattering coefficient of the freeze-dried wet papers with increasing recycle number suggested a decrease in external fibrils projecting from the wet fibers, which was in accordance with SEM observation. The change in distribution of PAM within a fiber wall with recycling therefore should be attributed to the decrease in external fibrils caused by recycling, so that it should influence the increment of tensile strength by the contained PAM. These results suggested that the PAM located nearby the fiber surface would be significantly important for strength development by addition of PAM.

Keywords: Polyacrylamide, Dry strength resin, Recycled pulp, Handsheet, Distribution, Tensile strength, external fibril

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## Report on the Results of the Follow-up Survey on JPA's Committed Action Plan for Fiscal 2009 and Efforts against Climate Change in the Japanese Pulp and Paper Industry

Naoki Ikeda
Japan Paper Association

The Japan Paper Association (JPA) has been actively working to save energy since 1997 when it established its "Committed Action Plan on Environment". JPA declares its policy of restraining CO2 emissions in the action plan, and is working toward the following targets revised in September 2007:

・On a five-year average basis from fiscal 2008 to fiscal 2012, reduce fossil energy consumption per unit and fossil energy derived CO2 emission per unit by 20% and 16% from the level of fiscal 1990, respectively
・By fiscal 2012, expand forest plantation area owned or managed by the industry at home and abroad to 700 thousand hectares.

Since fiscal year 1990, JPA has made a survey on the actual results of energy consumption in the year, published its results compared with that in fiscal year 1990.

This report shows the results for fiscal year 2008, as well as energy consumption, CO2 emissions and the position of the pulp and paper industry in Japan, and information related to efforts against global warming such as trial implementation of emission trading, establishment of energy benchmarking for the Japanese pulp & paper industry and the revision of Energy Saving Act.

## Improvement of Compressor Efficiency and Energy Saving Way

Hiroyuki Tanaka
Rotating Machinery Engineering Dept., Rotating Machinery Operations, IHI Corporation

Compressors have a high percentage of consumed power in factory. So in order to save energy, it is important to enhance the efficient operation of Compressors. In this paper, the characters of widely used compressor (reciprocating, screw, turbo) are introduced, and show some energy saving way for existing turbo compressors.

## Energy Saving of Air Compressors by Improving the Compressed Air Systems in the Mill

Kenji Nakano
Nichinan Mill, Oji Paper Co., Ltd.

Each Oji mill has been working to reduce the total energy per 1.5%. In Nichinan Mill, for accomplishment, we carried out various means such as inverter and a pulley change, intermittent driving, a change to the high efficiency model, flow improvement. However, about power-saving of the compressor, we remained in omission of air improvement degree. The consumption electricity of the compressor held about 6% of the factory all consumption electricity and another one step needed the action that stepped.

Because we were able to achieve power-saving by the plumbing line combination of the compressor and a pressure setting change this time, we introduce the summary.

## The Solution for Saving Energy and Reducing CO2 by Coating of "Reflective Heat Insulation"

Teruyuki Tsuyuki and Hiromitsu Aoyama
Cosmo Trade and Service Ltd.

Reduction of the greenhouse effect gas is taken up in worldwide as a huge environmental problem. There are a variety of actions for the problem at a governmental level, corporate level, and an individual level.

Today, handling the environmental issue at enterprises is a factor that they can't overlook it as a management element of the enterprise. Moreover, their action is not staying in a performance or promotion. They really set the action for the problem and the whole society has a request on them to act it immediately and to take comprehensive measures and policies.

In this text, for corresponding the environmental issue, we take up a superior coating material for the reflective heat-insulation, "Super Therm" that is applied NASA's ceramic technology. When the consumers adopt "Super Therm", we will explain the feature and the effect by introducing general precaution and case example of construction.

## The Activities for Energy Saving in Hachinohe Mill

Yutaka Nakayama
Mitsubishi Paper Engineering Co., Ltd.

In Mitsubishi Paper Mills, Ltd. Hachinohe mill, we have continued various activities for energy saving. We introduce a summary of these past 5 years.

And as one example of them, 51, 52 supercalenders, we remodeled the warm water facilities into the purpose by steam-saving and warm water displacement reduction in June, 2008. Because introduced original warm water collection / reuse flow facilities, but, as for collected warm water from two supercalenders in parallel, and reusing it, there were many problems on the real operation; a warm water flow as much as possible simple; became it, and was able to tie it to the improvement of the steam-saving, reduction of the displacement and operation characteristics. We introduce steam by this warm water facilities flow remodeling-saving and displacement reduction by this report.

## The Grass Roots Effort to Enhance Energy Conservation

Jin Takami
Fuji Mill, Oji Paper Co., Ltd.

After a rapid increase in crude oil prices, the cost of energy went up in recent years. That seriously affected our company's bottom line because the percentage of total cost to produce papers also increased. Besides, The Japan Paper Association (JPA) declares its policy to save energy and stop global warming "We aim to reduce the fossil energy consumption per unit by 20 percentage and fossil energy derived CO2 emission per unit by 16% compared with 1990 over 5 years from 2008 to 2012" according to Committed Action Plan on Environment of September 2007. Therefore, each Oji mill has been working to reduce the total energy by 1.5 percentage. However, in 2007, the result (-1.4 percentage) not achieved the goal (-1.5 percentage) at Fuji Mill. In 2008, all of us committed to meet the goal and made concerted efforts together to take the energy-saving action. We succeeded in reducing the total energy per unit by 2.7 percentage.

In this report, we introduce an action plan for energy conservation.

## Design Concept of the Retention Aid Polymer
## -The Adaptability of RX (High Performance Emulsion PAM) for Various Papermaking Conditions-

Kazuyuki Hirata
Shonan Research Center, HYMO Corporation

The retention aid polymer contributes to efficient in the papermaking process. Recently, the retention aid polymer is getting required for the improvement of not only retention performance but also paper quality because of changing of the papermaking conditions. Ordinary retention aid polymer had limited molecular weight range because the ultra-high-molecular polymer molecules tend to entangle each other in aquatic media, and the phenomena result in the formation trouble or poor paper quality.

We have developed the technology to adopt ultra-high-molecular polymer emulsion type 'RX' for the purpose of achieving both good retention and good formation. We already developed the 'ND' retention aid polymer, another ultra-high-molecular polymer which has made in water-water dispersion method. We introduce the characteristics of RX product with comparison to ND product.

## Recent Technical Trends and Applications for Surface Sizing Agents

Kazunari Sakai
Paper Chemicals Division, Harima Chemicals, Inc.

Waste paper recycling, grammage reduction, neutralization and closing papermaking system have been advanced from the viewpoint of environmental protection, saving resource, and energy conservation in papermaking industry. The demand for paper quality has risen as well, and the shift to surface chemical that gives the function to paper directly by coating has been advanced more and more.

Surface sizing agent that is one of the surface chemicals is used to give paper water repellency, and various kinds are applied in order to meet the demand for paper quality. It is important for the effective surface sizing to distribute uniformly in the paper surface. The sizing efficiency is greatly influenced by not only the stability and compatibility with other chemicals in coating solution but also characteristics of base paper.

Recently, the quality of surface sizing agent such as its sizing performance and the stability in coating solution has been demanded simultaneously due to the rise of conductivity, calcium concentration in coating solution as the shift to neutralized and highly closed papermaking system. Furthermore, the idea depends on the sizing by surface sizing agent has spread because it has been getting harder to give good efficiency by internal additives. Therefore, in this report, we state our technical attitude, approach for surface sizing. Besides, we introduce the technical trends of surface sizing in China, where the shift to coating chemicals has advanced dramatically.

## Novel PAM Based Dry Strength Resins for Highly Calcium Carbonate Filled Paper

Shiro Iida, Takayuki Shimoyoshi, Takafumi Sekiguchi and Tadayoshi Oguni
Chiba Laboratory, Paper Chemical Business Division, SEIKO PMC Corporation

Recently, domestic paper demand has declined due to global economic recession. So, Japanese paper producers made scrap-and-build plans to concentrate production on larger and more efficient machines, thus reducing costs and have proceeded with these plans to improve revenue and enhance their competitiveness. Under these difficult circumstances, polyacrylamide (PAM) based dry strength resins (DSRs) is one of the best solutions for maintaining productivity and quality of paper.

In order to overcome these problems, we have conducted the study based on the results for several model experiments that fixations of DSRs are different for pulps and PCC, and flocculation of PCC is also different, depending on ionicity (density) and molecular weight of DSR. As a result, we have developed novel PAM based DSRs for papers filled highly with PCC, which show excellent dry paper strength and high retention without excess flocculation of PCC fillers.

