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Low Energy LP Screen Technology  
-Energy Saving and Rationalization of Stock Preparation System-

Naoyuki Iwashige  
VOITH IHI Paper Technology Co., Ltd.

LP Screen has been developed as a fruit of our technology know-how, accumulated over 40 years. We proudly presented LP Screen to market as an extreme low power screen. Key technologies are in its inside structure - A design to make slurry pass with a constant velocity to whole screen plates, and a design to increase the consistency. It is our great honor to introduce key technologies of this innovative Screen as a recipient of a "Sasaki award 2010".

High Efficient Four Shafts Kneader (UV-Breaker)  
-Disperser for Ultraviolet Ink and Sublimation Ink-

Kazuo Aoshima  
AIKAWA IRON WORKS CO., LTD.

Recently, saving resource is an important issue in the Japanese pulp and paper industry. At the deinking process, to use low grade stock without decreasing the final product quality is required. Especially it is important to develop the technology to use magazine and MOW containing UV-ink and sublimation ink as raw material. Here we would like to introduce our "Four shaft" Kneader which would be the solution of the above problems.

Operating Experience by Retrofitting PM2 Press Section

Junji Ota  
Kanazu Paperboard Mill, Rengo Co., Ltd.

Rengo Kanazu Mill started its operation in 1961 as Kanazu mill of the former Nishino Seishisho and became what it is today by the merger of Rengo Co., Ltd. and Fukui Chemical Industry Co., Ltd in October 1991. The mill is situated in Awara City, the northernmost of Fukui Prefecture. The mill utilizes site area of 270,000 sqm and manufactures corrugating medium by PM2, the only papermaking machine as PM1 was scrapped in April 2010. Within the premise, there is a chemical and biotechnological plant production facility belonging to Kanazu Division and Central Laboratory (Fukui) under the control of Head Office, each operating under a different organization.

Ever since commencing operation in 1969, attempts to improve the running speed of PM2 have been made by replacement of No.3 press section with shoe press and modification of the driving device. However, significant aging was observed in the equipments used since start up especially at No.1 & 2 press section, where frames were deformed and affected operation. Therefore, press sections were replaced during August to September 2009. This report will introduce the outline of PM2 press section retrofit as well as some examples of its effects and troubles.

Operating Experience of Kvaerner Digester

Takeshi Sato  
Niigata Mill, Hokuetsu Kishu Paper Co., Ltd.

The N 9 paper machine which has the capacity of 350,000t/year has been built and has started for the production from September 2008 in 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 Niigata mill has to be increased 500t/day based on the total mill balance. All modifications and constructions were finished in May 2008.

In order to increase the production, Kvaerner digester were modified with installation of a new impregnation vessel.

The production of Kvaerner digester has been increased from 1,430t/day to 1,930t/day with this modification, and the total production of LBKP in Niigata Mill has been increased to 2,670t/day.

This paper reports outline and our operating experience of Kvaerner digester focused on a new impregnation vessel.

#### The Recent Activities of Energy Saving at Nichinan 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.

This time, it introduces the approach case with energy conservation in this factory that executed it in one year in the past.

#### Introduction of Maryvale Mill, Australian Paper Pty Ltd.

Koji Nagata

Maryvale Mill, Australian Paper Pty Ltd.

Australian Paper has a long and proud history of producing quality paper products for Australian consumers. Australian Paper is Australia's largest manufacturer of fine papers for print and office applications and also produces high quality packaging papers.

Maryvale Mill is located in the heart of Gippsland, Victoria, 160 kilometres east of Melbourne. It was built in 1937 and has been upgraded periodically over the years to improve efficiency and environmental performance. The Maryvale Mill is Australia's largest integrated fine paper-making and packaging papers complex, producing more than 500,000 tonnes of paper every year. At Maryvale we are committed to best practices environmental sustainability - we recycle large amounts of water, use waste products as energy sources and we have some of the best effluent treatment processes in Australia.

The Maryvale Mill has three pulp mills, five paper-making machines, an ECF bleach plant, pulp lapping machine, finishing facility and a waste paper processing plant. Much of the Maryvale Mill fine paper output is A4 copy paper sold in Australia and New Zealand, including popular brands like Reflex and Australian Pure White.

#### The Measures of Low Frequency Noise and Vibration from Lime Kiln

Tomoya Kujime

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

The Causticizing Step in Kraft Pulping Process of the Takaoka Mill has two sets of rotary kilns, No.2 Lime Kiln ( $\text{Ø}2.7\text{m} \times 55\text{mL}$ ) and No.3 Lime Kiln ( $\text{Ø}3.0\text{m} \times 65\text{mL}$ ). Generally, the rotary kiln is known as apparatus made to generate low frequency noise and vibration from the air vibration by combustion and resonance. From 2005 age, some complaint on vibrations of fittings or televisions began to be brought from two or more houses around a factory.

A main subject of this paper is to explain about the taken measures of the low frequency noise and vibration caused from the Lime Kiln.

#### Operating Experience of Energy Saving Refiner Bar

Kazuya Shimura

Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

Nippon Paper Ishinomaki mill has a capacity of one hundred thousand ton paper production per month, and the percentage of kraft pulp usage is approximately 50%. Pulp refining requires much energy, so we had often changed refiner bar in order to reduce cost and energy.

Conventional refiner bar is made by mold, so there is limitation of the plate design. But new model refiner bar (FineBar) is made by stainless steel and its design has remarkable originality. We have installed FineBar to LBKP refiners since April 2007. As a result, we achieved to save the energy consumption compared to conventional refiner bar. This report shows our operating experience and energy saving effectiveness in a period of using FineBar.

Promoting Forest Thinning through Utilizing Materials for Paper  
-“Forest Thinning Support Paper” by the “Morino Chonai-Kai”-

Toshiari Tanaka  
Paper Div., Direct Sales & New Products Development Dept., Mitsubishi Paper Mills Limited

In collaboration with the environmental NPO (Office Chonai-Kai), Mitsubishi Paper Mills developed “Forest Thinning Support Paper” in 2005. The most unique feature of this paper is that 15 yen per kg of paper is used to promote forest thinning, which serves to improve the health of forests and increases their sustainability. Specifically, the up charge is paid to forest owners to help pay the costs of thinning operations. By buying this paper, users become “Forest Thinning Supporters”, contributing to environmental protection by making forests healthier. “Forest Thinning Support Paper” is spreading other Japanese paper manufacturers.

Electrification Case with Warm Water Manufacturing Equipment for Broke Pulper

Takashi Hachiya  
Tokai Mill, Oji Specialty Paper Co., Ltd.

In our Tokai Mill, Oji Specialty Paper Co., Ltd., there exists a system to recycle broke paper, so called “Broke Pulp system”, in which hot water is used. Originally, steam for heating water was supplied from a boiler located in 380m apart from the system. Therefore, considerable amount of energy seemed to have been lost from this long distance piping between the boiler and the system.

In these circumstances, we decided to introduce heat pump water heater which is well known as higher efficiency than current steam boiler to save the energy consumption for the system. In addition, with benefit of its compact size and fire-free system, it was able to be placed adjacent to the broke pulp system and consequently the energy loss from the piping was expected to be reduced. When introducing the system, operation pattern was thoroughly simulated and optimized to level the hot water use. As a result, we were able to save a lot of energy, reduce CO<sub>2</sub> emissions and minimize the initial introduction cost at the same time.

Here we report the details in this article.

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Introduction of Total Tail Handling System for Paper Machine  
-From Wet End to Reel-

Keita Watanabe  
Paper Machinery Engineering Dept., Kobayashi Engineering Works, Ltd.

Tail threading systems and equipment has been developed over the years to be able to automatically thread the tail wherever an open draw occurred from one section to the next section of the machine. Some sixty years ago the rope threading system was introduced to thread the dryer section, calendar and reel. Approximately forty years ago the vacuum belt was introduced for threading systems at the dry end. The airfoil application was developed by Crown Zellerbach thirty some years ago.

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 Paperchine, 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.

Basic Concept of Drainage System and Possibility of Energy Reduction

Hitoshi Terashima  
Motoyama Shinkoh Co., Ltd.

Recently a dry part has been put into improved enclosed hoods, air supply/exhaust, and heat recovery systems, and has remarkably increased efficiency. There is a close relationship in drying wet paper between drainage systems and hood ventilation systems that the drainage system must meet. Although the basic concept of the drainage system remains unchanged, the condition plays a key role in the quality and energy cost for drainage systems. In order to have maximum drying and hold it, it is indispensable to understand the exact condition of the drainage system following a change in a good and stable condition, which may lead to reducing energy costs. We report it with "Basic Concept and the Possibility of Energy Saving".

Operating Experience of PM N1

Noriyasu Ohshima  
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 1,650mpm and the production of 1,050t/day in last December. At present, we work on the problem extraction and cope for the continuous operation at 1,700mpm.

This report presents the outline of facilities, operation troubles we have experienced since commercial production started and the countermeasures at the dry section of PM N1.

Operating Experience of PM N6  
-Dryer to Reel-

Hiroki Nagata  
Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

Commencing commercial production on Nov. 1st 2007, Ishinomaki PM N6 has mainly produced LWC and MWC at 1,600mpm since its smooth startup. With width of 9,450mm wet fabric, 1,600mpm operating speed and 1,005t/d capacity, the PM N6 is one of the NPI's largest PMs. Besides its large scale and capacity, the PM N6 has also equipped with both on-machine blade coater and on-machine calender. Furthermore, focusing on competitive cost performance as well as top class productivity, the PM N6 has installed numbers of leading technology to improve its operating efficiency.

This report has introduced the outline of PM N6's latest equipment and summarized our recent operating experiences in the dry section of PM N6.

#### Operating Experience of Niigata N9

Osamu Yoshikawa

Technical and Development Div., Hokuetsu Kishu Paper Co., Ltd.

Niigata N9 has started commercial production since September 1, 2008 as the 4th on-line coater paper machine in Hokuetsu Kishu Paper. N9 which has a higher productivity concept by its high speed and wide paper width has increased smoothly the production and speed thanks to our on-line coater technology from N6, N7 and N8, on-line calendar for A3 gloss, gap former, tandem shoe press, sizer and tail threading equipment for steady tail threading with high speed.

N9 has reached 1,600m/min as a maximum speed now, and tried various challenge for high speed to aim for more stable operation. One of the most important things to achieve high efficiency is a steady tail threading at high speed, and we've improved tail threading one after the other. This paper reports operating experiences of form the dryer section to the reel and spotlights tail threading and turn up device form dryer section.

#### Light Weight Containerboard Machine with Metso Technology

-Towards Lower Basis Weights-

Takashi Akazawa

Project & Engineering, Paper Business Line, Metso Paper Japan Co., Ltd.

The trend towards lower basis weights presents a set of challenges for production. First, the economical production of lighter weight grades requires higher machine speeds. Second, producing board from lower grade recycled furnish often causes quality problems, and, finally, the end product still needs be strong.

Over the past twenty years fluting and linerboard basis weights have decreased significantly (Figure 1). To compensate for this, it has been necessary to increase machine speeds proportionately. This is already evident in the higher design speeds of new installations.

While basis weights have decreased, the use of recycled fiber as the furnish for containerboard has increased. Economic pressures require cost reductions, which has led to the use of mixed waste instead of high quality OCC. This, in turn, has increased the ash content of the furnish (Figure 2).

The increase in ash content is often compensated by the use of a film size press. As is well known, ash does not make hydrogen bonds and thus does not contribute to strength. With furnish of strong fiber, a film size press is naturally not needed. Furnish made using mixed waste often comes with a high ash content, and so a film size press is necessary. This paper describes the outline of Metso new concept for fluting and linerboard.

#### Improving the Efficiency of the Process of Making Paperboard with Paper Additives

Kenji Sakai, Naho Murata, Hiroyuki Koshio and Shohei Mitsui

Syonan Research Center, HYMO Corporation

For the purpose of improving the efficiency of making paperboard, it is effective to improve water drainage by means of making suitable flocculation using drainage aids. However, normal linear polymer having high molecular weight often causes too large flocculation. It causes not only bad formation but also inefficiency at the press and dryer part and deterioration of paper properties.

In order to improve such problems, we have developed Himoloc FR-740 and new drainage aids (FR-type and DR-type) using our original synthesizing method without controlling molecular weight simply.

FR-type is multi-compound polymers, having very wide range of molecular weight and charge density. Therefore, FR-type includes both high molecular weight polymer having flocculation ability and low molecular weight polymer having coagulation ability. When FR-type drainage aids are used, floc is formed uniformly and not too large. So, FR-740 can improve water drainage without having a bad influence on other property and efficiency.

In order to cope with various conditions of the paperboard, we also have developed new DR-type drainage aids. Their flocculation force is designed to be more than FR-740 and less than normal retention aids. Because of introducing intramolecular interaction, new DR-type drainage aids have different characterization from normal linear polymers having high molecular weight. We expect high ability of water drainage without a bad influence on formation and paper strength in spite of increasing flocculation ability.

In this report, we show the performances of these drainage aids.

#### Carbon Roller Design for High-speed, Wide-face Paper Machines and Reduction Technique of the Dynamic Runout

Akihiko Yoshiya

Mitsubishi Plastics, Inc.

Masaya Nagai and Sadato Shigemura

Tocalo Co., Ltd.

Masanobu Yamanaka

Sunray Co., Ltd.

Rollers, which are composed mainly of carbon fiber reinforced plastics (CFRP), are called "Carbon rollers". Carbon rollers have great advantages over metal rollers, such as light weight, low inertia, less deflection, and high natural frequency. Today, carbon rollers have been intergraded into industrial machinery such as film and, paper making, and printing presses. When carbon rollers are used in paper making machines, the rollers are required to keep stable rotation at ultrahigh-speed even though the roller face is very wide. To achieve the performance, the highest level of dynamic balancing of roller is required. A unique balancing technique introduced in this paper enables to exercise the best roller performance.