## Safe Operation Monitoring on Production Facilities by Thermography Utilization and Its Case Report

Tatsuhiko Sada
System Sales Department, NECAvio Infrared Technologies Co., Ltd.

Energy problems in the manufacturing of Japan have been greatly influenced by the heat-trapping gas exhaust amount reduction rate 6% in the Kyoto Protocol. Similarly the heat-trapping gas problem in operation is an important problem and a variety of environmental measures are promoted by examining the use of the thermal recycle, RDF (refuse-derived fuel), RPF (solid making the waste plastic fuel), and the biomass energy, etc. as effective use of the resource in the paper manufacturing industry. However, it need not be said that the stability operation of the production facility and securing the efficiency driving are the necessary conditions it is safe, is safe, and piercing etc. are achieved as an enterprise.

This time, I would like you for the people of the industry that can attend a lecture to discover the use method in the paper manufacturing industry voluntarily by explaining the principle of measurement of the infrared rays thermography and the feature, and to use it for energy conservation and the environmental progress in recent years by introducing the safety operation watch and the case about the production facility using the thermography and the data logger.

## The Brand-new Beta-ray Basis Weight Gauge SB-1100 Can Be Used without Any License and Controlled Area: Certificated by MEXT

Hiraku Miyashita
Nanogray Inc.

Before 2005 exemption level of sealed radioactive ( $\alpha$ , $\beta$ , $\gamma$ -ray) source activities is 3.7MBq in Japan. Radiation protection regulation of Japan was changed and the exemption level was reduced in 2005. At that time, new certification system was started by MEXT. The certificated equipments can be used without any license and controlled area. All products of our $\gamma$ -ray density meters, $\gamma$ -ray level gauges and $\gamma$ -ray level switches had the certifications from MEXT in 2006.

Last year Nanogray Inc. introduce brand-new certificated $\beta$ -ray basis weight gauge SB-1100; can be applied basis weight measurement of papers, nonwovens and plastic films etc.

## Mechanisms on Scratch Generation on Paper Surface and Factorial Analysis of Scratch Resistance

Minoru Saito and Yasuji Kazumori
Hokuetsu Kishu Paper Co., Ltd.
Toshiharu Enomae and Akira Isogai
Graduate School of Agricultural and Life Sciences, The University of Tokyo

Glossy coated paper is used as one of the highest quality paper products such as photographic-quality paper and high grade container boxes. However, once the surface is scratched, the resultant traces of the scratch are remarkable and detrimental to its glossy surface finish. Such scratches arise when the coated paper is subject to scratching actions in various contact situations such as a coating process, paper cutting process, and offset printing.

The objective of this research is to investigate the surface deformation properties during scratching. Two different kinds of commercial coated paper samples (ink jet-type and offset printing-type) were prepared for comparative study. The shape of scratches that arise on paper surfaces in scratch tests were determined by using a laser scanning microscope (LSM) to evaluate the deformation mechanisms.

The scratches were typically classified into two types; “plastic deformation” and “fracture”. The two types are different and independent, but often involved in one scratch. The cross-sectional deformation area and the onset load of crack generation were measured, and then the relationship between them was discussed. Consequently, the characteristics of scratches were influenced by the surface properties. Namely, low plastic deformation and high fracture toughness were suggested to be required for high scratch resistance.

Keywords: Scratch, Cast Coated Paper, Plastic Deformation, Fracture, Laser Scanning Microscope

## Characterization of Adsorption of Charcoal from Cedar - thinned Woods as Additives for Paper

Hiroshi Fukui and Akio Takemura
Graduate School of Agricultural and Life Sciences, The University of Tokyo
Katsuhisa Tatsumi
SANYO PAPER MFG. CO., LTD.
Kensuke Kawarada
Tokyo Metropolitan Industrial Technology Research Institute

In domestic forest in Japan, it will be more important to utilize thinned cedar and cypress woods which were planted after the World War II, as Kyoto Protocol has provided a guideline to Japan for reducing greenhouse gas emissions up to 3.8% from the forests. Although such forest thinning is used partly as chips for papers and materials for various products, some of them are used as energy source for biomass boiler. However, in near future such woods especially softwoods will increase by thinning which may promote utilization of woods for not only energy use. Moreover, from the biomass view point, wood derived products such as charcoals will be one of the good candidates for fixing carbon dioxide as written in appendix of Kyoto Protocol Target Achievement Plan. In this paper, discussion is focused on how we utilize charcoal made from cedar-thinned wood as an additive of paper comparing with that made from seeds in plum liquor plant which can be also waste materials. Cedar-thinned wood obtained university test forest and plum seeds obtained at from plum liquor manufacturer were carbonized by using modified rotary kiln type carbonization equipment at the same temperature set inside the reactor. After carbonization they were milled and their particle distributions were compared. Both powdered charcoals were analyzed to compare pore size distribution by using mercury porosimetry, adsorption property by plotting BET N2 adsorption isotherm. Then adsorptions of Vitamin C in the de-ionized-distilled water to the charcoals and H2O2 decomposition by the charcoals to see the function of catalyst were measured respectively. Also, paper samples containing 7% (w/w) of each charcoal were hand made and used for evaluation for adsorption of formaldehyde, ethylene etc., which elucidated charcoal from cedar has a potential for not only fixing carbon dioxide but also for materials for greengrocery wrapping paper, deodorizing paper and so on.

Keywords: forest thinning, charcoal, adsorption, pore size distribution, paper

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## The Approach to Improve the Functions of SAQ® as a Cooking Additive

Junji Tanaka
Kawasaki Kasei Chemicals Ltd.

It is very important subject for pulp mills to produce pulp effectively from a viewpoint of effective use of fossil fuel and forest resources. In order to improve both delignification rate and pulp yields, anthraquinone compounds have been used as cooking additives. SAQ® has been used as a cooking additive in many KP mills. Kawasaki-Kasei has been putting energies into not only the technical service to pulp mills but also the studies of SAQ®. This report introduces three topics as our actions; (i) the development of SAQ® addition to impregnate effectively into wood chips, (ii) the studies of anthraquinone compounds which effect improves more significantly than SAQ®, and (iii) the suggestions of the eco-friendly cooking method with SAQ®.

## Chlorate Based Eka Purate® Technology Used for Small-scale Generation of Chlorine Dioxide for Microbiological Control in Papermaking

Ong Hui Lam, Yap Ken Fui, Gunnar Goransson, Yoshikazu Sonehara and Shigeharu Harakawa
Eka Chemicals, Asia Pacific

Good control of microbiological activity in process waters is crucial for high productivity and quality in pulp and paper production. Over the last decade oxidizing biocides have become the preferred solution for microbe and slime control in papermaking process waters. A key benefit of the change from organic biocides to oxidizing biocides has been improved cost performance.

Available oxidizing biocides include combined halogen oxidants, sodium hypochlorite, paracetic acid and chlorine dioxide. This report focuses on Eka Purate® a chlorate based technology for small scale generation of chlorine dioxide used as a biocide in papermaking industries in fresh water and process water applications.

## The Application of Latest Bladed Style Top Former Producing Board Grades
## -Pulse Frequency Top FormerTM-

Yutaka Fujishima and Masahito Mukai
Paper Machinery Engineering Dept., Kobayashi Engineering Works, Ltd.

The rebuild of a fourdrinier with a vintage blade style top forming configuration is examined for papermachines producing board grades. Limitations of the pre-rebuild design are discussed from a fundamental standpoint. The fluid mechanics of the vintage and rebuilt twin wire forming sections are examined. Design challenges and solutions to mitigate the limitations of the pre-rebuild former are discussed. The rebuild is engineered for the specific furnish and application based upon end product needs. A majority of the existing forming section remains intact minimizing installed cost and papermachine down time for installation.

Three rebuilds are reported on, two on linerboard grades and one on a woodfree uncoated grade. Performance is characterized before and after each rebuild with regards to operating capacity and a variety of sheet properties, depending on the grade of paper being produced. Significant improvements in capacity, formation, smoothness, and mechanical strength properties were realized after the rebuilds.

This report is prepared focusing on the linerboard rebuild at this time.

## Introduction of Electronic Nip Impression Measurement System “Sigma-Nip”

Osamu Suzuki
Nomura Shoji Co., Ltd.

A scheduled paper machine shutdown presents a valuable opportunity for mill engineers representatives to diagnose, correct, and optimize roll and nip conditions. Electronic nip impression measurement systems enable on-the-spot evaluation of nip profiles and have become an increasingly valuable tool for diagnosing problems and improving profiles, paper quality, and machine operation.

Sigma-Nip, an electronic nip analysis system, calculates and records nip width at multiple points across rollers face length in real-time with unprecedented speed, accuracy and repeatability. Sigma-Nip presents a revolution in quality control. Now, for the first time ever the technician is able to accurately, efficiently and economically measure roller profiles and alignment condition. Sigma-Nip consists of a series of thin-film resistive ink pressure transducers on a carrier sheet. As this carrier sheet is loaded in between rollers the Windows based software assimilates the readings into easily interpretable graphical images-all in real-time.

## Use of Superlow Viscosity Modified Starch for Coating

Mitsuo Ishida
Research and Development Laboratory, Oji Cornstarch Co., Ltd.

Recently development of printing technology requires high quality printing paper but also low-cost paper, so that paper mills have improved productivity and cost of color materials. They require the material that is able to make high solid and high speed coating color.

We have developed superlow viscosity modified starch, it's named "HSS COAT". Usually if it uses a low viscosity starch for coating color, surface strength of its coated paper is very week. But using of HSS COAT is able to maintain the surface strength of coated paper. Besides it can be prepared with higher solid coating color, so that coated paper quality, including such as gloss etc., is improved, and it's probable to reduce latex.

We would like to recommend using of HSS COAT for coating color.

## A New Type of PAM Based Micro-particle Polymer Dispersion
## -Performance of POLYTENTION-

Yoshihiko Terashita
Research and Development Department, Paper Chemicals Division, Arakawa Chemical Industries, Ltd.

From an environmental protection point of view, a necessity of paper recycling has to be highly encouraged by paper industry. Recycling rate of used paper has been increasing, and fibre quality has become worse. For a reason of operation cost reduction, consumption of fresh water has also been restricted. Under such highly closed wet-end condition, various wet-end additives or internal wet-end agents cannot show desirable performance.

We have already introduced a new PAM based type agent, POLYTENTION ("PT"), in recent report. "PT" shows high coagulation force and it can make fibre one-pass retention higher even under severe condition. "PT" also gives favorable paper strength to dried sheet, as compared to the sheet using only retention aids.

"PT" reduces total wet-end additives, and it is expected controlling the paper making conditions.

This report explains floc formation and sheet formation with "PT" and introduces the effect of "PT" under various paper making conditions.

## Insect Control and Energy Saving by Light Effects

Kazumasa Kamezawa
Ikari Corporation

It has been the most common understanding that the purpose of utilizing light is to secure a certain level of illuminance. However, recently, the aim of reducing effects on the environment has increased demand for other manners of utilizing light. From an insect control standpoint, now that chemical treatment is insufficient and needs for structural insect control is growing, insect control by light is becoming increasingly important.

We will give a presentation about the following topics.

1) Energy saving by utilizing light
2) Correlation between insects and light in facilities
3) Insect control by thermographic inspection
4) Adiabatic effect in facilities by IR (infrared ray) control

In view of energy saving, the combination of UV control and IR control which are seemingly contradictory will be essential for facility management in future.

## Benefits of Gas Seal Installation in Blowers for Containment of Noxious Odors
## -How to Contain Noxious Odors-

Atsushi Ebisu
Gas Seal Engineering Dept., John Crane Japan, Inc.

Noxious odor is one of the inseparable issues for paper mill plants. There is odor generation not only during the manufacturing process of pulp, but also during the concentrating process of black liquor and the bleaching process of recycled pulp.

How to prevent noxious odors from leaking out to the atmosphere is a big issue. Therefore, we can assume that many factories are using their energy to prevent odor leakage from the blower's shaft seal. John Crane has found out that the non-contacting gas seal is more effective than the conventional contacting mechanical seal when it comes to reducing the leakage of noxious odors. Non-contacting gas seals are also effective in reducing power consumption and extending operation longevity. John Crane's non-contacting gas seals, especially the Type 2800E, have been installed into paper mill plants and have succeeded in reducing odor leakage to ZERO. We at John Crane assure you that our gas seals will help to prevent gas leakage, and we hope that you will use our gas seals in your blowers.

## Mettler Toledo's Digital ISM and Cableless Solution for Pulp & Paper Industry

Natsumi Kimura
Process Analytics Division, Mettler Toledo K.K.

In 2007, Mettler Toledo introduced the new digital technology for on-line monitoring sensors, called ISM (Intelligent sensor management). ISM has a quite new concept for the future and for today. ISM gives every industry a lot of benefits by making all the handling operations much simpler, more error-free and more efficient.

In addition to this, Cableless solution "W100 cableless kit" is now available for easy installation and connection.

The W100 provides the advantages of cableless installations. In combination with the ISM technology, this kit provides flexibility for many applications in Pulp & Paper industry.

## Advanced Management Method of Press Section
## -FeltView-

Toshio Asazuma
Control System Eng. Dept., Voith IHI Paper Technology Co., Ltd.

The FeltView press felt optimization system provides scanning measurement of water weight, permeability and surface temperature continuously with on line for up to four press felts. These measuring data are changed to visual graphical figures and some arrangement pictures are shown in the monitor screen. In particular, color maps converted form raw signals produce the optimization operation with detailed analysis of water weight, permeability and temperature over a felt life.

The integration of these data enable more comprehensive data analysis of process interactions. Moreover, these data are saved in the OnView system for up to one year for a long term analysis and historical comparisons of felt performance.

"FeltView" system is optimal tool for press operators to back up to expected results with effective analysis of three data bases.

## Estimate of the Fixation and Reduction Amount of CO2 by Carbonization Treatment of Paper Sludge
## -The Possibility of CCS Technology of Carbonization Treatment-

Takao Ando
Faculty of Risk and Crisis Management, Chiba Institute of Science
Kimio Hiyoshi
Fuji Industrial Research Institute of Shizuoka Prefecture
Shuji Shimada

Gakunan Daiich Cooperation of Paper Manufacturing Association
Naoto Matsue and Teruo Henmi
Department of Agriculture, Ehime Univ.

In this study, we proposed a new CO2 fixation and reduction method for the paper industry using carbonized paper sludge (CPS). The carbonaceous material in CPS is derived from CO2 in the air. We considered the CO2 fixation and reduction method using carbonization treatment which stably preserves carbonaceous material in PS. And this CO2 fixation and reduction method is also considered to be a low cost and realizable carbon capture and storage (CCS) technology in the near feature.

We collected the CPS from PS cooperative treatment factory in Fuji city of Shizuoka pref., and analyzed by XRD, XRF and TG/DTA. The carbonaceous material in CPS was classified by chemical fractionation treatment using soil science method. Especially, the carbon content ratios of CPS were analyzed by CHNS/O Analyzer. The classifying results show that the almost all the carbonaceous material in CPS could be considered “humic material” that were chemically stable. From this analyzing results, the estimated total amount of CO2 correspond to carbonaceous material in CPS was equal to 19.6t-CO2 form the daily carbonization treatment process. In this process, the CO2 released from cellulose can be considered "carbon neutral", however the CO2 discharged from calcite should be calculated at 1.1t-CO2. At the same time, carbonization treatment needed 5,500m3 of LNG for combustion improver and 1,016kWh of electricity for exhausting gas treatment. From these processes, the 12.5t-CO2 emission was estimated. The total amount of CO2 storage in the daily carbonization treatment was calculated at 6.0t-CO2, and it was equal to 133.1kg-CO2 in 1t CPS. Applying the carbonization process to PS treatment enables to reduce 214.1 kg-CO2 in 1t dried PS (DPS) as compared to applying normal incineration process. On the other hand when PS is substituted instead of crude oil for fuel in boilers, the reduction of CO2 is estimated at 358.3kg- CO2/t (DPS)

These results show that the carbonization and thermal utilization processes to PS can be considered as a CO2 reduction method. And only carbonization process can be considered as CO2 fixation process in limited usage by returning it to the soil as soil conditioner.