#### Analysis of Distributions of the Paper Chemicals on Paper (III)

-Visualization Analysis of Distributions of Amphoteric Strengthening Agent onto Pulp Fibers-

Fumiaki Inokuchi and Tadashi Sawahata

Research and Development Center, Development Management Division, Arakawa Chemical Industries, Ltd.

Takushi Sakaemura

Research and Development Center, Paper Chemicals Division, Arakawa Chemical Industries, Ltd.

It is supposed that amphoteric strengthening agent (polyacrylamide series) could be aggregated under specific conditions (pH and conductivity) to form polyion complex (PIC). However, the condition of PIC in the solution has not been clear in the past. In this study, the form of PIC and the fixation process to pulp fiber in the solution have been clearly visualized as a result of observation under a phase-contrast microscope. Moreover, we describe the distribution state of PIC onto pulp fibers in the solution along with the results of the analysis under a scanning probe microscope (SPM) and a Raman microscope.

#### Magnetic Ion Exchange Resin Technology: Removal of Color, DOC (Dissolved Organic Carbon)

Kuniyasu Sasaki

Itochu Machine-Technos Corp.

Yuichi Nemoto

Maezawa Industries, Inc.

Magnetic Ion Exchange Resin System (MIEX® system) is able to remove color and dissolved organic carbon (DOC) by anion exchange process in industrial water and wastewater.

The purpose of this investigation is to evaluate applicability of MIEX® system for pulp and paper wastewater by MIEX® fundamental experiment.



As a result of this experiment, it was shown that this system is able to remove color, DOC and COD (chemical oxygen demand) effectively regardless of the concentration of organic matter discovered that and the more concentration of this resin increases, the more the removal rate improves. Therefore it was cleared that this system can be applied for wastewater from paper mill effectively as reuse of the wastewater or reduction of COD and color in wastewater.

Further, this paper introduces about commercial plant of Australian paper mill.

#### Preparation of nano sized TiO<sub>2</sub> from Paper Sludge Ash

Satoru Fukugaichi

Ehime Institute of Industrial Technology

Kousaku Nagashima

LINTEC Corporation

Naoto Matsue and Teruo Henmi

Faculty of Agriculture, Ehime University

Some of paper sludge ash (PS ash) contains TiO<sub>2</sub> which is used for pigment. This TiO<sub>2</sub> has 100~300nm of particle size and shows any little photocatalytic activity. PS ash containing nano sized TiO<sub>2</sub> was obtained by three kinds of acid treatment (HCl, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>) after alkali hydrothermal reaction of PS ash. XRD analysis and SEM observation showed that crystal structure of TiO<sub>2</sub> included in PS ash was anatase type and crystal size was 10-14 nm. BET surface area of PS ash containing nano sized TiO<sub>2</sub> was 258-288 m<sup>2</sup>/g. Gaseous acetaldehyde removal experiment was carried out to evaluate photocatalytic activity of nano sized TiO<sub>2</sub> in the PS ash. Nano sized TiO<sub>2</sub> obtained by H<sub>2</sub>SO<sub>4</sub> treatment have ability of decomposing acetaldehyde to carbon dioxide under UV irradiation, while untreated PS ash was able to decompose acetaldehyde any little.

Keywords: PS ash, nano sized TiO<sub>2</sub>, photocatalyst, acetaldehyde

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#### A Practical Total PID Tuning Approach for Chemical Process

Kenzo Fujii  
Idemitsu Kosan Co., Ltd.

This paper presents a useful technology of total PID tuning approach for a large scale plant. The proposed method has two stages. First stage is skill training to operator, and shared part of tuning. Second stage is tuned by engineers using performance based tuning. We were able to obtain actual plant stabilization in a short period by using this approach.

#### System for Real-time Display Physical Unit of Product

Masamitsu Aoki  
Tokai Mill, Oji Specialty Paper Co., Ltd.

Specialty paper industry in the recent situation, in addition to rising raw material costs, to meet customer demand for small, little more respect, and the production of various kinds.

So we have to do and how efficient production has become an important issue. Recently, real-time physical unit of product (cost) by the visibility, awareness raised the cost of manufacturing sites, efforts to optimize the operation conducted. In addition, we were able to confirm the improvement. This article explains about it.

#### Latest Technology of QCS Caliper Sensor

Takashi Sugawara and Noriyuki Kobayashi  
Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

Measuring the thickness of the web by using conventional caliper sensor has been achieved through the use of dual-side, contacting caliper sensors. Therefore, there has a problem of the flaw on the paper surface and sensor abrasion damage.

On that occasion, paper makers have been asking for a new type of caliper measurement, which overcomes the weaknesses of contacting caliper. Most of the QCS makers have been using laser sensor to measure the thickness. However, Ishinomaki Mill introduces Yokogawa's non-contact (one side light-touch) caliper sensor which is based on a combination of two techniques chromatic aberration and confocal displacement. This one can expect the improvement to eliminate the problems of the flaw and marking on the paper, sensor contact abrasion and dirt deposit on the contact.

This report presents the outline of introducing optical caliper sensor which we introduced into Ishinomaki mill N6.

#### Our Current Efforts to Advance PLC Technology

Seiji Hori  
FA System Dept., Nagoya Works, Mitsubishi Electric Corporation

Today's manufacturing industry is expected to further reduce costs and improve production efficiency due to global competition and shortened product life cycles.

To meet these needs, we have improved the performance and reliability of our new products. We would like to introduce our approach, using PLCs, to reduce the total cost of manufacturing.

## The Introduction of New Safety Management System Using IT in the Manufacturing Industry

Hidenori Kiyoshi  
NITTETSU ELEX Co., Ltd.

In 2006, the new safety management using IT (Information Technology) was commissioned by the Ministry of Health, Labor and Welfare, in cooperation with the National Institute of Occupational Safety and Health, Japan.

This report presents the above new safety management and several examples of IT equipment introduced into the manufacturing industry.

### Example of 2M/C DCS Renewal

Michitaka Kawasaki  
Chuetsu Pulp & Paper Co., Ltd.

It passed for nearly 22 years after introducing DCS into 2M/C and performed several times update from problems in the maintenance. The  $\mu$  XL system made in Yokogawa Electric Corp. which we introduced in 1996 stops an order in 2000 and maintenance becomes the end in 2010.

From an aspect of the operation stability, we thought that correspondence of the trouble in late years was difficult and carried out update to CENTUM VP Small made in Yokogawa Electric Corp. at the time of a stop in a fall in thought October, 2009.

Here, I report an update example of CENTUM VP Small which we introduced this time.

### Calibration of On-line Pulp Consistency Transmitter

Toshiyuki Nagao  
Mishima Mill, Daio Paper Corporation

In order to maintain an accurate fine pulp blend during the mixing process, the proper functioning of flow and consistency transmitters is essential. Apart from microwave measuring systems, standard on-line consistency transmitters generate their readings based on shear stress as registered on the mixing blades. This system yields a relative reading based on accepted, theoretical values – it does not provide a real-time, absolute measurement.

This is an issue because, even under controlled laboratory conditions, consistency values will vary between samples despite shear stress sensors indicating identical consistency ratings. These meters can be affected by a host of variables, such as pulp materials, temperature, additives, particulate velocities within the pulp or of the pulp itself, turbulence, etc. Insuring the proper operation of these sensors and their maintenance are critical issues in pulp quality control.

In this paper, we detail how we have re-engineered the calibration process to produce consistent readings from our resistance sensors. Additionally, we discuss some unexpected phenomenon that was observed during the calibration and which may merit additional investigation.

### Integration of Electrical and Instrumentation Control Systems

Hiroshi Ota and Takashi Ueno  
Paper & Material Handling Systems Engineering Department  
Industrial Automation and Drive Systems Division  
TOSHIBA MITSUBISHI-ELECTRIC INDUSTRIAL SYSTEMS CORPORATION -TMEIC-

Electrical and instrumentation control systems have become essential for the operation of all equipment in the field of manufacturing industry. Specification and application of electrical and instrumentation control systems are different. This paper introduces the capability of system unification utilizing unified controllers nv series.

### The Solution of Efficiency Improvement and Yield Improvement of High Quality Film

Kunio Yamamoto

Sales Engineering Div., Yokogawa Electric Corporation

A high quality film is a material used in the market such as the liquid crystal, semiconductors, and the batteries. In the film material industries such as the liquid crystal, semiconductors, and the batteries, a lot of film materials are manufactured to correspond to the diversification of needs and the product-short life cycle.

The company's that manufactures the performance film being able to respond to speedy development, the improvement of the quality, and the customer demand such as reduction in costs becomes a very important factor. In each enterprise under the environment, the companies are improving promptly quality and lead time in the film manufacturing process. The problem and the solution of this environment are described in this report.

Current Situations and Issues in Instrumentation Work and Meter Maintenance

Masanori Okimoto

Aasahi Kokusai Technion Co., Ltd.

Necessary time of difficult steers of a decrease in construction according to a decrease in capital investment and a severe cost reduction demand, etc. aiming at the economic shrinkage period in the future is faced though the instrumentation work and meter maintenance industry grow up riding on the wave of economic development, get over time when Japanese economy is saturated, and came.

In this report, the idea is described as charge of the technology in the experience, the instrumentation maintenance of the instrumentation charge in the petrochemical facility, and the construction company and the health and safeties about a current problem as the construction company and the approach in the future, etc. based on the experience

Camera Technology for On-line Paper Measurements of QCS

Takuya Akutsu

Honeywell Japan Inc.

The technological advancement in many fields has vastly improved camera technology in past few years. It is stretching from high sensitivity and high resolution to the compact and the light weight. Then, the image processing technology enable large-capacity and high-speed processing in the same way. This evolution is enough available for the online measurement. I introduce newly three kinds of camera sensors for Honeywell QCS to here.

The Influence of Blanket Type on Printing

Masanori Kawashima

NPi Research Laboratory, Nippon Paper Industries Co., Ltd.

Douglas W. Bousfield

University of Maine

The development of print gloss is reported for the first time using actual printing inks, coatings and press blanket materials. The print gloss for several blanket textures is measured and the results show that the surface structure of the blanket material has a significant influence on print gloss development. Higher blanket roughness correlates with low gloss. A model, based on the surface tension driven leveling of an ink filament, is proposed to predict the print gloss right after printing. This model predicts the correct gloss dynamics and gives insight into the length scale related to the blanket texture. Ink tack on the press blanket texture is also measured by a rolling nip device, which detects the separation forces at the nip exit. The influence of blanket type on the maximum and minimum pressures is reported. Rough blanket textures are found to correlate with smaller tack forces. The reduction of tack force with increase blanket texture is thought to be related to the earlier onset of cavitation at the nip exit.

Keywords: print gloss, blanket texture, ink filament, gloss dynamics, tack force, cavitation

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#### Creation of "Super Eucalyptus" with the Molecular Breeding Technique

-Does the Molecular Breeding Technique Become One of the Last Resorts for Greening of Ruin Areas and Higher Biomass Production in Near Future?-

Takashi Hibino

Forestry Research Institute, Oji Paper Co., Ltd.

Since 1991, Oji Paper has been advancing the overseas forest plantation business for securing the forest resource and to protect the environment. Paper quality is greatly affected by the fiber properties such as fiber length, cell wall thickness, cellulose and lignin content. To get comprehensive understanding the fiber development, we have developed the EST database and oligo-microarray system for the Eucalyptus genomics.

We already collected the gene expression profiles of three different Eucalyptus trees using our Eucalyptus oligo-microarray. To identify the expression trends of the genes involved in cellulose and lignin biosynthesis, we performed the trending data analysis using their expression profiles among several samples. Their trends could be divided into two groups, clearly. Finally, we identified the two gene clusters. Each cluster has several transcription factors (TFs). We already reported that EcHB1 (HD-Zip class II) and EcMYB1 (Werewolf-like MYB) can be used to improve growth and fiber properties by analyzing transgenic tobacco plants as model experiments in 2007 IUFRO Tree Biotechnology meeting at.

Currently, with the modified EcHB1 gene, we succeeded with creating "Super -Eucalyptus". In this report, author show details of the latest results in own study.

#### Operational Experiences on New Waste Fuel Boilers

Hiroaki Hamada

Hokkaido Mill-Shiraoi, Nippon Paper Industries Co., Ltd.

Hokkaido Mill-Shiraoi in Nippon Paper Industries is located in Shiraoi-cho, which is in the southern part of Hokkaido, and almost the same distance from Tomakomai city and from Muroran city; 30km from Tomakomai city, and 37km from Muroran city. Hokkaido Mill - Shiraoi has abundant water resources from the Shikiugawa River and has the capacity of 420,000 tons per year, which consists of three large-scale paper machines and one coater machine. It is one of our main mills for printing papers in Eastern Japan.

By 2010, Nippon Paper Group is working to reduce units of fossil energy by 20% compared to fiscal 1990 levels, and also reduce per unit CO2 emissions from fossil energy consumption by 16% compared to fiscal 1990 levels. To achieve our plan, we installed power generation plants running primarily on new energy such as biomass fuels in 11 mills from 2003 to 2009. Because Hokkaido Mill-Shiraoi had been reliant on heavy oil boilers and on inefficient Coal Stoker boilers, we installed a new boiler which was the eighth ones in our group in 2008.

In this paper, we will introduce main specifications of the new boiler, and operational experiences after start-up.

#### Operation Experience of New Energy Boiler

Takashi Kenmoku

Nikko Mill, Oji Paperboard Co., Ltd.

Oji Paperboard Nikko mill is located nearby Kinugawa river which we can utilize its rich water and is close to metropolitan area. Making use of this good location, we have mainly produced liner, core board and so forth. We started operating a biomass boiler, aiming at the switch from crude oil to biomass fuel and decreasing carbon dioxide emission. I will report the experience of operating a biomass boiler after start-up, and the summary of an early trouble with operating.

## Challenge for Energy Saving and Stable Operation by Innovative Technology in Stock Preparation

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 an actual reference of saving energy, comparison of operation and present situation which we got by integration and simplification of existing system flow and innovating latest technology from pulping to screening for No.1 and No.2 line in May 2009.