Keywords: paper sludge (PS), carbonization treatment, CO2, CCS, soil

Effects of TEMPO-mediated Oxidation of Pulp Fibers on Filtration and Ion-exchange Properties of Handsheets

Masanori Ishizuka
Technical Division, Yamashin Filter Corp.
Tsuguyuki Saito, Toshiharu Enomae and Akira Isogai
Department of Biomaterial Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo

First, highly fibrillated TEMPO-oxidized hardwood bleached kraft pulp (FTO-HBKP) was prepared by disintegration of TEMPO-oxidized HBKP (carboxylate content of ca. 1.5 mmol/g) in de-ionized water. The translucent FTO-HBKP dispersion thus obtained was added to the original unbeaten HBKP suspension in tap water to prepare HBKP/FTO-HBKP handsheets. The addition levels of FTO-HBKP to HBKP were set to be 0-30% based on dry weight of HBKP. The HBKP/FTO-HBKP sheet density was linearly increased as the addition level of FTO-HBKP was increased from 10 to 30%, and correspondingly the peak position of micro-pore size of the sheets was shifted to smaller range direction. Although air permeability of the sheets was decreased with the addition of FTO-HBKP, the sheets prepared even with 30% FTO-HBKP had still sufficient air permeability for filter materials. Filtration efficiency of nano/micron-size particles for the sheets in air was clearly improved by the FTO-HBKP addition, showing that the HBKP/FTO-HBKP sheets have potential applications as high-performance air-filters. Second, a TEMPO-oxidized softwood bleached kraft pulp (TO-SBKP: carboxylate content of ca. 1.2 mmol/g) was prepared from unbeaten SBKP, and handsheets were prepared thereof using either de-ionized water or tap water with 0-30% (based on dry weight of TO-SBKP) aluminum sulfate. Ion-exchange behavior of sodium carboxylate groups in TO-SBKP was then evaluated. When the TO-SBKP sheets were prepared in de-ionized water with aluminum sulfate, Na content originally present in the TO-SBKP sheet was decreased with the increase in the aluminum sulfate addition by ion-exchange. When tap water was used, Ca and Mg ions present in the tap water were first introduced to the TO-SBKP sheets by ion-exchange. Al content was increased with the aluminum sulfate addition by ion-exchange. Once-dried TO-SBHKP sheets also had similar ion-exchange capability from Na to Al, when the sheets were soaked in tap water or de-ionized water with aluminum sulfate.

Keywords: TEMPO-mediated oxidation, oxidized pulp, papermaking, disintegration, nano-fiber, air-permeability, ion-exchange, filtration efficiency

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Vol.64, No.9 Abstracts

## Improvement of Productivity and Quality by Preventing Starch Degradation at Papermaking Process

Katsuhiko Hidaka, Takumi Sugi and Hiroyuki Suzuki
Kurita Water Industries Ltd.

Amphoteric and cationic starches have several important roles for improving paper quality and productivity as wet end chemicals. Starch is also used as a surface sizing agent and a coating binder. Therefore, much starch mixes into wet end process with dry-broke. Because starch is a good nutrient, microorganisms propagate and produce amylase: starch degrading enzyme, which would degrade wet end starch, thus inhibit the functions.

We detected amylase throughout the process in some paper machines; the concentration was especially high at dry-broke with much starch. According to our lab test, it's indicated that amylase degraded amphoteric starch and deteriorated paper quality and productivity.

As amylase spreads throughout the process with bacterial contamination, we should treat and keep cleanliness from stock system; mainly dry-broke to recovery system. "Fuzzicide®", our inorganic biocide is the best chemicals to solve the problem because it has high bactericidal activity and durability in the process. We fed Fuzzicide® to each system, mainly coat-broke and kept cleanliness in the whole process by monitoring ORP (Oxidation Reduction Potential). In the result, amylase activity decreased considerably throughout the process.

## Modification of the Existing Cooking System to COMPACT COOKINGTM Process
## -Existing MCC Digester Rebuilt to COMPACT COOKINGTM in Moorim Group Donghae Pulp Co., Ltd.-

Yan Ju
Fiber Business Line, Process Technology, Metso Paper Japan Co., Ltd.
Gook Chan Ahn and Young Mok Kim
Moorim Group Donghae Pulp Co., Ltd., Korea

In order to obtain the profit by means of improving the cooking efficiency and saving the energy consumption without increasing the production rate, No.2 continuous digester has been modified from MCC cooking to COMPACT COOKINGTM G1 in Moorim Group Donghae Pulp Co. Ltd. With this modification it was showed that increased the cooking yield about 1%, improved the viscosity of the blow pulp, and saved a certain amount of the steam consumption. In the study of No.2 digester further modified to COMPACT COOKINGTM G2 in which No.1 batch digesters are stopped and No.2 digester is increased its production rate to 1400ADt/day to keep total production rate same as before. It is showed that saving a huge amount of steam, increasing cooking yield, viscosity, brightness, and reducing reject content in the blow pulp. On the other hand, with DiConn system it is possible to run with higher blow temperature than 100oC, it results in a higher wash efficiency both in Hi-heat zone of a digester and in a PDW, produce more flash steam in the cyclone, and increase the dry solids content in black liquor to the recovery boiler. In order to optimize the energy consumption in a fiber line, it is important to confirm the heat balance from a cooking plant to a bleaching plant for using warm/hot water effectively, especially for the digester in which the flash steam don't send to the steaming vessel.

## Comprehensive Approach to Optimize Dryer Part
## - From Drying Energy Saving to Sheet Stabilization -

Jean Deshanais
Enerquin Air Inc.
Christophe Bastien
Thermopap
Hidenori Tsuzuno
Horikawa Engineering Works Ltd.

Dryer part of a paper machine is the area where vast amount of energy is introduced and exhaust. Paper web drying process is well known technology but it should be noted that handling this area under well managed conditions in accordance with fluctuations of production load is not easy.

Global-Analysis of dryer part under collaboration between a dryer hood supplier, Enerquin Air, and a drainage system analyzer, Thermopap, with newly developed analysis tool effectively reveals overall energy efficiency of dryer part, which offers trouble shootings, ways to energy savings and further energy management of this area. Finally, Thermopap offers on-line energy management system, TEMS.

## Innovating Hybrid Cleaning System for Dryer Fabrics and Backing Rolls

Shinji Otsuka
MATSUBO Corporation
Daniel Strom
m-clean papertech AB

Innovating cleaning system MultiJet®, developed by m-cealn papertech AB, Sweden is used for cleaning of paper machine fabrics and backing rolls for coating station. Since year 1995, over 200 systems have been operated worldwide. Hybrid cleaning technology with high pressure water jets, air doctors and high volume vacuum gas flow allocated upon roll, which is protected by patent worldwide, assures the perfect cleaning during production and keep the original permeability of dryer fabric through the life end.

MultiJet & Brush® is a development of the MultiJet® for on-line backing roll cleaning of coating station, integrating Ø150mm rotating brush in cleaning head. It assures the perfect cleaning without leaving any moisture streak or in any other way negatively affecting the paper quality.

## Novel Concepts for Monitoring and Control of Deposits in Pulp and Paper Mills

Akihiro Maeshima
Pulp and Paper Service Department, Katayama Nalco, Inc.

Deposit control programs in pulp and paper mills are critical for machine runnability and paper quality. Although these programs are used in most systems, the management of their performance has historically been quite poor and complicated, entailing intensive analytical work and representing, in general, a reactive approach to the problem. This paper introduces the use of online and offline monitoring tools to enable a proactive approach to deposit control. Monitoring techniques are used for program dose optimization, trial evaluation and for studying the effect of process conditions on the deposit propensity of the media. Nalco's innovation integrates online monitoring technologies with deposit control programs to monitor and control microbiological slime, pitch and stickies, and inorganic scale. With demonstrated success in the laboratory and at the mill sites, this approach enables papermakers to optimize chemical usage, ensure deposit control program performance, improve operating efficiency and ultimately reduce total cost of operation.

## Reel Optimization System (ROS)

Makoto Matsushita
KGK Engineering Corp.

In the paper manufacturing, the reel process is understood to be very important as it is related directly to the paper loss control at the end process in the paper machine. Recently, the Reel Optimization System (ROS) developed by Vishay Systems is evaluated in the paper industry to be the system which can not only monitor the nip load directly and control it equally in both TS and DS during the full reel process but also synchronize the primary & the secondary arms movement by the hydraulic cylinders equipped with the position controllers during the spool transportation process, then can realize to decrease the paper loss dramatically by eliminating wrinkles and air bubbles. ROS is also contributing to produce the optimum density rolls which decrease the losses, like slipping in the next re-winding process caused by not uniformed roll. We would like to introduce the proven effects of the Reel Optimization System (ROS) which has been already confirmed by European and USA paper mills.

## Yield Management and SmartView Web Inspection System

Shuichi Shoda

Surface Inspection Systems Division, COGNEX K.K.

“SmartView” Web Inspection System (WIS) and its related technologies can help users to maximize productivity. In paper machine, “SmartView” can be used not only as a conventional WIS but also as a system monitoring paper conditions for optimizing its process. In coater and supercalender, “Line Synchronization” technology enables upstream defect information to be fed forward to value added processes. “AWA (Advanced Winder Advisor)” enables re-reeler and winder to stop automatically at accurate defect position for man-power saving and maximizing throughput. SmartView is open architecture and can provide defect and process information via OPC/ODBC to other measurement systems. For example, WIS and Web Monitoring System integration allows users to track source of defects and help them to prevent sheet break.

## New Automatic Cutter for Broke Roll and Core Recycling System

Shigeru Hanano
Maruishi Co., Ltd.

Papermakers and converters strive to improve the quality, reliability, logistic, ergonomics, environmental sustainability and cost effectiveness. The new paper machines and converting lines gets wider and faster for each new installation with maximum automation level. To stay competitive on a global market is constant improvements and investment in new technology a must. Examples of new innovate products within core and broke roll handling equipment are; Roll cutter, CLICS inner core systems, Core groover and Core recycling systems.

## The 2010 Pan Pacific Conference
-April 18-21, 2010 in Melbourne, Australia-

Yuji Matsumoto and Akira Isogaii
The University of Tokyo
Shigeru Sato
Oji Paper Co., Ltd.
Yasushi Ishikawa
Nipponn Paper Industries Co., Ltd.
Daisuke Fujishiro
Hokuetsu Kishu Paper Co., Ltd.
Takehiko Uematu
Kao Corporation
Kunitaka Toyofuku
JAPAN TAPPI

2010 Pan Pacific Conference incorporated in 64th Appita Annual Conference (18-21 April) was held under the Appita’s auspices in Melbourne, Australia. From Japan, 17 people attended the conference from a university and company including Mr. Hasegawa, president of JAPAN TAPPI.

On behalf of JAPAN TAPPI, Mr. Toyofuku, executive director of JAPAN TAPPI and Dr. Matsumoto, Professor of The University of Tokyo attended the conference. Pan Pacific Conference is held every two years in the rotation of 8 countries of Pacific Rim. The conference was held in Korea in 2006 and in Canada in 2008.

In corporation with Appita Annual Conference in this time, 29 papers were presented as Pan Pac session and 48 papers were presented as Appita Annual session in all fields of the pulp and paper. From Japan 8 papers presented (3 from university and 5 from company). A summary of the both conferences, Japanese presentations and other interested ones are described.

The representative from TAPPI (USA), JAPAN TAPPI, Korea TAPPI, APPITA (Australia), Taiwan TAPPI, TAPPIP (Philippines) were in the attendance at the conference, but, PAPTAC (Canada) and CTIP (Chile) were absent.

## A Report on 96th PAPTAC Annual Meeting and EXFOR 2010

Kunitaka Toyofuku
JAPAN TAPPI

The 96th PAPTAC Annual Meeting and EXFOR 2010 was held in Montreal, Canada on February 2-4, 2010. The meeting had 400-500 participants and 36 exhibitors. There were 3 special business session and 86 general presentations on 13 sessions.

I participated after an interval of five years since 2005. The meeting symbolized dullness of the Canada paper industry of these days, both participants and exhibitors decreased sharply in comparison with five years ago. As I visited FPInovations (former PAPRICAN) of the Montreal suburbs after the meeting, I report it together.

## Reduction of Regulated Elements Leaching from Fly Ash

Makoto Iwasaki and Kazuya Ikeshima
Pulp and Paper Research Laboratory, Oji Paper Co., Ltd.
Kenzi Kimura
Oji Cornstarch Co., Ltd.
Kiyoshi Okada
Materials and Structures Laboratory, Tokyo Institute of Technology

In this study, we investigated two method s to reduce the leaching amount of regulated elements (Fluorine, Boron, Chromium, Lead, Selenium, Arsenic etc) from fly ash. First method is to mix Paper sludge and Coal or Paper sludge ash as well as Coal ash. In order to control the component of fuel charging into incinerator. Second one is to control the heating temperature in the incinerator. Both methods were effective for reduction of regulated elements leaching from fly ash, which resulted in decreasing the quantity of fly ash discharged from mill as a wasted material. We assumed that CAS composed by CaO, Al2O3 and SiO2 produced during burning fuels would react or capture some of regulated elements and this phenomena could bring into decreasing the leaching amount of regulated elements from fly ash.

Keywords: fly ash, leaching, regulated element paper sludge, coal, incinerator

## The Adsorption Behavior of the Dispersant Polymer on Pigment in Coating Color

Atsushi Nakamura, Kengo Yamane, Yui Kikuchi and Hiroo Kaji
Tsukuba R&D Laboratory Corporate Research Center, Mitsubishi Paper Mills Limited

Ground calcium carbonate (GCC) which is used as one of the main pigments for paper coating color, is manufactured by the following steps; “mechanical grinding of naturally occurring calcium carbonate rocks”, “dispersion in water” and “wet grinding to obtain the target size particles”. In the manufacturing process, the high consistency dispersion can increase production efficiency and improve paper quality because of reducing dryer energy consumption and inhibiting binder migration during drying process.

Poly carboxylic acid type dispersant is found to be beneficial to prepare higher consistency dispersion, however optimum condition of it has been less well understood. Since the Zeta potential of pigment particle and the determination of the dispersant adsorption amount are useful factors to investigate the dispersion condition of pigment, we measured the Zeta potentials of pigment particles in higher consistency by using colloid vibration current method zeta electrometer and the dispersant adsorption amounts by total organic carbon analyzer (TOC). In our experiment, the Zeta potentials of pigment particles were the almost same level between 10% and 50% slurry and the smaller size particles showed lower Zeta potentials because the dispersant was absorbed selectively onto smaller size particle. Not only these experimental results, but also we decided that the Zeta potential changed through the following two steps. In the first step, the Zeta potential changes dramatically by a little amount of dispersant adsorption. In the next step, the Zeta potential as the dispersant adsorption density on the pigment increases.

We also investigate the effects of solute ion species on the behavior of the dispersant. Although the adsorption amount of dispersant increased in the presence of dicationic ion species, the dispersibility of pigment decreased. The Zeta potential measurement result shows dication ion species reduce the electrostatic repulsion between dispersants on the particles and make them even harder to disperse pigments.

Keywords: calcium carbonate, dispersant, Zeta potential, total organic carbon, dicationicion

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## High Performance Energy Saving Screen for Waste Paper Treatment
## -MaxFlow-0, 1, 2, MaxSaver and GHC-Rotor-

Nobuhiko Okumura
Technical Department, AIKAWA IRON WORKS CO., LTD.
Keiji Yasuda
Technical Sales Department, AIKAWA IRON WORKS CO., LTD.

Aikawa has developed screens for years as a leader of Screen manufacturing. Maxflow Screen series is the latest outward flow screen with the technologies based on our long experience. High capacity, efficient contaminant removal, low power consumption is the concept of this Screen. This simple design is the answer from our experience to pursue optimized functionality. The combination of NW Super-2 Basket with high contaminant removal efficiency and GHC rotor which has superior vacuum efficiency in low rotating speed, enables a efficient contaminant removal and power saving. The Maxflow series could suit in any specifications and process. This paper introduces the features and report the case studies of Maxflow Screen series.

## Energy Saving Report by Introduction of “Intensa Pulper”

Takayuki Suzuki
Stock Preparation Engineering Dept., VOITH IHI Paper Technology Co., Ltd.

Pulper is one of the highest power consumption equipment among various components of secondary fiber system. Therefore increasing efficiency of a pulper which stands at the first stage of the system leads to reduction of power consumption in the whole system. VPIT’s low consistency pulper “Intensa Pulper” which received Sasaki Award last year can be directly connected to slot screen bypassing primary coase screen, thanks to its high quality comparable to outlet of coase screen with lower power consumption compared to conventional pulper. With Intensa Pulper, it is also possible to reduce power consumption significantly in secondary fiber system including auxiliaries, by simplifying the system in combination with LP Screen which can cut power consumption down to approx. 1/4 of conventional slot screen.
Here we would like to introduce the case of Nippon Daishowa Paperboard Co., Ltd., Akita Mill, who actually adopted this system and achieved huge energy saving.

## Continuous Nip Profiling with Embedded Sensor Technology

William S. Butterfield
Xerium Technologies, Inc.