## The Variety Eco-wood Pulp Production by Batch Digester

Hidemori Ninomiya

Pulping Section, Sendai Mill, Chuetsu Pulp & Paper Co., Ltd.

Abandoned planted forest and bamboo forest erode other healthy forest, and affect eco-system at Satoyama (mountain village forest) nationwide. Proper thinning of such forest contributes the maintenance of Satoyama environment and the sustainability and reproductively of the biological diversity; in addition this contributes to prevent global warming.

Therefore the utilization of the forest waste resource such as thinning woods have to be accelerated, so producing paper products from the thinning woods is good solution for this purpose.

Sendai mill has been utilizing local thinning bamboo and cedar for years. We upgraded the batch digester system pulp line for small lot into ECF pulp production plant, and this upgraded line has started production recently and the local thinning bamboo and cedar wood are utilized more effectively.

We introduce an example this time because we started the variety eco-wood pulp production.

## Operating Experience of Carrier Flow System for Effluent Treatment Facility

Ichiro Nishioka

Kanto Mill Ichikawa, Hokuetsu Kishu Paper Co., Ltd.

Hokuetsu Kishu Paper Co., Ltd. Kanto mill consists of two divisions which are Ichikawa and Katsuta. Ichikawa division is located in the great Tokyo area and the main product is Coated White lined board that is mainly made up the used paper. In order to adapt the changing used paper quality and the increasing production capacity, the effluent treatment facilities have been improved several times.

Because of the facility aging problem, one of the microorganism treatment processes of the effluent treatment facility was currently replaced from Rotating Biological Contactors to Carrier Flow Systems. Until now, this new facility has been running well and providing great result.

In this paper, we introduce the outline of our new facility and the experience of the current operation.

## The Laborsaving of the Finishing Process

Masashi Tamaki

Kishu Mill, Kishu Paper Co., Ltd.

In order to improve per-capita productivity of our Kishu Mill, each process was analyzed. Then, we found out low per capita productivity in finishing process and decided to streamline it. Before this streamline program, each production line had own finishing process, such as a cutter, a roll packing machine and a flat sheet packaging machine. During this program, these processes were consolidated and some of new systems were installed. After this consolidation process, another problem was expected. If all of paper making processes reach the maximum production rate, capacity of new finishing process is not enough to handle it. To overcome this problem, we installed temporary roll stock system for sheeting rolls as the buffer. In addition, automatic conveyance system has been installed entire this new process which is based on barcode identification system. As a result, per capita productivity had been significantly improved from 450t/person to 490t/person.



In this report, we introduce detail of our laborsaving process and current operation.

#### Development of Water Soluble Direct Thermal Paper

Hiroyasu Naruoka

Nippon Paper Papyrus Co., Ltd.

Akihito Ogino and Yasuaki Matsumori

Nippon Paper Industries Co., Ltd.

We introduce the market and feature about direct thermal paper having a function of water dispersion. This product consists of the water soluble paper that disperses to water quickly. Main usage is for direct thermal paper labels which have pressure sensitive adhesive on the back side.

At first, this label is printed by portable direct thermal printer with information of some letters or barcode and putted on objects. After using, the label is easily removed by water washing. It is special characteristic of this product.

For example, when the information should be expressed by label sticking on a surface of the returnable container, the information by human hand writing is unclear and occasionally other people can not read it. If all information is printed by direct thermal printer instead of human hand writing, these problems would be solved.

In addition, it brings an advantage, because it doesn't need to peel off the label with the hand, if the label is quickly dissolved by the water.

#### Introduction of Vina Kraft Paper Co., Ltd.-Vietnam

Masaru Kobayashi

Vina Kraft Paper Co., Ltd.

Vina Kraft Paper Co., Ltd. (hereinafter called VKPC) located near Ho Chi Minh City, Vietnam was incorporated in January 2007, and started building the largest containerboard mill in Vietnam. VKPC is a joint venture company between SCG Paper (Siam Cement Group), the biggest paper manufacturer in Thailand, and Rengo (Japan), and commenced commercial operation of the containerboard mill in April, 2009. Today, I would like to introduce VKPC as one of the examples of our joint ventures in a foreign country.

#### Report on the Results of the Follow-up Survey on JPA's Committed Action Plan for Fiscal 2010 and Efforts against Global Warming 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 2009, 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 carbon tax, emission trading, and total buyback program for renewable energy.

#### Strength Properties of Paper Pasted with Starch

-Role of Paper and Starch in Restoration of Paper Based Cultural Properties-

Takeo Kotake and Tatsuo Yamauchi

Graduate School of Agriculture, Kyoto University

Naoharu Usami

Using an imitated washi paper made from wood pulp, a penetration of starch solution into a paper sheet and the locative variation in amount of starch applied by brushing were examined. As to the brush application with thin starch solution, the starch solution well penetrated inside the paper and a starch-paper complex structure, which was typically formed at the application method based on impregnation, was developed. In this case the tensile strength significantly increased with an increase of applied starch amount. On the other hand at the brush application with thick starch solution, the starch solution little penetrated inside a paper and a starch layer was eventually interposed by paper layers, which was typically formed at the application based on blade coating method. In this case the tensile strength little increased with an increase of starch amount. At the folding endurance the existence of a starch layer readily led to brittle failure although the starch solution penetrated well within a paper sheet. Thus, the applied amount of ca 33% at the application method based on impregnation and that of ca 25% at the brush application gave the maximum in folding endurance and more application of the starch rather caused a decrease in the folding endurance, irrespective of application method.

Keywords: brush application, pasting, restoration of cultural properties, starch, strength properties, washi papers

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#### Operational Data as a Source for Understanding the Trend of Technological Development

Kiyooki Iida  
Executive Director emeritus, JAPAN TAPPI

We believe that describing how one technology has been developed is helpful for inventing and developing new technology in the future. So, JAPAN TAPPI has been working to publish them in a series of booklets entitled "Technological development in 30 years in the Japanese paper industry".

Though these descriptions or the reviews are readily understandable, they are converted information in some ways and need to be verified by real data in mill operation. We are interested in those operational data in mills as information of the first order. Then, how to summarize them, usually of very large amount, in an accessible form is a problem. One suggestive method is to convert them in a chronological table. Though the table is usually a history of one specific operation unit, it represents the trend in general and supports the historical reviews as well. Following four examples, newsprint machine, linerboard machine, power plant and recovery plant, demonstrate that the chronological table of each specific unit is as informative as the historical review of the technology.

#### Growth and Wood Properties of Eucalypt Elite Trees for Pulp Production

Shinichi Onogi, Kazunori Hayashi, Eiji Iwata and Akiyoshi Kawaoka  
Research and Development Department, Agri-Biotechnology Research Laboratory,  
Nippon Paper Industries Co., Ltd.

Improving productivity of existing plantations is essential for commercial afforestation because the land available for plantation is limited and profitability of companies which conduct afforestation and woodchip production. Therefore, higher woodchip yield per unit square of plantation and higher quality of woodchip are in demand. Clonal plantation is considered to be one of the most effective ways. In clonal plantation, elite trees with high growth and good property as pulpwood in given land are selected. Then seedlings produced by clonal propagation are planted.

In this report growth and wood properties of eucalypt elite trees candidates and of same clones with different growth are investigated.

#### Improvement of Water Quality and Wet End in a Board Machine with a New Microbial Control Concept

Hiroki Katsura, Katsuhiko Hidaka and Hiroyuki Suzuki  
Kurita Water Industries Ltd.

Recently, closed and alkali papermaking process and increasing corrugated used paper as furnish result in the increase of chemicals, pulp, energy and effluent treatment costs. Here, we show the newly microbial control technique, using Fuzicide which can contribute to decrease those costs and increase productivities by improving water qualities throughout the process and wet-end.

#### The Automatic Counts Monitor System of the Capture Insect

Satoshi Motosugi  
Ikari Corporation

The present standard insect capture device is light inducement-style catching insect device.  
The function of the light inducement-style catching insect device induces an insect by light and captures it with the adhesion paper.

In addition, the investigation method of the standard insect habitation situation installs light inducement-style catching insect device in the investigation point for a certain period of time (about 1 month) and performs it.

The person in charge collects the adhesion paper for a certain period of time (about 1 month) after progress and identifies calculation of the number of the capture and a captured kind.

We perform prevention measures on the basis of these findings to plan maintenance of the on-site hygiene management, improvement.

However, it depends, and quick prevention measures are necessary to find relief and the security of the product which is recent user needs.

I introduce new light inducement to enable an anti-quick prevention measure-style catching insects device this time.

#### New Board Machine Start Up in Vietnam

Kazunari Sato

Paper Machine Engineering Dept., Voith IHI Paper Technology Co., Ltd.

VKPC (Vina Kraft Paper Co., Ltd.) PM#1, the largest paper machine for liner and corrugating medium in Vietnam, started its operation in Apr, 2009, supplied by Voith IHI Paper Technology Co., Ltd.

The majority of paper machines in Vietnam are still in process of development. The start up of VKPC PM#1 with state-of-the-art technology is remarkable news in the industry of paper business.

This paper will introduce the outline of project including the specification of Paper machine, installation and start-up phase.

#### Factors Influencing Surface Strength of Coated Papers

Peter Dahlvik, Guillermo Bluvol, Karl-Heinz Kagerer and Manfred Arnold

Omya International AG

This paper focuses on the influence of different coating color parameters on the surface strength of pilot coated paper. Pick resistance was determined in full-scale sheet-fed offset printing. A tailor-made printing method including a special printing plate and the usage of high-tack inks was developed with the objective to evaluate the impact of different coating parameters on surface strength mainly in terms of edge picking. Evaluated parameters include the solids content of the coating color, the type, fineness and particle size distribution of the pigment and binder level.

The developed full-scale printing test method provided clear differentiation related to the investigated parameters and it was possible to correlate this differentiation with lab test data on ink-coating interaction. It was shown that binder level can be optimized for cost savings while keeping sufficient pick resistance by maximizing the solids content of the formulation. In addition, clear differences related to the type of pigment were detected. Other lab tests showed poor or no correlation with the observed degree of edge picking.

#### Lanolin, Wool Wax and Surface Coating

Hiroyuki Kawashima

Croda Japan KK

Lanolin is a wax sticking to sheep wool as lipid ingredient. A lipid ingredient included in the sheep wool was known for a gentle and protective for the skin from ancient times. The extraneous matter of the wool was a woolen grease-shaped thing called wool grease and named Lanolin as a refined matter. The wool grease sticking to wool is different from the oils and fats which seem to be the lipid from tallow and lard. It looks like epidermal lipid which is waxy solid. The ingredient has complicated variety and unique physicochemical characteristic such as cosmetic, pharmaceutical basis, rust preventative, agent for textile, the softener of chewing gum, etc. are developed, and the new application using Lanolin are developed. The main application is surface processing, and we can expect development of the paper manufacture industry.

#### A New Development of Density Decreaser for Paper

-MUSCUT Series-

Yasuo Mori and Hajime Saito

Global Market Innovation Department, Research & Development Division, NICCA CHEMICAL CO., LTD.

Low-density paper called "KASADAKA-SHI", which is characterized by its lighter weight & higher-caliper than conventional paper, is currently used in a wide range of products such as book paper and paperboard. Low-densification enables paper to provide not only advanced functions like the increased bulk by weight reduction as well as increased paper caliper and the improved quality like handling and page-turning, but also the weight reduction without caliper change which is widely noticed from the environmental point of view due to the restraint of deforestation by reduced consumption of virgin pulp. Decreaser for paper is currently widely employed in various techniques as additive to achieve the low-densification of paper from among other options.

NICCA CHEMICAL has launched cationic type decriaser for paper called "MUSCUT K-300 series" which features advanced modification effects like sizing, enhanced opacity and softness as well as bulk. However MUSCUT K-300 series still has defects to be improved, such as reduced paper strength and inconsistent compatibility of the combination with anionic agents. Our continuous elaborate works enable us to develop new nonionic type decriaser for paper called "MUSCUT N-800" which features suppressed reduction of paper strength and improved compatibility with other combination agents.

In this paper, we report on the features and practical applications of MUSCUT N-800.

Hardness Measuring Instrument for Roll Quality Profiler

-Wireless RQP, Online RQP-

Osamu Suzuki

Nomura Shoji Co., Ltd.

Roll density or hardness is the most important factor in determining the difference between a good and bad roll. The defects such as corrugations caused by non-uniform roll hardness profiles are a major cause of lost production for producers and converters. A reliable measurement of the roll hardness profile is of critical importance in deciding whether a roll is good or bad. Production staff needs to be able to test and figure out the results as efficiently as possible.

TAPIO Roll Quality Profiler is designed for fast and accurate measurement of paper roll and machine roll hardness profile. The measurement device includes hardness measuring unit and distance sensor. RQP is the fastest and the most accurate system to detect reels that need to be excluded in printing or converting processes.

Development of the Special Boring Machine for the Roll with High Precision

-Original Method for Producing Well-balanced Roll with Uniform Wall Thickness-

Yusuke Nakagawa

Production Technology Section, Nomura Plating Co., Ltd.

As one of needs for paper machines increasing running speed is required. One way to realize high speed running, uniform roll production of the outer shell thickness is needed. Namely, inside diameter size precision is high, at the same time, there is not machining gap of central part.

Until recently, standard method of machining is honing after the inside diameter processing of the roll. By this method it is the limit of increasing of machine speed, caused by wobble.

So we have begun to develop a new technique in purpose for getting cylindrical precision and minimizing surface roughness.

At our company we have adopted a honing less processing from single side instead of the conventional processing from each side. And we have succeeded in producing the new machine, realized to product the roll with uniform wall thickness, increased cylindrical precision and obtained surface roughness.

As a result 50 microns of cylindrical precision was obtained for the roll ( $\text{Ø}580\text{mm} \times 5,765\text{mmL}$ ) and there is not gap at central part.

With this success we can obtain uniform wall thickness, it is expected that temperature unevenness is decreased at the time of cooling and heating, and equalization of the nip.

Advantage of Acid Sulfite Cooking as Processes of Bioethanol Production

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Keiichi Nakamata

Technical and Development Division, Hokuetsu Kishu Paper Co., Ltd.

From the standpoints of biorefining processes, Japanese larch (*Larix leptolepis*) wood, acacia (*Acacia mearnsii*) wood, and bamboo (*Phyllostachys pubescens*) stem were cooked using the magnesium base/acid sulfite cooking method, and the dissolution behavior of carbohydrate in spent sulfite liquor (SSL) was studied. It was found that glucose dissolves rapidly into SSL immediately after sufficient removal of lignin from the pulp. Cellulose more rapidly dissolved as glucose into SSL at the later stage of cooking than at the initial stage. In addition, it was shown that larch mannan and acacia xylan dissolve as monosaccharides and oligosaccharides during the initial stage of cooking, and that both the hydrolysis of oligosaccharides and the decomposition of monosaccharides in SSL proceeded with increasing cooking time. The amount of enzyme adsorbed to residual lignin in enzyme-treated pulp was measured by pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS). Acid sulfite pulp (SP) enzyme-treated absorbed cellulase as 30-80 FPU on 1 g of lignin. It has a much lower value than soda-anthraquinone (AQ) pulp enzyme-treated.

Keywords: glucose, ethanol, cellulose, lignin

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Utilizing Wood Biomass as Energy such as Power Generation and Thermal Use

-Current Situation of its Utilization and Problems to be Solved when Developing Biomass Utilization into Business-

Junji Shinoda

Kankyo Shisetsu, Editor-in-Chief, Kokyo Toshi Journal Inc.

With the revision of the New Energy Law by a cabinet order in 2002, the government introduced subsidies for the construction of woody biomass power plants, prompting companies, municipalities, forest unions, and other organizations to build such facilities nationwide. In 2003, the Renewable Portfolio Standard Law came into force, accelerating the construction of facilities that generated 5 to 50 megawatts of electricity using woody biomass. In addition, a wide range of projects to use woody biomass energy, including the development of next-generation bio-fuel such as cellulosic bioethanol, the use of biomass heat for a wider range of purposes, and thermal power generation by burning a mixture of coal and biomass, are currently under way.

According to a survey by the Forestry Agency, by the end of fiscal 2008 the number of woody biomass power plants had reached 144, 12 times as many as in fiscal 1999, when the survey was first carried out, and the number of boiler facilities using heat from woody biomass had also grown sharply from 174 in fiscal 1999 to 615. A shortage of wood chip and soaring fuel prices lowered the operating rate of these facilities and hit their profitability, but there have recently been plans to add biomass to fuel at coal-burning thermal power plants and to build large power plants using woody biomass alone, and so the supply-demand for wood chips is expected to become tight again. The changing circumstances for using woody biomass energy are heightening expectations for untapped biomass resources such as forestry residues, which have been impeded by high costs.

Using woody biomass as a source of energy is the final stage of the cascaded use of forest resources. Recently, various business models with new value such as energy service companies (ESCO), carbon offsets, and CO2 emissions trading have been announced, and feed-in tariffs for power generated using woody biomass are expected to be introduced. These changes will increase the profitability of woody biomass power generation, which has been a stumbling block so far. Woody biomass power generation should be promoted as an effective way to achieve the Forestry Agency's Forest and Forestry Revival Plan, which aims to increase lumber self-sufficiency to 50% by 2020 and create a low-carbon society.

Approach to Energy Saving at Otake Mill

Hitoshi Akamura

Otake Mill, Nippon Daishowa Paperboard Co., Ltd.

Nippon Daishowa Paperboard Co., Ltd. approaches to energy saving based on environmental action plan. I advocates fiscal 2010, reduce fossil energy consumption per ton product and fossil energy-derived CO2 emission per ton product by 20% and 16%, respectively, from the level of fiscal 1990.

In the Otake mill, we make trial and error, and we perform approach to the energy saving.

）The concise grasp of the latest activities of the energy-saving activity by “the energy-saving measures construction plan”

）The improvement of the investment effect of “the energy-saving measures examination book” by positive practical use

）“Energy saving hearing” to carry out to draw up energy saving construction efficiently

）“The gleaning” that was aimed for energy saving activity of the all the members participation type

Here, we introduce these four approach to energy saving.

Introduction to “Nobita-kun” Energy Efficient Cooling Coils

-Improvement of Vapor Compression Refrigerating and Heat Pump Performance by an Advance Cycle-

Tomoe Morimoto

Sinryo Denki Hoan Association

Typical application of Vapor Compression Refrigerating and Heat Pump cycle is the package air conditioners, which the demands for performance improvement have been increasingly extending to many aspects as economy and environment.

In order to respond to these demands, Sinryo Denki Hoan Association advocate an "advance cycle", based upon thermo-fluid dynamic point of view. Considering that Refrigerating and Heat Pump Cycles has been consider as "reverse CARNOT cycle" "advance cycle", was started to review in view points of "reverse RANKINE cycle", to offer less sensitive cycle to the irreversibility bound to occur in an actual plant. "Nobita-kun" is a heat exchange promoting device installed in to energy efficient coils", which at the same time reduces compressor power the viewpoint of fluid dynamics. Test shows improve cycle performance either in static states or in dynamic states, and test with a simple form demonstrates cycle COP improvement that has demonstrated to give useful for daily operation.

The Discovery Method of the Energy-saving Source in the Factory  
-Mechanism and Method of Theme Discovery in Production Site-

Tetsuji Nishiyama

Techno Management Research Institute Co., Ltd.

Recently saving-energy has become an important issue to the management of pulp and paper industry. The huge investment is continuously required. On the other hand, saving energy without investment by all employees is reconsidered. However, site engineers / workers think that all saving activities are done and remain no more. To breakthrough the problem, there are two methods, 1) Organize small groups and make it clear the target, 2) How to discover the energy-saving source. In this paper, I will report the following method, "Target is decided by the relationship of value of production amount VS energy value unit", "Visualization of energy usage", "Index suitable to each site is management daily", "Review of operating index relative to energy", etc.

Energy Saving by Improvement of KP Washing Process and Vacuum Evaporating Process

Nobuhisa Nagao and Yoshihiro Saito

Kitakami HiTec Paper Corporation

Kitakami HiTec Paper Corp. (KHP) is located in the Kitakami city which is the inland of Iwate Prefecture. KHP is the subsidiary company which split from Mitsubishi Paper Mills Ltd. in 2005. In addition to commercial LBKP produced conventionally, there were started productions of the tissue in 1997, the base paper for the photograph and IJ (resin coated paper) and the fine paper in 2002. KHP has a series of pulp facilities, and a cooking system is M&D continuous digester which performs rapid vapor phase cooking. All raw materials are domestic wood chips, which are mainly from Iwate.

This report describes two contents of our efforts to raise the black liquor concentration by improvement of the KP washing process and to improve clogging in the vacuum evaporating process.

Automatic Classification of Paper Using Combinational Optimization of Image Features

Taku Ishikawa

Research Institute of National Printing Bureau

Noriko Yata and Tomoharu Nagao

Research Institute of Environment and Information Science, Yokohama National University

For security printings such as banknotes and securities, the ability to recognize fakes and forgeries is important. However, adding new features to security printings is not easy because it leads to cost increases. We therefore focused on information in the paper of such printed matter. The information of paper is changed by conditions of production. Therefore, it is conceivable that information of the paper is effective in the classification of the paper. Previous studies proposed, as a method of paper classification, a focus on features of paper images, such as periodic wire marks, and this has been shown to be effective. Hence we considered paper classification methods that reflected changes in a greater variety of features, and found that combining multiple features computable from images of the paper was effective.

This report describes a method of automatic classification of paper that used a Support Vector Machine which selects, with a Genetic Algorithm, multiple image features computable from captured images of papers. The image features used for the classification are features calculated from the pixel values, features obtainable from the binary image, features obtainable from the segmented image, and features computable from the Gray Level Co-occurrence Matrix. Experiments have been carried out to determine the ability of the proposed method. Five kinds of paper provided by different manufacturers, and hand-made paper made under different conditions, were examined as specimens in these experiments to automatically configure of a paper classifier.

The results showed that, using the proposed method, it was possible to automatically configure a precision paper classifier capable of recognizing specific papers with different characteristics.

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The Activities for Energy Saving in Tomioka Mill

Kenichiro Hatta  
Tomioka Division, Oji Engineering Co., Ltd.

Oji Paper Group work for reducing the amount of CO<sub>2</sub> emission derived from the fossil energy and effort to conserve energy and switch to an alternative fuel. Although paper production is on the decrease, we've succeeded in reducing 6% energy compared with 2008. Energy-saving extraordinary team has been organized for activity energy saving at Tomioka Mill since August 2009.

This report presents an outline of the energy-saving sectional meeting and our energy saving efforts on several cases at Tomioka Mill.

The Activity of Energy Saving in Niigata Mill  
-Energy Saving at Large Paper Machine-

Minoru Sakaue  
Niigata Mill, Hokuetsu Kishu Paper Co, Ltd.

Recent years, the global warming is the one of the biggest issue for us. Especially, reducing carbon dioxide emissions which are well known as a greenhouse gas is our main concern. Because of these movements, we need to expedite both the reducing fossil fuel consumption and the saving other energy consumptions at the same time. In order to approach these issues, we have started the energy saving program at Niigata mill since 1980's and these works have brought great success. However, after we installed the new paper making machine PM9 and converted the other related processes such as the pulping, the bleaching and the chemical recovery facilities, the energy consumption surged and that cost put pressure on our profit. In this report, we introduce the energy saving program at the Niigata mill and give the detail of our achievements after we installed and converted the new processes.

Oil Saving by the Mixture Combustion of Wood Chip Dust Fuel in the Recovery Boiler

Takuya Mori  
Sendai Mill, Chuetsu Pulp & Paper Co., Ltd.

Recently, many people concern about environmental issue especially global warming effects, it is important for us to reduce greenhouse gas CO<sub>2</sub> emission.

Sendai Mill is managed by single boiler system - No.6 recovery boiler (6RB), produces sufficient amount of steam to maintain the mill operation. RB main fuel is black liquor though we have to use crude oil additionally due to lack of steam amount and control the pressure, accordingly the oil mixture ratio reaches up to 20% in calorie basis.

As follow, we introduce 6RB oil consumption saving method by utilizing wood dust fiber screening away from our own material wood chips and purchasing wood dust fuel.

Power Plant Optimization by Using Steam Generated from No.5 Boiler (PS Boiler) as Middle Pressure Steam for Process Use

Koji Yamazaki  
Iwanuma Mill, Nippon Paper Industries Co., Ltd.

The PS Boiler (No.5 Boiler) plays an important part in Iwanuma mill. This boiler burns up all of paper sludge and DIP dregs that are generated during pulp production process. No.5 Boiler steam has been supplied to the condensing Turbine-Generator (4T/G), so we have examined whether we can utilize No.5 Boiler steam as the moderate pressure steam for supply to process in our mill. Because the power generation efficiency of condensing Turbine-Generator is generally low comparison with that of condensing extraction Turbine-Generator (3T/G, 6T/G). This means that increase of power supply to process by decreasing the moderate extraction steam increasing condensate flow in 3T/G or 6T/G.

In this time, we will introduce how we have optimized generation power and steam in our mill by utilizing No.5 Boiler steam as the moderate pressure steam for supply to process.

#### Energy Saving by Turbine Load Optimization System

Naoki Sagara

Yatsushiro Mill, Nippon Paper Industries Co., Ltd.

Power plants of most paper mills consist of plural boilers and turbines, which supply steam and power to meet the process requirements. In our mill operators are controlling the balance of the turbine loads with as much load as possible of the high efficiency turbine. However, it is difficult to keep the cost minimum operation all the time manually responding to the process conditions. In order to further improve the efficiency we studied the Turbine Load Optimization System with simulations and some actual tests together with the vendor. The results made us expect the reduction of the steam consumption. We installed the system last September in Yatsushiro mill to realize the supposed improvement.

This article introduces a case study of the system, current problems and countermeasures against them.

#### Energy Saving of Compressor Driven by Assisting in Steam Turbine

Takashi Oda

Tonegawa Board Mill, Rengo Co., Ltd.

Rengo established "Eco Challenge 009" in 2001 as the company's 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.

On 2009, the final year for the Challenge, the company achieved to reduce carbon emissions by 26.8% compared to 1990 levels, considerably exceeding the targeted value of "Eco Challenge 009" by 22%. Under "Eco Challenge 020", the company follows its slogan of "Less Weight, Less Carbon" and aims to reduce carbon emissions by 32% compared to 1990 levels.

The paper will introduce energy saving made possible by changing the control of air compressor operation by using the steam turbine and motor drive combination system, which was newly installed to replace the aging air compressor of Tonegawa PM1.

#### Energy Saving & CO2 Reduction by High Efficient Steam System

-High Efficiency Control Method of Once Through Boilers in Multiple Installation and Air Compressor Utilizing Process Steam Differential Pressure-

Masahiko Murakami, Tomohiro Okubo and Yasukuni Tanaka

MIURA Co., Ltd.

MIURA as a leading manufacturer of small once-through boilers has adopted "Plant infrastructure total solution" as a slogan and is promoting various eco-friendly proposal activities through water treatment devices for industrial water and compressors using in-plant process steam, and so on. This paper explains following technologies;

)Small once-through boilers with very high efficiency and multiple boiler installation system by using each boiler's most efficient operation point

)Features and energy-saving effects of the steam-driven air compressor with compression heat recovery unit

#### Energy Saving by Replace of the Aeration Device and the Energy Saving Type Blower Introduction

Naoki Hayashi

Osaka Mill, Oji Paperboard Co., Ltd.

The long recession causes the big profit decrease in the paper manufacture industry. The paper manufacture industry uses a lot of energy. Therefore we can get big profit by energy saving. In addition, I have to do energy saving to prevent global warming. In our company, the energy saving is one of the most important problems.

The observance of the environmental conservation is important now, too. The improvement of the facilities which balance energy saving with processing capacity stabilization about the facilities of the drainage processing is demanded. We introduce a high efficiency aeration pipe and an energy saving type aeration blower as an energy saving example this time. These introduced it for energy saving of the aeration tank in facilities of the drainage processing and stabilization.