Press section efficiency is largely dependent upon contact uniformity in the press nip. Yet, improper cover crowns, biased loading, uneven roll cover wear and uneven fabric wear can all cause non-uniformity-leading to costly sheet breaks, reduced paper quality, increased costs and decreased roll cover or fabric life. Traditional tools used to measure nip performance require machine downtime and data extrapolation to obtain a snapshot used to forecast operating conditions. Until now, there has never been a way to reliably monitor the uniformity of the nip profile to changing machine conditions.
SMART® Technology employs a proprietary embedded sensor system to extract data from the roll cover during machine operation. For the first time, machine operators get real-time knowledge of true operating conditions. Real-time knowledge provides the ability to make on-the-run adjustments and the power to optimize production, reduce energy consumption and control costs.

## High Dew Point Type of Totally Enclosed Hood System for Large & High-speed Paper Machines

Takashi Hatogai
Engineering Dept., Shiratori Engineering Co., Ltd.

The Paper & Pulp industry is considered as a typically huge energy consuming one and each Paper Manufacturing company has been repeating sincere efforts aiming not only improvement of their production efficiency but also higher yield of wooden fiber, recycling of used paper, better energy efficiency for their various kinds of equipment and so on.

Particularly these days, upsizing of machines is much promoted and the tendency for higher speeding with bigger width of paper is getting notable. Under such tendency, it is further requested to save the energy cost. At the same time, it became an important subject how to improve the indoor environment.

In order to respond to such new demands from the industry, we, Shiratori Engineering, has been making best effort to develop new technologies basing on both accumulated capabilities for research & development and the know-how achieved from lots of supply records.

Here, we would like to introduce you the essence of our “High Dew Point type of Totally Enclosed Hood System”.

## Industrial Inkjet Printing
## -Market Trends and Solutions from a Coating Pigment Supplier Perspective-

Vesa Kukkamo and Philipp Hunziker
Research & Technology Services, Omya

The business environment in digital printing is currently under rapid change. The highest growth rates are expected to be in what are traditionally offset quality markets (OQM) where the new technology industrial inkjet presses can provide offset quality printing at significantly increased outputs. In the OQM, transactional and direct mail segment is currently showing the highest potential for digital color printing. The challenge in paper selection for OQM is to find the right balance between image quality, paper handling characteristics, and costs. The state of the art coated inkjet paper cannot meet the cost requirements and hence new paper grades have to be developed. Future design of coated inkjet paper is based on CaCO3 pigment, dual-pore structure of the coating layer and absorbing base paper. The coating can be run at high solids content, which means more flexibility for the application. The binder amount is decreased to a minimum and hence the cost structure is optimized. The future coated inkjet paper has shown in industrial scale tests that it can fulfill the needs of the new business environment and therefore complements the growth of digital printing.

## Factors Affecting Life of Progressing Cavity Pumps

Takeshi Kawamura
HEISHIN Ltd.

Progressing cavity pumps in abbreviate form: PC pump (HEISHIN Ltd.'s brand name is HEISHIN NEMO pump), which belong to rotating positive displacement type, can handle various types of liquid. PC pump suck a liquid strongly and discharge it smoothly. This smooth dynamics enables PC pump to be used for liquid transferring in several industries including papermaking, food, motor and water treatment. For example, in a paper factory, PC pump is used for transferring coating color, pulp, chemical fluid and dyestuff (see the picture 1 and 2).

The factors affecting life of PC pump based on choosing a pump is described below.

## Development of Highly Precise Coater Blades Formed with Chromium Plating
## -New Coater Blades that Can be Make High Quality Coated Paper-

Hirofumi Kishi
Blade Group, Nomura Plating Co., Ltd.

Newly developed coater blade having long life with good profile is presented in this paper.

Nomura Plating Co. has developed “Long life plated coater blade with special chromium surface” in 1990. Developed blades were having at least 3 times longer life compared to the blade of SK material. Since then this blades have been accepted and widely used by the customer.

In addition to the long life, our coater blade has such merit as improving surface quality of the paper and deceasing streaks due to metallic characteristics of chromium on the blade. Hence, plated blade has been well-received and widely used in many customers in the paper industry even today. However, customers requirement to reduce production cost and improve paper quality are becoming harsh year by year.

And so, we pursue a forward improvement of blade having longer life and fewer streaks and then we have successfully developed “Chromium coater blade with precisely maintained blade shape”. Longer life of this new blade has been established by increasing thickness of plating with suitable kind of chromium. And stable good profile is obtained by precisely grinding blade edge also.

Field evaluation is also presented in this paper.

## HC900 Hybrid Controller
## -Honeywell’s Latest Controller for Quality Control System (QCS)-

Yoshimaro Morikawa
HPS Marketing & Business Development, Honeywell Japan Inc.

The Honeywell HC900 Hybrid Controller is an advanced loop and logic controller offering a modular design sized to satisfy the control and data management needs of a wide range of process equipment.

The HC900 Controller provides superior PID loop control and more robust analog processing than most logic controllers without compromising logic performance. A separate, fast scan cycle executes a rich assortment of logic and calculation function blocks. Logic blocks may also execute in the same scan with analog function blocks for time critical events. These function blocks may be fully integrated into a combined analog and logic control strategy for uncompromising control performance.

Powerful combination together with Honeywell’s performance proven control technology provides users an ideal solution for process control. Open Ethernet connectivity with Modbus TCP Protocol also allows network access using a variety of HMI/SCADA software.

## New Optical Caliper
## -The Innovative Measurement Solution-

Nobuya Horiguchi
P&W Solutions Dept., Yokogawa Electric Corporation
Rambod Naimimohasses
Research and Development Department, ABB Ltd.
Ake Hellstrom
Private Consultant

Caliper measurement and control is a vital part of papermaking. But this measurement can be a challenge. Over the years, various mechanical and optical sensors have been invented to achieve the best combination of accuracy, no sheet damage and reliable operation.

Some caliper sensors utilize laser triangulation. There are several inherent accuracy problems in this method, one particular problem known as light penetration. Grade-dependent and process-dependent calibrations or other compensations may be required when utilizing a laser caliper sensor.

In this paper, we present a new, optical on-line measurement that measures caliper without laser triangulation, thus vastly reducing errors and provide a more reliable measurement. This new method can also detect very small scale variability of the sheet. Findings on a production paper machine will also be discussed.

## A Report on the Third 2010 Japan-China Pulp and Paper Technology Exchange Symposium

Kunitaka Toyofuku
JAPAN TAPPI

Abstract

The third Japan-China technical exchange, “2010 Japan-China Pulp and Paper Technical Exchange Symposium”, sponsored and arranged by Japan TAPPI and China TAPI, was held on May 17-18, 2010 at Yayoi lecture hall in department of agriculture, The University of Tokyo. It was the first holding in Japan, and, as for about 110 Chinese side participants, the Japanese side participant was about 130. For each 9, in total 18 lectures were performed in the symposium. After a symposium, the Chinese side participant visited research laboratories in Tokyo and paper mills in the Fuji district.

## Relationship between Hexenuronic Acid and Brightness Reversion of ECF-bleached Hardwood Kraft Pulp (Part II)

-Mechanism of Brightness Reversion and Depressing of the Yellowing by Size-pressed Treatment-

Ayano Kawae and Yosuke Uchida*2
Advanced Technology Laboratory, Oji Paper Co., Ltd.

Yellowing of ECF (Elementally Chlorine Free) or TCF (Totally Chlorine Free) bleached pulp has became a significant problem since 1990s. It has been shown that hexenuronic acid (HexA) is a main cause, but the mechanism of the yellowing is not clear. In order to suppress the yellowing, the removal of HexA from pulp has been conducted by acid treatment, hot chlorine dioxide bleaching, ozone bleaching and others. However, they need a large amount of energy, and decrease pulp yield and strength.

In this report, mechanism of the yellowing was investigated. The results suggest that the yellowing consists of two-stage reactions. The first reaction is the hydrolysis of HexA, and the second one is the reaction of 5-formyl-2-furancarboxylic acid (FFA), which is one of hydrolytic products of HexA. Therefore, it is suggested that the yellowing can be depressed by inhibition of the reaction of FFA.

We found that low molecular weight carboxylic acids (for example, citric acid, tartaric acid and others) and polycarboxylic acid (for example, polyacrylic acid) are useful as a yellowing inhibitor. Size press coating test was carried out as one of the practical ways of adding the inhibitor to the paper. This method was effective to depress the yellowing, while maintaining physical paper properties.