#### Successful Cases of Energy Conservation

Hisakazu Tsujimoto

The Energy Conservation Center, Japan

Successful cases study workshop in Japan was started as an opportunity to report the results of desperate energy conservation efforts which had been made mostly by the industrial community since the first oil crisis of 1973. The first convention called Energy Conservation Excellent Instance Workshop was held in 1978 by Japan Thermal Energy Engineering Association (sponsored by then-Ministry of International Trade and Industry). When experienced the second oil crises in 1978, Japanese industry and economy were forced to address further energy saving to overcome the crisis.

Later on the Energy Conservation Center, Japan took over as an organizer, but it was continued and held 35 times so.

#### Principle of Measurement of 3D Coordinate Measuring System MONMOS and Its Application

Katsuyuki Nagai and Hajime Honda

TOPCON CORPORATION

SOKKIA TOPCON has produced a 3-D coordinate measuring system, "MONMOS", using the NET series, an instrument based on a surveying total station. The original purpose of the system is measurement in the construction, plant facilities and tunnel management fields but is also widely used for precise measurements of bridge parts and alignment of machine installation, fields in which it is now highly valued by customers. In this report, we explain the principals and specifications of our "MONMOS" system and introduce an example of use thereof in the field of paper manufacturing in Germany.

#### Preparation of Visible-light Responsive Photocatalyst from Paper Sludge Ash (PS ash)

Satoru Fukugaichi

Ehime Institute of Industrial Technology

Kousaku Nagashima

LINTEC Corporation

Naoto Matsue and Teruo Henmi

Agriculture Facility of Ehime University

Visible-light responsive TiO<sub>2</sub> photocatalyst were prepared by calcinations with NH<sub>4</sub>Cl after alkali hydrothermal reaction of PS ash containing TiO<sub>2</sub>. Obtained samples showed the absorption in the visible light religion of 400nm to 500nm by UV-Vis diffuse reflectance spectrometer analysis. Gaseous acetaldehyde removal experiments were carried out to evaluate photocatalytic activity for treated PS ash under visible-light irradiation. The treated samples have ability of decomposing acetaldehyde to carbon dioxide under visible-light irradiation.

Key words: PS ash, visible-light response, photocatalysis, acetaldehyde

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#### Effects of Metso Washers on Fiberline

Hiroshi Yamashita

Sales & Marketing Fiber Business Line, Metso Paper Japan Co., Ltd.

The main purposes of washing before bleaching plant in a kraft pulp mill are (1) minimizing the wash loss into bleaching plant, (2) recovery of heat source, (3) recovery of alkaline chemical. In order to accomplish those purposes, many kinds of washers have been developed. Metso continuously has been researching and developing washing technology since the first press washer was launched in 1954. As a result of such development, the fifth generation press washer which is called TwinRoll™ Press Evolution started operation in 2009.

On the other hand, Metso has a different type and an effective washer called Pressure Diffuser (PDW) which can operate under high pressure and high temperature condition. Especially the new unique system called DiConn™ system in cooking plant which was developed by Metso enables a mill to improve and optimize the heat recovery in a cooking plant. The combination of DiConn™ system and digester operation optimization brings not only improvement of washing efficiency but also further reduction of steam consumption.

#### STEAM STAR

-STEAM STAR is the Screw Type Steam-powered Compact Generator, this Machine has Improved Power Output, which is Maximum 160kW-

Kozo Moriyama

Energy System Department, Machinery & IT Division, Shinsho Corporation

In small-sized steam plants, as a effective countermeasure for energy saving and reduction CO<sub>2</sub> emissions, a screw type compact steam generator unit "STEAM STAR" has been developed by KOBE STEEL, LTD. in 2006.

At present time, this machine has been improved power output, which is 132 & 160kW.

This machine has many excellent features as bellow;

- 1) The generating efficiently is about 50% better than a conventional turbine type. (It can be generated efficiently with stepless adapted for fluctuating steam flow rate)
- 2) It has excellent pressure control characteristic comparing pressure reducing valve.
- 3) The first time of all-in-one construction package in the industry.

In this paper, details of above-mentioned features are introduced and shows their application for steam systems, domestic credit system for CO<sub>2</sub> emission.

#### Development of Novel ASA Sizing Agents

-Internal ASA Sizing as an Alternative to Rosin Sizing-

Yasushi Fujiwara, Teruyuki Matsushima and Tadayoshi Oguni

Chiba Laboratory, Paper Chemical Business Division, SEIKO PMC Corporation

In Japan, rosin sizes are most widely used as internal sizing agents. Even under the neutral papermaking conditions, rosin sizes have been also used due to the unique development of neutral rosin sizes in Japan. However, some of papermakers in Japan have requested the alternative sizing agents to rosin, because of rapid increase in its price since the end of 2009. Thus, we have adopted alkenyl succinic anhydride (ASA) as one of the alternatives and developed novel ASA sizing agents based on research and development of emulsifiers (polymer surfactants), emulsification methods, and application procedures. The novel ASA sizes have potentialities to bring fundamental solutions to the most serious problem inherent in ASA sizes such as formation of deposits in papermaking.

## HIGH SPEED URTRA FORMER II

-Improving the Productivity and Formation by the Increasing the Dewatering Capacity-

Yasuyuki Yazaki

Research and Development, Kobayashi Engineering Works, Ltd.

Not only responding to but also creating the end-users' needs which have changed from time to time, Kobayashi continues to meet demands in pulp and paper industry by introducing various sophisticated formers with independently developed technologies.

Ultra Former Series firstly developed since early 1960's, with remarkably improved productivity and sheet quality in addition to initial cost, labor and energy savings, have been installed with 700 units to 120 complete paperboard machines around the world.

The export of 280 units for Ultra Former Series to 17 overseas countries has earned Kobayashi a solid reputation for "Kobayashi, as Ultra Former" in multiply paperboard industry of each overseas country even at present.

This paper is to introduce the method for realizing further improvement of productivity and sheet formation by increasing the dewatering capacity, achieved by the modification made to "High Speed Ultra Former" which is capable of higher productivity in Ultra Former Series.

## Function of Pigments for Paper Application

-Development of Pigments for Environmental Friendliness-

David I. Gittins, Leslie McLain, Paul Meizanis and Roger Wygant

Development and Technology group, Imerys Research

Makoto Suzuki, Tsukasa Yokoyama and Fumihiko Murata

IMERYS Minerals Japan K.K.

Over the past decade, the pulp and paper industry along with its suppliers has come to realize that acting in a sustainable manner is in the best interests of all stakeholders. The increasing importance of the triple bottom line (improved profits, environment and community) is obviously by reading most paper producer's web sites. The industry is now making efforts to act in a more sustainable manner while maintaining a profitable business model. In this paper, we would like to introduce Imerys work on the new technologies called Barrisurf, Fiberlean and Starch encapsulated Kaolin (SEK) which are developed to help the industry reduce its carbon footprint, diminish use of environmental bad actors, and increase the use of more earth friendly products that are easily recyclable.

## New Method of Monitoring Paper Machine Dynamics with Video

Kazutaka Fujita

Yokogawa Electric Corp.

Jun Nishimura

Engineering Dept., Yokogawa & Co., Ltd.

Many paper machine parameters and problems are difficult or even impossible to monitor due to the lack of or inadequacy of available methods and sensors. Thus, many issues cannot be quantified and properly addressed. Feature Extraction and Identification (FEI) technology (IVS, 2009 patent pending) addresses this challenge with a novel utilization of paper machine video for a wide range of issues such as paper edge problems, sheet flutter, sheet release point, and others. FEI also provides a simple alternative for the monitoring and display of sheet breaks, table formation, and holes.

FEI can be used as part of a sheet break or portable video troubleshooting system, where, along with sheet break capture and various other troubleshooting tools, FEI is effectively used to monitor and troubleshoot operation issues.

FEI can also be used as an exclusive tool for monitoring certain parameters critical to paper machine operation. For example, when placed on the winder, a dedicated FEI system will provide real-time displays (trends) of paper edge movements, cut lines, and slitting knives.

## Integration between Web Inspection System and Web Monitoring System

Shuichi Shoda

Surface Inspection Systems Division, COGNEX K.K.

COGNEX developed "SmartSystem", an integrated system between "SmartView" Web Inspection System (WIS) and "SmartAdvisor" Web Monitoring System (WMS). "SmartSystem" has a "Single User Interface" with defect information and monitoring images. And, synchronization between WIS camera and WMS camera is accurate so that the system allows user to track source of defects and help them to improve their process.

#### Achievements in Industrial Ozone Bleaching

Emil Germer

St. Petersburg State Forest Engineering Academy

Alexis Metais\*2 and Dr. Jean-Christophe Hostachy

ITT Wedeco

First industrial production of ozone bleached pulp started almost 20 years ago in connection with increasing environmental pressure and the Total Chlorine Free (TCF) wave. Like many other new technologies, ozone bleaching did not immediately reach its optimal efficiency from a technical viewpoint, but had to face several issues during its early years. By improving mixing technology, better understanding ozone chemistry on pulp components and tuning the whole process, the so-called ECF-Light bleaching sequences - including an ozone stage - made it possible to deliver a pulp quality similar or better than conventional ECF bleaching would do. Today the choice of ozone may still be motivated by ecological requirements but it is mostly justified by the economical savings resulting from chemicals costs cut-off. Actually, both targets are reached simultaneously when implementing an ozone bleaching stage. Through several industrial results, this work describes process improvements in ozone bleaching since 1992 and points out why should ozone now be considered as a the keystone of modern pulp bleaching processes.

Keywords: ozone bleaching, ECF-Light bleaching, TCF- bleaching

#### Influence of Soluble Anthraquinone Compound on Bleaching Load during Kraft Cooking of Various Woods

Shiho Takahashi, Mitsuko Homma, Mikio Kajiyama and Hiroshi Ohi

Graduate School of Life and Environmental Sciences, University of Tsukuba

Junji Tanaka

Kawasaki Kasei Chemicals Ltd.

In this study, the influence of soluble anthraquinone compound (SAQ) addition to the kraft cooking process on decreasing the load of elemental chlorine free (ECF) bleaching was investigated by analyzing unbleached pulps. As a cooking additive, 1,4-dihydro-9,10-dihydroxyanthracene sodium salt in alkaline solution (SAQ) has been used to accelerate delignification in many kraft pulp (KP) mills. The addition of SAQ resulted in increased pulp yield as well as increased pulp brightness among all investigated hardwood and softwood pulps. Furthermore, the hexenuronic acid (HexA) content in unbleached pulp was not affected by the addition of SAQ under the same cooking conditions. Therefore, it is likely that the load of ECF bleaching will not increase with the addition of SAQ. The most important benefit of the addition of SAQ was found to be a decrease in the kappa number along with an increase in the pulp brightness to induce a decrease in the bleaching load.

Keywords: acacia, eucalyptus, pine, kraft cooking, pulp brightness, hexenuronic acid

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#### Trend of Pulp Bleaching Research in Oji Paper

Makoto Iwasaki

Advanced Technology Laboratory, Oji Paper Co., Ltd.

In this paper three topics which I was concerned to the development were briefly described.

##### 1) Medium consistency Oxygen bleaching

This method was applied to NUKP fiber line in Tomakomai mill as the first installation of medium consistency oxygen bleaching in Japan in 1986. At first the delignification rate at O2 stage was lower than the target. After many trials, we could overcome this problem with developing two stages oxygen bleaching method. However several years ago three stage oxygen bleaching system was started by the effort of young power.

##### 2) Xylanase treatment of LOKP

LOKP was treated by xylanase produced on-site in order to reduce the amount of chlorine using for delignification. This method was first installation in Japan and the first xylanase on-site production and application of it directly to LOKP. This method was stopped after ECF bleaching started, however, new method to utilize the effluent from xylanase treatment of LOKP for health care etc was investigated by young researchers.

##### 3) Yellowing problem brought by ECF bleaching and the discovery of solution method

We met yellowing problem aroused from ECF bleaching of LUKP. After struggle we could find the cause of it and proposed ways to remove it during the bleaching stage. The causing chemical was considered to be Hexenuronic acid formed by pulping stage from xylan in hardwood. A young researcher found the effective chemical to remove it and its on-site production method was installed in a mill.

#### Recent Report on Kraft Pulping Process in Japan

(Phase 1) Brown Stock Process

Pulping Technical Committee, JAPAN TAPPI

Tsukasa Watanabe and Yosuke Uchida

Oji Paper Co., Ltd.

Tetsuya Tanaka

Hokuetsu Kishu Paper Co., Ltd.

In order to provide and share the technical information among Japanese pulp and paper industries, Pulping Technical Committee surveyed Kraft pulping operations in all domestic KP mills. We received the answers from all mills equivalent to 30 mills. This report summarizes results of the above investigation, concerning operational conditions and equipment of brown stock process which covers from cooking to post oxygen delignification.

#### Recent Report on Kraft Pulping Process in Japan

(Phase2) Bleaching and Treatment after Bleaching

Yasuo Asano

Nippon Paper Industries Co., Ltd.

Pulping Technical Committee, JAPAN TAPPI

We report on the bleaching and the treatment after bleaching among the KP operation technology questionnaire results that Pulping Technical Committee executed. There were 48 BKP lines in 28 mills (L:29 lines, N:15 lines, and L(N switches:4 lines). The process of the oxygen delignification was set up by all lines.

In the ECF bleaching, there were 40 lines, and the conversion has advanced from three lines of the last investigation greatly. The main ECF bleaching sequence were three or four stages and in both accounts for almost 80%. First bleaching stage was D stage (25 lines), A stage (9 lines) and Z stage (7 lines). The alkali extraction stages were strengthened with hydrogen peroxide or hydrogen peroxide and oxygen in the line of 80%, and hydrogen peroxide was used in the line of 90% or more. On the other hand, it was limited to a conventional bleaching though there were 11 line of hypochlorite.

The average kappa number of UKP was 10.0 (LUKP) and 12.0 (NUKP), and it was not different from the last investigation. The total available chlorine in the ECF bleaching was 33.4kg/t (LBKP) and 47.0kg/t (NBKP), and a numerical value that was higher than a conventional bleaching. The average COD discharge was 11.8kg/t (LBKP) and 12.7 kg/t (NBKP), and it has improved from the last investigation.

#### Optimization of a Continuous Digester Operating with Low Bulk Density Chips

Yan Ju

Fiber Business Line, Process Technology, Metso Paper Japan Co., Ltd.

In operation of a continuous digester with low bulk density chips, there is a problem that liquor level in chip chute becomes to be unstable which may affect on a digester operation. To modify an existing feed system to COMPACT FEEDTM is a good way to solve this problem. On the other hand, in order to obtain a homogenous cooking it is important to even both alkali profile and temperature profile in a digester, and to make even chip column formation in a digester top. By utilizing DiConnTM system it can save steam consumption by means of producing more flash steam, increasing dry solid content in black liquor which decrease steam consumption in an evaporator.

#### Andritz Technical Solution for Mill Survey Report of Japanese Kraft Mill

Kanji Hagiwara and Hiromi Kida

Capital System Sales Group 1, Andritz K.K.

Refer to Mill Survey Report of Japanese Kraft Mills, there are mills put new fiber lines with bigger capacity during recent 10 years. But also many mills are still using very old equipment. Also raw material of chip has been changed due to cost reduction. Most of the mills have spent a lot of effort to decrease mill energy consumption. But still mills are strongly requested to decrease the energy cost due to const increase of oil price. This paper presents recent Andritz recent technology of Kraft Pulp process, and technical solutions for the energy saving based on the Mill Survey Report.

#### Producing Polysulfide by Electrolysis of White Liquor, Integrated with Kraft Pulping Process

Kazuhiro Kurosu

Research Laboratory, Nippon Paper Industries Co., Ltd.

An electrolytic oxidation process to produce polysulfide (PS) liquor from the white liquor, and application of this process to the kraft pulping (KP) process is introduced.

PS cooking and modified cooking process has been realized because it is valuable to increase yield of KP, but it is not practical to simply combine these processes. We have been developed the electrolytic process as a much more accomplished technology to increase KP yield from 1996. Highly concentrated PS liquor is available with good efficiency, and pure sodium hydroxide is available simultaneously in the electrolytic process. Integration of the electrolytic process with modified cooking process, in which cooking liquor is split and charged into the multistage of cooking digester, provide ideal method to increase KP yield. Moreover, sodium hydroxide obtained from the electrolytic oxidation of white liquor is useful to other process than cooking in KP, such as oxygen delignification, so this electrolytic process is expected to realize quite advanced KP process.

Concrete illustration and idea of above contents are proposed in this article. Technical issue and solution to the problem is also stated.

#### On-site Production of New Bleaching Agent "Peroxymonosulfuric Acid" and Application of It to Pulp Bleaching

Tetsuo Koshitsuka

Tokyo Research Laboratory, Mitsubishi Gas Chemical Company, Inc.

In Japan, full-scale ECF bleaching started at the Niigata Mill of Hokuetsu Paper Company in 1998. After that, other companies also began to change from chlorine bleaching to ECF bleaching. The ECF bleaching methods is a combination of chlorine dioxide, ozone, oxygen, and hydrogen peroxide.

The problem of this ECF bleaching became clear that discoloration of product increased. In particular, we noticed discoloration of paper became worse when three factors exist at the same time. Three factors are hexenuonic acid, aluminium sulfate, and acidic papermaking. We researched chemicals that have the ability to remove hexenuonic acid efficiently, we knew that peroxymonosulfuric acid can remove hexenuonic acid efficiently. Peroxymonosulfuric acid can be produced by the reaction between conc. hydrogen peroxide and conc. sulfuric acid. But, continuous production method of peroxymonosulfuric acid was not popular because of the large amount of reaction heat that was produced by the reaction and severe corrosion.

We overcame many difficulties, and established industrial methods and equipment to produce peroxymonosulfuric acid in continuous ways. This method and equipment was first adopted in the world at the Tomioka Mill of Oji Paper Company. After that, a bleaching sequence that introduced peroxymonosulfuric acid revealed some performance like 1) resolution method for the discoloration problem, 2) cost performance, 3) high brightness, and 4) increase in production. This method is being used at two mills and two more mills will adopt this same method in the future.

GL&V/Kawanoe Energy Saving Technologies  
-Minimum Investment and Faster Payoff-

Junichi Yano  
KAWANOE ZOKI CO., LTD.

Energy saving projects has been becoming one of the most important and urgent matter within the Pulp & Paper industry in order to enhance competitiveness and improve their earnings. Today, many Japanese paper companies will particularly or completely fund energy saving projects depending on the project scope, amount of energy reduction, and the return on investment. Many customers have been successful claiming energy saving incentives by GL&V energy saving technologies, such as by upgrading disk refiners with spline technology and by Luthi rotor.

Metso's New Rotating Consistency Transmitter Adopts Patented "Metal to Metal" Process Seal

Kiyoyuki Doi  
Sales Division, Process Automation Systems, Metso Automation Co., Ltd.

Metso has developed Metso Rotating Consistency Transmitter to better meet user needs. This universal transmitter suits all pulp and papermaking applications. It is based on Metso's long, in-depth experience in developing world-class consistency transmitters featuring several patents.

Metso Rotating Consistency Transmitter features shear force measurement principle, but with a new approach. It features Direct Torque™ technology, which replaces traditional force balance technology and gives improved measurement stability and faster response.

The new consistency transmitter has an optimal design, which results in higher reliability, easier maintenance, longer lifetime and lower lifetime costs.

One of the factors behind the longer lifetime is the patented Metal-to-Metal Precision™ sealing construction that replaces the conventional structure with rubber components. The lighter design with fewer parts lowers the maintenance need to the minimum. It is easy to maintain it onsite by the mill staff, partly even when the process is running.

Metso Rotating Consistency Transmitter is fast to install, and its installation costs are low. In case of replacements, the costs are even lower because the existing installation set-up can be used. Calibration tuning and recipe change can easily be done during production. These new solutions increase the transmitter's availability time and reliability compared with traditional technology.

Theoretical Study of Shear Wrinkles in Web Span

Takao Kobayashi  
Core Technology Laboratory, Oji Paper Co., Ltd.

In many cases, when the web is transported in a paper machine or a rotary press, the mechanism of wrinkle trouble by paper factor is not clear. Then, theoretical consideration was done by using FEM from the viewpoint of traveling performance of web about the condition that shear wrinkle which run on the roller and causes the trouble is generated by paper factor.

As a result, the possibility of causing the lateral motion of running web turned out depending on the factor of paper origin like orientation angle and tension profile. The reason is that the web is transported with shear deformation done on driving roller according to the load of tension.

In addition, the technique for analyzing the process that shear wrinkle caused by tension and lateral motion of web runs on the roller was examined. Although a huge number of element meshes was needed to express wrinkle by simulation, it was shown to be able to analyze the generation of wrinkle by using elastic-plastic analysis.



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#### Revision of the Utilization Rate Target of Recovered Paper

Kiyoshi Kamikawa  
Japan Paper Association

Japan Paper Association (JPA) has successively set up the utilization rate targets of recovered paper four times since 1991 and has promoted paper recycling proactively. Since the current utilization target of 62% by the fiscal year of 2010 had been achieved 2 years ahead and the target year was approaching, JPA had started the consultation of the new utilization rate target beforehand.

Taking globalization of recovered paper trade and environmental impacts of recovered paper utilization into consideration, JPA has just set up the new target of 64% by the fiscal year of 2015, based on the projection of demand/ production of paper and paperboard, collection /export of recovered paper etc, within the range of technological upper limits of recovered paper utilization.

The paper industry in Japan will further promote the utilization of recovered paper by the measures of maintaining DIP capacity, improving the utilization technology of office and miscellaneous recovered paper, operating the verification system of recovered paper content, saving energy and reducing CO2 emission.

#### Evaluation and Application of Recyclability of Printing Materials

Hiroshi Nishihara  
Center for Sustainable Design, ltd.

In this article, a 12 years project which has promoted development and evaluation of recyclable printing materials is introduced. The project started in 1999 with government subsidy and major stakeholders like printing industry, suppliers of printing materials, paper mills, paper recover, and publishing industry have been involved in it.

This article is consisted of 4 parts. First part is the overview of the project including organization, finance, background, objectives, history, achievements and characteristics.

Second part addresses development of evaluation method for recyclable printing materials: hotmelt adhesives, seals, UV inks and colored papers.

Application of recyclability evaluation as green procurement policies and standards are introduced in third part.

Finally, some considerations on future agenda are brought.

#### To Promote the Recovery of Waste Paper -The Necessity of the Consumer Enlightenment-

Seiko Hirai  
Japan milk carton recycling association

A domestic recovery rate of the waste paper was 78.3% (21,715 million tons) in 2010 according to paper recycling promotion center of the public interest corporation. On the other hand, the utilization rate of recovered paper was 62.5% in 2010 and the utilization target of 62% by 2010 was achieved. Because the recovery of the waste paper increased by strengthening the garbage reduction measures of the municipality in addition to the rise of a recent environmental problem and the concern for recycling, the recovery rate exceeds the utilization rate. A new target of which 64% will be the utilization rate of recovered paper by fiscal year 2015 was announced this year. To promote the utilization rate of recovered paper, it is necessary to classify the waste paper neatly at the recovery because a constant recovered paper quality is requested corresponding to the usage. If neither further understanding nor cooperation of the consumer can be received, it cannot be achieved.

A present recovery system was established by thorough enlightenment to the consumer though there was circumstance that dealing in the taboo goods not mixed with the waste paper when the recovery started because the two sided polyethylene film was processed to the paper carton such as milk cartons (beverage paper container), and there was no recovery route. Moreover, the paper production technology that makes the paper carton a raw material develops, too. Accepting them is in the situation of possible.

I wish to introduce an example of the paper carton as one case to aim at the supply and demand stability of the used paper though the paper carton of only about 1% of the entire amount of the paper production.

#### The Basic Technologies of De-inking Agent and Its Functionalization

Ryugo Shimoyama

Research & Development Dept., Nissin Kagaku Kenkyusho Co., Ltd.

The technologies of recycling lower quality waste paper have been developed in recent years. As one of suppliers for de-inking agent, we also has developed and functionalized the de-inking agent to solve various problems. In this report, we describe the basic knowledge about types, mechanisms, properties, synthesis of de-inking agent and functionalization of that.

Specific Water Management and Integrated Water Loop Provisions and Innovative Technologies of Saving Energy for Stock Preparation

Masakazu Eguchi

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

As recycled paper ratio goes up, and non-fiber inorganic or organic substances are more used in the paper to enhance the paper strength or paper quality, consistency of white water circuit and effluent water in Stock Preparation Process are getting increased, and getting more contaminated. One of the reasons for such consistency increase are, decrease of specific consumption of fresh water/effluent water, inappropriate white water and effluent water treatment, and supply/effluent water unbalance derived from unbalanced of process water system.

Additionally, it is also a reason of contamination, that to minimize emission, some effluent sludge are partially re-circulated in the loop, or put in the final products, which causes further contamination in white water loop. A contamination of white water may lead to a longer maintenance time, sheet breaks from contamination, and general decrease of the equipment performance.

What is the ideal goal of white water and effluent water and its balance in paper mill? We would like to introduce our idea of ideal water management for overall paper mill.

Also, in this paper, we would like to refer to the energy saving technologies, which may meet the demands of reduction of electricity consumption coming in this summer by the disasters hit eastern Japan.

#### The Latest Technology for Waste Paper Treatment

-The Countermeasure against the Increased Rate of the Recycling Waste Paper-

Kazuo Aoshima

Aikawa Iron Works Co., Ltd.

Saving resources and energy are required in all industries, not only the paper industry. In this situation the paper industry is committed to the waste paper recycle. The target of this year is 62.5% utilization rate of waste paper. This target was achieved. But the target of next 5 years is 64%. So in the future the waste paper never used until now will be used. It's mean that Taboo paper (include UV ink or sublimation ink) will be used.

#### Recent Report on Kraft Pulping Process in Japan

(Phase 3) Safety Controls and Varieties of Each Manager's Concern

Pulping Technical Committee, JAPAN TAPPI

Munehiro Kitamura

Mitsubishi Paper Mills Ltd.

In order to improve Kraft pulping operations in domestic KP mills, Pulping Technical Committee surveyed. This report summarizes results of human factors, Safety Controls and varieties of each manager's concern.

#### Evaluation of Biodiversity in the Aquatic Environment of the Industrial Area

Takashi Nishida  
Japan Pulp & Paper Research Institute Inc.

#### Abstract

A wide range of materials used in the pulp and paper industry are derived from biological resources. The pulp and paper industry is also benefited by ecosystem services (supports of biodiversity) such as sequestration of CO<sub>2</sub> produced by energy supply and effluent purification. The loss of biodiversity as well as global warming is increasingly recognized as a threat to not only wildlife but also economic sustainability. Biodiversity is often defined as the variety of all forms of life, from genes to species, through to the broad scale of ecosystems. Unlike CO<sub>2</sub> emissions, quantitative methods to evaluate biodiversity, however, have not yet been developed. Therefore, most industrial actions for conserving biodiversity are limited to propose guidelines for preservation of biodiversity. Only few studies have been conducted to evaluate the degrees of biodiversity. Japan Pulp and Paper Research Institute has made enormous efforts to preserve biodiversity using various biological assessment tools combined with state-of-the-art analytical techniques since 1994 when the significance of conserving biodiversity was not even recognized. In this study, an ecological survey was conducted near industrial sites to calculate and visualize degrees of biodiversity.

#### Waste from Paper Mill to Power-WTP

Tamio Fukuzawa, Mutsuo Yoshinaga and Ryo Yoshida  
Sales & Technology, ANDRITZ K. K.