Keywords: Hexenuronic acid, Brightness reversion, Yellowing, Kraft pulp, Hardwood, ECF bleaching, 5-formyl-2-furancarboxylic acid, Polycarboxylic acid, Inhibitor

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## Web Inspection System for the Pulp and Paper Industry

Masahiro Nakata
Inspection System Division, Omron Corporation

An initial Web Inspection System, if it detects the defect, was the one only of simple information of it with the buzzer and the lamp, and marking to the defect location. Afterwards, defect information on the defect position, the size, and the classification name is added. It became a very usual function there was a defect recording system that Omron developed in 1989 now, too. Moreover, by transmitting inspection data to the next process like FCS (Fault Control System) and WCS (Winder Control System), it got to do the productivity improvement and the product management of the next process, too. Also, at present, it became possible by the improvement and the generalization of the PC and the network technology to handle a large-volume defect image, too. As a result, it is possible to say that the volume of information of the inspection data became big drastically and that the existence value, too, became bigger.

## Operating Experience of Canvas Cleaner

Junji Okawa
Fuji Mill, Oji Paperboard Co., Ltd.

Oji Paperboard Fuji PM8 produces corrugating medium 440 tons per day. Recently papermaking conditions have been changed by using various recycled paper. These situation cause deposition troubles on the machine clothing such as the wire fabric, the press felt and the dryer canvas. Moreover deposits on the machine clothing induced defects on the paper which lead to large amount of re-finishing and loss. Most of defects were occurred at dry part, and we took some countermeasures, but we cannot solve them easily.

In this condition, we have introduced COMBI CLEANER from KGK for dryers in May 2006 based on reference at other mills. Then we have reduced the amount of re-finishing and loss by defect. COMBI CLEANER has shown high cleaning performance for the dryer canvas by super high pressurized water. This paper shows the background of introduction, operating experience and the effectiveness of COMBI CLEANER.

## Operating Experience of Water Jet Turn-up System

Tomotake Suzuki
Fuji Division, Oji Engineering Co., Ltd.

Oji Paper, Fuji Mill, N2 machine has produced white lined board since October 2001.

Although N2 machine used to use the tape turn-up system in the reeling process, it happened a trace problem pressed on the products because of the tape thickness (about 1.0mmt), which has become the main reason of spool loss at the turn-up process.

In order to modify the existing turn-up process more stably and to improve the production efficiency by reducing the spool loss at the reeling process, we installed a water jet turn-up system in N2 machine in April 2009. In this article, we report the outline of this modification, our operation experience and the improved result.

## ValZone Metal Belt Calender
## -The Extended Application from Coated Board to Uncoated Woodfree Paper Grade-

Kei Iwanaga
Metso Paper Japan Co., Ltd.

ValZone metal belt calendar, which was delivered to board machine market few years ago, has long calendering zone formed between a heated metal belt and a heated thermo roll. Metal belt calendering gives better surface topography and printability, because the extended dwell time gives efficient thermal energy transfer to plasticize the web surface, which enables symmetrical calendering with low nip load.

This article introduces new applications to coated fine paper and uncoated fine paper grades as well as board grades. This metal belt calendering performance can produce higher production efficiency with higher bulk or lower raw material cost and can help paper and board manufacturer in future.

## Operating Experience of Retrofitting PM6 Reel with a Soft Drum

Hirokazu Haraguchi
Sendai Mill, Chuetsu Pulp & Paper Co., Ltd.

The PM6 in Sendai Mill has been built up in 1986 for manufacturing wood free paper, and has been shifted to adapt all coated paper grades widely since 1994, mainly to adapt LWC paper. The PM6 has been manufactured LWC paper and A3 paper as its main product stably, without hard competitions.

The hard nip calender has been equipped at the PM6 from the beginning, however other latest on-machine coaters have equipped soft nip calender with elastic roll to adapt needs of high smoothness, high gloss, and high bulk nowadays. So, we have equipped the soft calender in May 2009, to make such high smoothness, high gloss, and high bulk products as on-machine finishing.

This report also refers to the soft drum at reel which has equipped for adapting wide range of quality grade of products, and refers to outline of those facilities and our operating experiences with them.

## Sirius Reel
- Sirius Reeling Technology and Turn-up System -

Takafumi Torii
Coating & Finishing Eng. Dept., Voith IHI Paper Technology Co., Ltd.

The paper processing is trending toward on-line processing, output expansion by high efficiency, and of course improved quality. For the reeling process to fulfill those requirements, the completely new reeling concept is required. This article starts to introduce mechanical structure and technology of Sirius reel. These practical experiences lead to reeling concept; Sirius. Latest turn-up system of reeling technology is represented.

## New QCS Control Technology
-Energy Saving and Improvement of the Production-

Makoto Fujii
P&W Solutions Dept., Yokogawa Electric Corporation

Today, carbon footprint reduction is one of the major issues to all the industries in the entire world. In Japan, pulp-and-paper industries have achieved 30% energy savings in past 30 years by the environmental conservation consulting, such as co-generation systems, high energy efficiency facilities and biomass boilers.

In paper making process, QCS has been installed to measure and control the paper quality, but with recent tendency of the society, its role has evolved rapidly into the direction of productivity improvement and energy savings. As a Japanese QCS supplier, Yokogawa has delivered the solutions to meet the requirements from the Japanese customers. In this paper, CD caliper and moisture controls are discussed and solutions are proposed to relief the concerns raised by many of the paper manufacturers.

## Development of Dryer Section and Dryer Fabrics

Motohiro Tanaka
Shikishima Canvas Co., Ltd.

We, Shikisima Canvas Co., Ltd., celebrated the 100th anniversary of the production of Dryer Fabrics in 2008.We have maintained our position of leadership in this business field in Japan since we produced the nation's first Dryer Fabric in 1908 by fulfilling varieties of products, high quality products and technical services. Through that period, we've been coping with the technical innovations incorporated in modern paper-making machines, e.g. high-speed and wider width, so that we can satisfy customers' requirements. Four large-scale high-speed paper-making machines have recently been installed in Japan, all of which are highly productive and enable the production of high quality coated paper. To respond to those machines, we've developed high-performance dryer fabrics taking advantage of the know-how on manufacturing and design technologies cultivated through our years of experience.

We, herewith, report the technological change on dryer section and dryer fabrics referring to the required performance of dryer fabrics and the actual status of use for the latest high-speed and wider width paper-making machines.

## Comprehensive Study on Mechanism of Paper Strength Development by the Addition of a Cationic Polyacrylamide Dry Strength Resin

Takushi Sakaemura
R&D Department, Paper Chemical Division, Arakawa Chemical Industries, Ltd.
Graduate School of Agriculture, Kyoto University
Tatsuo Yamauchi
Graduate School of Agriculture, Kyoto University

In order to understand in detail mechanism of strength development by addition of a cationic polyacrylamide-based dry strength resin (PAM) at the internal application method, effects of PAM content and beating degree of fibers on the mechanical properties of papers made from bleached hardwood kraft pulp and further depth profile of PAM within a fiber wall were comprehensively investigated. The PAM retention in this study was quite high at lower addition levels under ca. 1% irrespective of beating degree, but decreased with decrease of beating degree at higher addition level. Measurements of an attenuated total reflection/Fourier transform infrared (ATR/FT-IR) combined with sputter etching and an electron spectroscopy for chemical analysis (ESCA) indicated that PAM tended to be distributed more inner side of fiber wall with increase in degree of beating. The retained PAM increased mechanically bonded area between fibers and further in some extent increased force holding capacity per bonded area for the papers from unbeaten and lightly beaten pulps. On the other hand for the papers from heavily beaten pulps, PAM addition caused a further increase of optical contact but no further increase of the mechanically bonded area. The increase in bonding strength per unit mechanically bonded area was a major cause of the strength development by PAM addition for the papers from lightly beaten pulps. The marginal effect of PAM addition on development of tensile strength for the papers from heavily beaten pulps should be related to the result that PAM content on and/or nearby the surface of fibers decreased with increase in beating degree. The increase in tearing strength by PAM addition for the papers from unbeaten and lightly beaten pulps would be derived from mainly an increase in bonding strength per unit mechanically bonded area rather than the increase of the bonded area. On the other hand, the retained PAM for the well-bonded papers from moderately and heavily beaten pulps gave constant tearing strength or a rather decrease in the strength, irrespective of the increase in bonded area probably due to stress concentration.