ANDRITZ has been continuously developing the newest technology in the field of the environmental business lines, such as bio-mass utilization as carbon neutral, hydro power as clean energy, and waste to power (WTP) in the field of pulp and paper industry. Andritz sales turn over the past years related to the environmental business has been accounted 50% more over of the total annual sales. This paper introduces Andritz environmental technologies to convert the waste from paper mill such as reject, paper sludge and sludge from water treatment to an alternative energy for fossil fuel.

In addition to the WTP system, ANDRITZ is a leading company of wood pelletizing plants, and has the market share of more than 50% all over the world.

#### Some Examples on Abrasion-and Corrosion-Resistant Cladding for Bio-Mass Boiler and Its Auxiliary Facility

Hiroaki Fukumoto and Taketoshi Goto  
Welding Alloys Japan Ltd.

From the viewpoint of resource conservation and reducing fossil fuel carbon dioxide emissions, bio-mass fuel are considered as the most important primary energy source. Fluidized bed boiler is highly adaptive for various fuels. Because of its low affection for environment, it is the best method for direct combustion of bio-mass fuel. The paper industry companies are installing fluidized bed boiler for bio-mass as an alternative system for fuel oil boiler system to reduce carbon dioxide emission. Though fluidized bed boiler has the ideal characteristics for bio-mass boiler, there are some corrosion and abrasion problems to cope with.

Welding Alloys Japan has been making rebuilding and hard-facing business tailored to customer needs. In recent years, customer's inquires on rebuilding and hard-facing are increasing for bio-mass boiler and its auxiliary facility. We introduce wear phenomenon and prolonging lifetime method of equipment that we experienced.

#### Impact on the Filtrate from Bleached Pulp Treated with Peroxymonosulfuric Acid for Effective Removal of Hexenuronic Acid

Eiko Kuwabara, Tetsuo Koshitsuka,  
Mikio Kajiyama and Hiroshi Ohi  
Mitsubishi Gas Chemical Company, Inc.  
Graduate School of Life and Environmental Sciences, University of Tsukuba

The Elementary Chlorine-Free (ECF) bleaching process for kraft pulp (KP) has prevailed in Japan. We have known that hexenuronic acid (HexA) in ECF bleached pulp plays an important role in brightness reversion (yellowing) of the pulp, and studied ways to remove HexA. Acidic sized paper made from ECF bleached pulp often causes the yellowing by heat and moisture. As a result, we noticed that peroxymonosulfuric acid (MPS, Caro's acid) and HexA react effectively, and developed an ECF bleaching process which is equipped with a MPS stage. Consequently, the brightness reversion significantly decreased. MPS was found to be one of the bleaching chemicals which can remove HexA efficiently, and it has begun to be used in the first stage of a KP bleaching process in Japan. On the other hand, there is concern that removal of HexA may cause an increase in the environmental load from the effluent of the pulp bleaching process and a decrease in pulp yield. We have clarified the relationship between the amounts of HexA removed from pulp and the total organic carbon (TOC) in the filtrates of washed pulp which were subjected to MPS treatment, hot acid (A\*) treatment, and chlorine dioxide (D) treatment, respectively. The environmental load in effluent was compared between the various methods for HexA removal. From the results, it was found that the effluent load of the MPS process was considerably lower compared with other processes. In addition, it was suggested that the reaction of HexA removal by MPS treatment should be different from that of cutting the bond between a xylan chain and a HexA residue.

Keywords: kraft pulp, ECF bleaching, peroxymonosulfuric acid, hexenuronic acid, brightness reversion, TOC

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Technology of Paperboard Making System for Resource-Saving  
-Construction by in Total Wet End System and Coating Agent Prescription-

Kazushige Inaoka

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Resource-saving which means basis weight reduction of paperboard is rapidly advanced. This trend makes internal additives less effective. Therefore, we tried to examine the technology based upon concepts to utilize the strength of fibers and give functions by surface chemicals.

It was found that reducing alum dosage was good for strength, some demerits such as pitch trouble, poor drainage and retention could be offset by using coagulant and retention aids. This is "Total wet end system" we also suggested. Besides, application of coating agents was found to be effective for strength and sizing quality even in highly closed papermaking system and lightweight-trend of paperboard.

Therefore, we could say that construction by the combination of total wet end system and coating agent prescription is quite effective technology to correspond to paperboard making for resource-saving.

The Influence on Bleaching Load by SAQ® as a Cooking Additive

Junji Tanaka

Kawasaki Kasei Chemicals Ltd.

The influence on ECF bleaching load by SAQ® cooking is deliberated by the analysis of unbleached pulps. SAQ has been used as a cooking additive in many KP mills. By SAQ cooking, not only reduction of kappa number but also increase of brightness was observed in all the unbleached pulps. Furthermore, hexenuronic acid (HexA) content in unbleached pulp was not affected. Therefore, the ECF bleaching load can be reduced by SAQ cooking.

Modern Retention Technology for Higher Ash in Paper

David Lovell, Ross Howat and Shintaro Nakayama

Asia Pacific, Eka Chemicals

Compozil is one of the well-known brand names for retention system in the paper making industry. Fine paper market is expected to grow to 150 mln tonnes from 90 mln tonnes by 2020 and this additional 60 mln tonnes will be produced on state of the art high speed machines, with machine speed between 1,800 mpm and 2,000 mpm and ash contents up to 30%. Eka Chemicals has developed new retention technology to achieve challenges of high filler. This new technology, Compozil Fx could be achieved up to 32% ash in paper.

PARETOTM Mixing Technology

-A Novel Mixing Technology for Water and Energy Saving-

Shintaro Sato

Paper Service Marketing, Asia Pacific, Nalco Company

Sustainable activities and cost reduction are key business drivers for pulp and paper industry. NALCO developed PARETO technology in 2006, and this technology has achieved many success of water and energy saving and improving productivity.

PARETO Optimizer is key part of this technology and it is designed by using CFD (Computational Fluid Dynamics) simulation. At the outlet of optimizer, the conical jet is discharged into process pipe and it makes complete mixing with process flow and chemicals. By using PARETO, water saving will be possible because process water can substitute for fresh water what is used for secondary dilution. And PARETO can save energy also, for example, improved polymer performance can help drainage, and steam consumption will be reduced on papermachine. And if mill use warm water for dilution water, using process water for dilution should eliminate energy of heating water.

This technology is installed all over the world especially for feeding retention aid. Recently it has been expanded to pulping process and wastewater treatment. Since NALCO renewed PARETO technology last year, I'd like to introduce it to Japanese pulp and paper industry.

Introduction of the Latest Saving Energy Technology

-ADC, MaxFlow, FINEBAR, GHC-

Keiji Yasuda

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Recently from the environmental stand point, the usage of Forest wood pulp and wastepaper pulp is increasing. Forest wood pulp is short fiber, and many main materials are LBKP. It is an important issue to get paper strength without useless fiber cutting by the refining process. And the second important issue to be achieved is power saving. With the latest LBKP refining data, we would report the features of each ADC Double Conical Refiner/VS Double Disc Refiner and FINEBARTM VS casting plate.

The increase in wastepaper usage also made the power saving in the screen process of stock preparation more important. We also report our latest developed energy saving Screen rotor, "GHCTM Rotor" and NW1 basket with larger open area.

Thermal Conductivity of Paper Coatings: Role of Latex Binder

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Omya Development AG

Philip Gerstner

Department of Forest Products Technology, Aalto University

Thermal conductivity of pigmented coatings has been shown to be related to the connectivity and material placement within the coating structure. In the case of calcium carbonate and latex binder, as studied here, the colloidal interactions determine the relative positioning of binder and pigment in the wet state, i.e. the actions of segregation and agglomeration, mostly in the form of depletion flocculation, in which, at a critical latex dose, the packing of the pigment becomes disrupted. The consolidation of the structure during drying reveals that latex binder initially centres itself between the pigment particles at their contact nodes. Conductivity of the calcium carbonate pigmented structure is determined by the packing density, and connectivity provided by the dispersant polymer (polyacrylate). In the case of low T<sub>g</sub>, latex becomes deformed and extruded, such that it acts as a fine pore generator, such that the conductive path becomes more tortuous. Latex with medium T<sub>g</sub> deforms less to provide the local connectivity at the node points only, and so contributes at low doses maximally to thermal conduction. At higher dose, the insulating property of latex dominates. High T<sub>g</sub> latex behaves as a hard sphere, has little to no contact area, and becomes excluded from the inter-pigment contact nodes, such that the thermal conductivity is relatively high due to the close packed structure.

Thermal Spray Technology for Carbon Roller and Applications for Paper Mills

Masaya Nagai and Sadato Shigemura

Tocalo Co., Ltd.

Akihiko Yoshiya

Mitsubishi Plastics, Inc.

Masanobu Yamanaka

Sunray Co., Ltd.



Carbon Fiber Reinforced Plastics roller (CFRP roller) is called carbon roller. Carbon roller exhibiting excellent characteristics including lightweight, high-stiffness, and low-flexure has been increasingly employed in manufacturing industrial fields. Compared to conventional metal rollers, carbon roller is lighter and stiffer, and exhibits lower inertia moment. Generally, carbon rollers are rarely used without surface coating due to the lack of wear resistance and gripping properties with paper web and plastic film sheet. The authors have invented a coating technique using various materials on carbon rollers after years of research and development. This paper describes thermal spray technology for carbon rollers and application for paper mills.

Curtain Coating for Printing and Board Paper  
-Its New Approach and Prospect-

Toshihiro Katano  
Voith IHI Paper Technology Co., Ltd.

Curtain coating has been applied particularly to specialty paper, namely thermal paper, non carbon paper, information paper and so on. Nowadays, for further utilization of DF coater, Voith IHI has been developing it from two aspect; color and machinery. For example, until recently, it was the main stream to replace an air knife or a rod coater by a DF coater for specialty paper. However, now, Voith IHI is aiming to install a DF coater as an alternative to a blade coater for pigment coating. Referring to this movement, this thesis will introduce an approach to the new area of DF coated paper and board paper and its prospects.

Improved Productivity and Reduce Rejects with 2D On-Line Formation Analyzer

Yan Luo  
Techpap SAS

A well controlled sheet formation is necessary to warrant optimal physical characteristics and sheet quality. To evaluate sheet formation, the paper maker must have visual control in addition to sheet formation information such as floc size and distribution, overall LT (Look Through), floc anisotropy, periodic marks and trends. Centre Technique Du Papier and Techpap have developed a new 2 dimensional on-line formation sensor based on present video analysis technology. The first Techpap Formation system was installed in the mid 90's with many installations made in markets throughout the world since.

Case Study of Optical Caliper Sensor

Noriyuki Kobayashi  
Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

For those who involved in QCS (Quality Control System) measure paper quality online, measuring the thickness of the web by using caliper sensor had been difficult issue for a long time. Traditionally, critical caliper measurement has been achieved through the use of dual-sided, contacting caliper sensors. This sensor sometimes requires very delicate tuning of contacting pressure or mechanical alignment, and the some result of them did not satisfy us. Therefore, recently paper makers have been asking for a new type of caliper measurement, which overcomes the weaknesses of contacting caliper. On that occasion, Yokogawa, one of the QCS makers released optical caliper sensor. The measurement is based on a combination of two techniques chromatic aberration and confocal displacement and adopt unique non-contacting (one side light-touch) design less caliper-related defects than existing one.

This report presents the outline and the results of introducing optical caliper sensor which we introduced into Ishinomaki mill N6.

The Innovative Dryer Cylinder Drive and Lubrication System for Gearbox  
-Speed Up Your Machine with the Assistance of AS Drive and Lubrication Solutions-

Tomoaki Takahashi  
MATSUBO Corporation

A large number of paper machines have reached the end of their economical life due to old and redundant drive assembly designs. With an ever increasing demand in terms of production speed and quality, the bottle neck could be traced to the dryer section drive assembly. Normally this requires a complete rethink of drive layout, forcing new solutions for modern problems. Very often, an increase in noise levels, oil leaks and paper web flapping will provide the first signs for a need to take action. This article will provide an overview of the innovative solutions by means of effective silence gearbox system FlexoGear® and peripheral equipments including lubrication unit Lubriflex® and intelligent oil flow meter FlexoFlow® produced by AS Drives & Services GmbH, Raken Germany.

#### Scientific, Technical and Financial Challenges of Achieving a Biofuels Industry

Richard B. Phillips  
North Carolina State University

Despite many years of intensive research and development, biofuels are commercially produced today almost exactly the same way as 20 years ago. Biofuel production technology developments in progress include three broad categories: purely biochemical, purely thermomechanical, and hybrid technologies that incorporated elements of both. None has achieved commercial success thus far. We discussed four areas where science is needed to make a breakthrough:

1. Better integration of land and bio-energy plantation economics to provide abundant, affordable biomass feedstock.
2. Bioengineering improvement of biomass feedstock to increase carbohydrate (biomass) or lignin (thermo-chemical) content.
3. Other bioengineering improvement to reduce the recalcitrant of biomass through the various steps required to achieve product yields.
4. Simpler process design that achieve capital efficiency.

Our Research Team at North Carolina State University has developed a foundation to simulate - both technically and financially - integrated biomass - to - biofuels conversion technology options and have indentified promising alternatives incorporating current and projected advances in each area of the chain.

Keywords: biomass, enzymes, biochemical, thermomechanical, economics

A Rreport on ISWFPC 2011  
-June 8-10, 2011 at Tianjin, China-

Tomoya Yokoyama  
The University of Tokyo

ISWFPC 2011 (The 16th International Symposium on Wood, Fiber, and Pulping Chemistry) was held in Tianjin, China on June 8-10, 2011 hosted by CTAPI (China Technical Association of Paper Industry). Total participants were 410 people, and 138 oral presentations including 4 plenary lectures on 11 specific fields were conducted with 156 poster presentations. Summaries of several presentations were described.

#### TAPPI PaperCon 2011 Conference and Exhibit Participation Report

Takao Ochiai  
Nippon Paper Industries Co., Ltd.

Nippon Paper Group is aggressively expanding business ventures in foreign markets in an effort to achieve 30% of the Group's total sales from businesses abroad, in line with its "Group Vision 2015". To achieve this goal, one of the key elements that our Group is focusing on is nurturing of company personnel who will be able to perform equally as effective in our overseas business ventures as in Japan. To this end, we have implemented various programs.

As Nippon Paper Group goes forward with this goal, the need for young engineers experienced domestically in the management of various areas of pulp and paper plants operations including quality control and engineering who are able to apply these skills and knowhow to the overseas plants is critical. Nippon Paper Group has developed a global program for engineers called "Technical Training Course for Employees Transferred Abroad". This program sends employees to an existing Group plant located abroad, and immerses them in the education of the spoken foreign language as well as exposing them to the various cultures, business practices and plant operations. The goal is for employees to learn quickly and acquire the skills necessary to perform effectively in the international business arena.

As part of this program, in March, 2010, I was sent to North Pacific Paper Corporation (“NORPAC”) which is one of our major affiliates in North America, to study and train for a year and a half. The program allowed me to attend a TAPPI pulp and paper conference called “TAPPI PaperCon 2011 Conference and Exhibit” in Covington, KY. The conference was held from May 1-4, 2011.

In this paper I am about to present, I will first introduce the mill I was assigned to, the NORPAC mill. Later, I will report on the conference itself. Let me just explain to you that I am unable to give a comprehensive report on the conference itself as I was the lone participant from Nippon Paper Group or from other Japanese paper mills. Therefore the sessions I was able to attend were limited.

Growth of Young Short-Necked Clam in the Artificial Tidal Flat created by using Solidification/Stabilization Techniques with Paper Sludge Ash-based Coagulants

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Environmental Preservation Center, Mie University  
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Faculty of Chemical Engineering Technology, Tati University College

Paper sludge (PS), which is mainly made from paper factories waste can be utilized for useful applications. We have developed an in situ solidification system for treatment of sea bottom sediments, the “Hi-Biah-System (HBS)”, by using incinerating PS coagulant. The solidified material produced by HBS has applied for restoration of the marine environment ecosystem (i.e. Tidal flat, Seaweed and seagrass bed, etc.). The number of benthos individuals in the constructed artificial tidal flat has been shown to be similar to those observed in a natural tidal flat. In this report, we showed the monitoring data of the growth of young short-necked clams (*Ruditapes philippinarum*) in the artificial tidal flat. The remarkably large growth was observed in the artificial tidal flat rather than natural tidal flat. We believe that these solidified materials were useful for restoring marine ecosystem.

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#### The Trend of Domestic Forest Resources

Kusuo Akahori  
Writer

The demand of domestic wood has hung low at the long period of time. The demand of the present domestic material is reduced to 1/3 of the 1960s.

However, the self-sufficiency rate of domestic timber has been rising slightly. Because in recent years, the supply of forest resources is increasing, import of wood is decreasing.

In order to overcome the severe situation of forestry, the government decided upon the forestry reproduction plan in December, 2009. By this plan a wood self-sufficiency rate will be raised to 50% in ten years.

This plan includes reexamination of the forestry planning system, maintenance of the structure of forestry, maintenance of a road, training of a forestry business unit, establishment of the processing and circulation organization of wood.

#### Key Discussion Points to Tackle Now -Reexamining Energy and Global Warming Policies-

Akihiro Sawa  
The 21st Century Public Policy Institute

In the wake of the Great East Japan Earthquake, efforts are afoot to carry out a sweeping review of Japan's energy policies. In preparing for such a major reassessment on the energy policy front, there are three areas that need to be consolidated as key discussion points: (1) Securing a "stable supply" of energy; (2) adopting the correct approach to energy supply responsibilities and cost sharing; and (3) realizing an energy industry competent in supporting stable supply. Zeroing in on these discussion points, this lecture will also strive to adequately consider and define the responsibilities involved in the devising and implementation of effective policies.

#### The Enforcement of the Revised Soil Contamination Countermeasures Act

Dai Sakamoto  
Technical Division, Kokusai Environmental Solutions Co., Ltd.

In order to protect the health of the citizens, the Soil Contamination Countermeasures Act was enacted in May, 2002 for the purpose to facilitate the implementation of counter-measures against soil contamination by formulating measures to apprehend situations of soil contamination, and was enforced in next year February. However the revised act was enacted in April, 2009 and enforced in next year April because some problems came to be recognized after six years from former enforcement.

One of the problems is the increase in discovery of soil contamination which is not regulated by the Act. And the fact that removal was chosen overwhelmingly became clear by the data gathered from the local authorities. As a result, the revised Act was enacted in April, 2009 and it was enforced in last year April.

From a viewpoint of the actual enforcement, there is a tendency for the half of the number of area designated to be remediated, although about 850 areas have been designated in 8 years. And it was confirmed that the number of area designated had increased in last and this year. It is thought that the opportunity for the soil survey obligated by the Act has increased by the legal revision.

Furthermore, the Designated Areas are mostly located in Tokyo which is followed to Osaka and Kanagawa prefecture. On the other hand, there is no area designated by the Act in 32 prefectures; therefore the area designated by the Act is concentrated on some particular areas in Japan.

Official Data shows that the soil survey based on the Act is increasing clearly. And it is assumed that the number of the Designated Areas and the land, which cannot perform removal for remediation since the land price is cheap, have increased recently. Therefore, it is required to gather the information about the instruction positively by local authorities and new countermeasure technology so that landowners could take the correspondence taken into consideration from the broad viewpoint.

#### Effective Utilization of Wastes

Masanori Shimizu  
Future Promote Recycling Co., Ltd.

Future Promote Recycling Co. Ltd. promoted recycling of industrial waste and aims at construction of circulation-ized society. Recycling medicine, various metal wastes, incineration ashes, inorganic sludge, etc. are going across handling goods variably. The ashes incinerated conventionally were mainly recycled as a cement raw material, and reclamation processing of the part was carried out. Our company built the network with the partner company in which recycling processing is possible on a large scale, and realized recycling-ization to materials for engineering works, such as groundwork material for paved road and cement solidification material.

The Revised Law Concerning Waste Disposal and Scavenging of the Enforcement in 2011  
-For the Paper and Pulp Industry-

Humiaki Nagaoka  
BUN Environment Study Office

The Act of Disposal of Waste Matter was revised for the first time in several years. The measure against unsuitable right processing and the correspondence to a recycling society- low carbon type society are provided by this law.

The concrete contents of the new system are as follows. The processing contractor of waste has to notify those who discharged waste of it having become impossible to process. The contractor has to undergo the periodic inspection of a final disposal site and a waste incineration plant every five years and three months. The contractor has to exhibit a final disposal site and a waste incineration plant on the Internet.

#### Evaluation of Biodiversity in the Aquatic Environment of the Industrial Area

Takashi Nishida  
Japan Pulp & Paper Research Institute, Inc.

A wide range of materials used in the pulp and paper industry are derived from biological resources. The pulp and paper industry is also benefited by ecosystem services (supports of biodiversity) such as sequestration of CO<sub>2</sub> produced by energy supply and effluent purification. The loss of biodiversity as well as global warming is increasingly recognized as a threat to not only wildlife but also economic sustainability. Biodiversity is often defined as the variety of all forms of life, from genes to species, through to the broad scale of ecosystems. Unlike CO<sub>2</sub> emissions, quantitative methods to evaluate biodiversity, however, have not yet been developed. Therefore, most industrial actions for conserving biodiversity are limited to propose guidelines for preservation of biodiversity. Only few studies have been conducted to evaluate the degrees of biodiversity. Japan Pulp and Paper Research Institute has made enormous efforts to preserve biodiversity using various biological assessment tools combined with state-of-the-art analytical techniques since 1994 when the significance of conserving biodiversity was not even recognized. In this study, an ecological survey was conducted near industrial sites to calculate and visualize degrees of biodiversity.

#### Detailed Instructions on How to Operate Activated Sludge Treatment

Takao Ogawa  
Ogawa Environmental Research Institute, Inc.

Most of facilities of Activated Sludge Treatment (AST) are operated based on the operator's experience.

The main reasons why the AST is not operated systematically are as followed:

1) The decomposing ability of BOD component by Activated Sludge (that is, an activity of Activated Sludge) in the aeration tank is not evaluated quantitatively in real time,

2) The instrument / equipment to measure promptly and continuously the BOD value of raw waste water and its decomposing rate is not available.

I show that the performance of AST is analyzed quantitatively by using these two indicators.

#### Fuel-izing of Sludge and Processing of Waste Water by the Detailed Seaweed

Yasuhiro Yukawa

Japan Biomass Corporation

In Japan, sludge occupies about 18% in all the industrial waste. 75 million tons of sludge has occurred in every year. About 70 percent of waste sludge is destroying by fire.

Incineration of sludge will generate not only carbon dioxide but nitrous suboxide. Nitrous suboxide has 310 times as much greenhouse effect as carbon dioxide.

Our company is mainly developing the technology of the sludge reduction by a detailed seaweed.

Dry powder of the detailed seaweed which contains a vitamin B group abundantly is made into a sludge reduction agent. Sludge will be reduced if this sludge reduction agent is added to the effluent treatment institution of an activated sludge method. The cultivated detailed seaweed is condensed and it dries. This dry thing becomes the assistant combustion material of a coal-fired power plant.

According to this technology, it is not necessary to convert the effluent treatment institution of an activated sludge method.

#### Conditions and Outlook for Environmental Business in China

Hu Junjie

Tepia Research Institute, Tepia Corporation Japan

China has economically developed in the past 30 years and has rapidly expanded the environmental business, while she is confronted with various environmental problems. In this article, we give an overview of the present situation of environmental problems and promising markets for the environmental business in China. We also propose an ideal business model for the environmental market between Japan and China based on our analysis of Japanese companies that have extended their business to the environmental market in China.

#### The Newest Trend of Drainage Regulation based on Water Pollution Control Law

Kensuke Mizuhara

Environmental Management Bureau, Ministry of the Environment

The addition of the item of environmental standards was performed and a change of a standard value was made on November 30, 2009. These environmental standards are related with protection of the health of the person concerning the water pollution of public water areas, environmental standards concerning the water pollution of groundwater.

Reexamination of the provisional effluent standard concerning boron, fluoride, ammonia, etc. was carried out in July, 2010.

The contents of revision of Water Pollution Control Law are expansion about the range of clarification of measurement frequency, and the measure in case of an accident.

#### Global Warming Countermeasures of Saitama Prefecture

Takashi Matsumoto

Global Warming Strategy Division, Department of Environment Saitama Prefecture

The amount of discharge of the greenhouse gas in Saitama Prefecture is leveling off mostly. The carbon-dioxide emissions of a segment of industry are about 50% of the total amount of discharge. It decided upon "Stop the global warming · Saitama Prefecture navigation 2050" in February, 2009. By this plan, the green house effect gas emission of Saitama Prefecture in 2020 is reduced by 25% in 2005. It decided upon "The promotion ordinance of global warming countermeasures of Saitama Prefecture" in March, 2009. The promotion ordinance includes the measure in active conduct of business, the measure in a building, the measure in a car, the spread of energy-saving home appliance products. "The planning system of global warming countermeasures" was enforced from 2011.

## The Basic Study on the Relationship between the Physical Properties of Coating Pigment and the Coated Paper Quality

Keiko Hashiguchi, Takehiro Yoshimatsu and Masanori Kawashima  
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In recent years, the market needs for high quality and high performance papers even in coated paper. It is well known that we are able to control the coated paper quality by adjusting the type and the particle size of the coating pigment. In addition to this situation, a great variety of the coating pigment has also been developed lately. But the relationship between the characteristics of coating pigment and the coated paper quality is not well known. In this study, the coated paper samples were prepared by using nine types of coating pigment, which differ from each other and the quality of its coated papers were evaluated. The aspect ratio of a coating pigment is known as the ratio of its diameter to its thickness. But the measuring the aspect ratio is quite limited in calculating by the image analysis which needs the special computer software technology. A simulation model, based on the hexagonal shape, was proposed to predict the aspect ratio of the kaolin pigment. In this study, it was found that particle size, specific surface area (BET) and aspect ratio in coating pigment were all quite important properties for the coated paper quality.

## Visualization of the Behavior of Hydrophobic Colloidal Substances and Cationic Polymers in Pulp Suspension

Yasunobu Ooka and Shisei Goto  
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The interactions between hydrophobic colloidal substances (HCS) and cationic polymers in pulp suspension were investigated by means of confocal laser scanning microscopy (CLSM). In this experiment, four types of cationic polymers, Poly (allylamine hydrochloride) (PAH), poly (vinylamine) (PVAm), Poly (diallyldimethylammonium chloride)/acrylamide copolymer (DADMAC/AM) and polyacrylamide (PAM), were used. PAH and PVAm were labeled with fluorescein-4-isothiocyanate (FITC). The HCS in the filtrate of a deinked pulp from a mixture of ONP/OMG were also dyed with a fluorescent hydrophobic probe, Nile Red. The dyed HCS were added to hardwood bleached kraft pulp (HBKP), and then these cationic polymers were added individually. The suspension after the polymer addition was divided into long fibers, fiber fines and colloid fractions. The state of the dyed HCS in each fraction was observed as fluorescence by CLSM.

In the case of the addition of only dyed HCS to HBKP, the pulp after washing showed no fluorescence. Therefore, no interaction between the HCS and the fiber could be observed. Conversely, when 0.5% of the labeled PAH were added, patches of fluorescence were observed on the surface of the fiber. The addition of HCS to HBKP followed by 5% of the labeled PVAm revealed that most of the fluorescent patches caused by dyed HCS were located on the external fibrils of fibers, and some of dyed HCS formed large agglomerates. By adding PAM and DADMAC/AM, the turbidities of colloid fractions were low, but the HCS formed large agglomerates and fixed to the external fibrils of fibers. The smaller polymers, PVAm and PAH, formed the smaller HCS agglomerates although the turbidities of colloid fractions were high. Observations from the fraction of fiber fines revealed that PAM and DADMAC/AM caused large agglomerate of fines with the HCS whereas PVAm and PAH gave no agglomeration.