Keywords: Beating, Distribution, Dry strength resin, Handsheets, Mechanical properties, Polyacrylamide, Retention

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Vol.64, No.12 Abstracts

## “Why Human Being is Attracted by Paper”
## -The Future as Viewed from “Power of Paper”-

Fumihiko Onabe
Emeritus Professor, The University of Tokyo

The human being as a living organism existing in a given environment possesses the mental process including sensation, perception and cognition. One can create psychological inner world in his brain as a microcosmos. The essential of dominance of paper media lies in the affinity of paper with human being. Developmental psychology theory suggests that the appeal of paper to human sensation and perception as well as the capability of paper of storing the meaning of sentences into the cognitive structure of individual brain deeply and stably are innate nature. Therefore, the paper media will maintain its dominance in the formation of individual essential knowledge even in the digital age. As for the hedonic value as an indicator of human affinity, the hedonic value of paper is highest among others and will boost cognition processes. On the contrary, the hedonic value of electronic displaying devices at the current stage is insufficient and will inhibit cognition processes. According to the Affordance theory, the body sensation as well as historical and cultural environments in the interaction between media and human being will affect cognition processes, the shape of media and various sensations other than visual one in the reading of paper-based book or electronic book reading terminal will affect cognition processes. For further elucidation of this issue, the cognitive science and brain science will be significant tools. The French media theory “Mediologie” expresses the role of paper of supporting material for characters as “Pouvoir du Papier (=Power of Paper)”. It is expected that the integration of “Mediologie” and “Cognitive Science” will further approach to the essentiality of “Power of paper”.

## Status of International and Japan for Global Warming Tackling

Koichi Sasaki
The Institute of Energy Economics, Japan

As a global warming tackling, the Kyoto protocol was adopted in UNFCCC COP3 1997 and entered into force in 2005. The Kyoto protocol is regally binding of the emission reduction to developed countries. All countries including Japan are required to achieve the target reduction because already the Kyoto protocol is into target year (2008-2012).
On the other hand, the international negotiation of global warming tackling is focused on next following framework of the Kyoto protocol because the Kyoto target is by 2012. Japan should advocate the fair and effective international agreement for the post Kyoto protocol. For the domestic discussion, not only ideals and it is necessary to show the possibility and the image in the future to the citizen.

Keywords: Kyoto protocol, Post Kyoto protocol, UNFCCC, AWG-KP, AWG-LCA, International negotiation, Emission trading scheme, Carbon tax

## Status and Trend of Environmental Laws and Regulations

Masanobu Yuasa
Environmental Management Department, Oji Paper Co., Ltd.

Although many environmental laws and regulations have been enacted and put in force mainly to tighten the control since the 1990s, this trend could continue for the duration.

The focus of attention to come in environmental laws and regulations could be placed on (a) energy saving and global warming curbing countermeasures, (b) the chemical substance management and (c) waste and recycling affairs. Especially, it is expected to introduce a drastic reform for "Waste Disposal and Public Cleansing Law" because there are some situations taking place, which interfere with adequate recycling.

In this environmental report, the environmental laws and regulations are presented, which have been revised for the past several years and have to be watched closely. It can be said that for ensuring compliance to environmental laws and regulations, it is necessary to understand the purpose and outline of the laws and regulations, and raise the level of efforts.

## Factory Noise Source Identification and Countermeasure using Noise Vision

Masahiko Aoki
Consulting Division, Nittobo Acoustic Engineering Co., Ltd.

In recent years, the factory noise becomes a severe problem in Japan. It is not only important to the surroundings, but also important to protect the people who are working in the factory. To make an effective countermeasure for reducing noise, it is very important to find the noise sources and know their characteristics. However, generally, since there are too many noise sources around the factory, the noise source identification may be very hard and it may cost too much.

In this paper, a novel noise source identification technique and system is introduced. The name of the system is "Noise Vision"; it can display the noise source strength on the pictures quickly. The system uses a hard spherical microphone array with flush mounted cameras. As applications of this system, several cases identifying factory noise source are introduced. It is very useful way to reduce both cost and time for noise source investigation.

## Some Concerns on Waste Disposal and Public Cleaning Law
## -For the Paper Industry to be a Top Runner in a Recycling Category-

Fumiaki Nagaoka
BUN Environment Study Office

Waste Disposal and Public Cleaning law is operated under strictly controlled licensing policy. Waste paper, which belongs to “4 items which have already been recycled”, has been regarded an item without being required to get license since the law got in action.

Then, what is recycling? What kind of performance will be asked for the paper industry to keep the privilege of doing outside the licensing policy?

## The Improvement of the Throb from the Fiber Recycle Plant

Tomoki Kitamura
Kanto Mill (Ichikawa), Hokuetsu Kishu Paper Co., Ltd.

Hokuetsu Kishu Paper Co., Ltd. Kanto mill consist of two divisions which are Ichikawa (Chiba prefecture) and Katsuta (Ibaraki prefecture). The main products of Ichikawa Division are Coated White lined board and Specialty White Paper board which are made up chiefly of the recycled fiber.

Ichikawa Division is located near the Tokyo metropolitan area and this location has great advantages of collecting the wastepaper and delivering our products. On the other hand, this location is surrounded by residential area. Therefore, how to operate these plants with minimum environment impact is the most important issue for us. In particular, the fiber recycle plant and the stock preparation system are located very close to residential area. Therefore, in order to improve these environmental issues, we have been doing the efforts as much as possible.

In this report, we introduce the improvement of the throb from the fiber recycle plant.

## Nippon Paper Industries Conducts Environmental Activities and Community Development

Mamoru Shibata
Environment & Safety Dept., Technical & Engineering Div.
Nippon Paper Industries Co., Ltd.

The Nippon Paper Group is committed to helping preserve the global environment over the long term and contributing to the development of a recycling-based society by carrying out its corporate activities in recognition of the importance of biodiversity based on its Charter on the Environment to reflect the philosophy behind its environmental measures. And the Nippon Paper Group conducts various activities based on its corporate philosophy and corporate citizenship initiatives. Nippon Paper Industries also conducts various environmental activities connected with community development. We introduce some characteristic cases what we recently conduct together with local government offices or other company.

## Environment in Asia and China

Meguri Aoyama
Deputy Director, International Cooperation Bureau, Keidanren

China’s rapid growth is now a driving force in the Asian economy. However, growth is also seriously generating major environmental liabilities. China's government recognizes this problem and developed laws and institutions to protect the environment, have achieved significant results. But problems remain with the implementation and enforcement of environmental regulations. This article surveys China's environment policy from viewpoint of Plan-Do-Check-Act cycle.

## Recovery of Heavy Metal from Bottom Ash and Fly Ash

Masaki Takaoka
Department of Environmental Engineering, Graduate School of Engineering, Kyoto University

In Japan, 22.8 million tons of incineration residues are generated at present and about 7 million tons of them are disposed finally. Incineration residue with various kinds of heavy metal is a recyclable resource. Recovery of heavy metals from incineration residue is important from the perspectives of resource recycling and reducing environmental risks associated with heavy metals. In this paper, recovery technologies of heavy metal for fly ash are introduced after indicating important points on recovery from heavy metal from municipal solid waste incineration bottom ash and fly ash.

Keywords: Fly ash, bottom ash, heavy metal, recovery

## Recent Issues of Biodiversity in Japan

Hisashi Kawagoe
Global Biodiversity Strategy Office, Nature Conservation Bureau, Ministry of the Environment

The Convention on Biological Diversity was adopted in 1992. The 10th meeting of the Conference of the Parties to the Convention on Biological Diversity (COP10) will be held in Nagoya, Aichi Prefecture in this October. In Japan, various measures are underway on biodiversity. For example, the Basic Act on Biodiversity of Japan enacted in 2008, and the National Biodiversity Strategy of Japan 2010 approved by Cabinet resolution in 2010. However, according to the Japan Biodiversity Outlook (JBO), which was released in 2010 as a report of comprehensive assessment of Biodiversity in Japan, Loss of biodiversity as a result of human activities in Japan has affected all ecosystems and the loss is continuing on the whole. After COP10, we will accelerate efforts to further the conservation and sustainable use of biodiversity.

## Aerodynamic Characterization of Dryer Fabrics and Boundary Layer Air Flow in Paper Drying

Makoto Sumiyoshi and Yasumasa Takenouchi
Engineering Division, Shikishima Canvas Co., Ltd.

The function of a dryer section is to increase dryness of the wet paper sheet conveyed from a press section, to produce paper with required qualities, and to transfer it to the following process. It is generally understood that air flow is an important factor, affecting sheet dryness and thermal energy efficiency. Since paper machine speed has reached 2,000m/min, boundary layer air flow exerts critical influences on paper drying. We measured velocity of boundary layer air flow dragged by moving dryer fabrics. Samples of dryer fabrics with different characteristics were selected for our experiments. We will report and elucidate experimental results from pilot machines in selecting optimum fabrics, and will introduce several case studies on commercial paper machines from our experiences.

Keywords: air pumping action, dryer fabric, canvas self ventilation, visualization experiment, boundary layer, load of driving motors, air-cap dryer