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The Latest Low Consistency Pulper Technology -IntensaPulperTR -  
-Developing Story of the Innovative LC Pulper-

Naoyuki Iwashige  
Stock Preparation Group, VOITH IHI Paper Technology Co., Ltd.

The IntensaPulperTR, which was developed by VOITH IHI Paper Technology Co. (VPIT) and released 2006, is really innovative pulping machine with extraordinarily higher performance than the conventional low consistency pulpers and as result VPIT has received this year's honorable "Sasaki Award" of JAPAN TAPPI.

In this paper, VPIT will show the development procedure of the IntensaPulper, that is, the research and development stage at the VPIT R&D center and the field trial with the commercial size of the proto type IntensaPulper at Oji Paperboard Co., Oita Mill.

The other advantages which will be gained by applying the latest IntensaPulper technology will be also introduced.

Sludge Dewatering Machine, Rotary Press Filter  
-Dewatering of Paper Making Waste Water Sludge-

Koji Matsumoto  
Tomoe Engineering Co., Ltd.

The sludge dewatering machine used in wastewater treatment is important equipment for volume reduction and solidification of sludge. The sludge dewatering machine is required to have higher dewatering capacity and be more energy saving and efficient to realize low-cost wastewater treatment. To meet these needs, Tomoe Engineering has introduced Rotary Press Filter from Fournier Industries Inc. of Canada, made improvements, and has been manufacturing and selling the equipment. Key features of Rotary Press Filter include high dewatering capacity, low power consumption, small footprint, small amount of washing water, easy odor control, and easy maintenance. In recognition of the achievement of these features, Rotary Press Filter won the Sasaki Award. This paper introduces the treatment capacity and effect of introduction of Rotary Press Filter.

Development and Operating Experience of the Newest Kneader

Hideyuki Goto and Isao Aoki  
Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

Nippon Paper Group, Inc. has prepared its "Group Vision 2015", which calls for becoming one of the top five pulp and paper company in the world, with a view to realizing stable and high revenues in our domestic businesses and a full-scale expansion of our businesses overseas over the next ten years. Then, we installed the N6 paper machine in the Ishinomaki Mill of Nippon Paper Industries Co., Ltd. as a first step of our vision, which is mainly producing a light-weight coated paper and an ultra light-weight coated paper, and started its operation in November, 2007.

We also installed the new de-inking pulp plant which is called "HDIP-2" in order to supply high quality de-inking pulp to N6 paper machine. Regarding the installation of the HDIP-2, we designed its process to optimize the efficiency of deinking and reject system in relation to becoming poor quality of old paper in the near future. Especially, we have developed a newest 4-shafts kneader "UV-Breaker" with Aikawa Iron Works Co., Ltd. and installed it as a coarse kneader in the HDIP-2 process in order to manage any old papers with UV printing.

In this report, we show our development and operating experience of the newest kneader.

### Operating Experience of Formmaster

Nobuyuki Kido

Kasugai Mill, Oji Paper Co., Ltd.

Oji Kasugai No.8 machine started up in 1962. The unit, which has a wire width of 5.81m and a design speed of 700m/min, produces 330t/d unbleached kraft paper for wrapping and taping.

Recently, because of speeding up of processing machine at the customer and diversification of end products, higher quality is required increasingly, such as good runnability and sheet strength. To meet these demands, we installed high-speed shaking equipment "Formmaster" from Metso in January 2007. It enabled us to enhance paper quality and to improve production.

This paper will present the outline of "Formmaster" and our experiences in its operation.

### Operating Experience of No.3 Incinerator

Tomoo Arano

Environmental Section, Niigata Mill, Hokuetsu Paper Mills, Ltd.

In the fall of 2004, Niigata mill considered replacing the old sludge incinerator. As a result, we formed a project to build a new one that works not just as an incinerator but also as a biomass power boiler in order to reduce energy cost. It uses paper sludge, demolition wood and RPF (Refuse Paper and Plastic Fuel) as Fuel.

At that time, the biomass power generation was being supported through a new energy promotion project sponsored by Agency for Natural Resources and Energy.

The following year, the construction of new biomass power boiler began. And Niigata mill made a trial run of the boiler at the end of 2006. Now, we'll report some specific things we learned about new biomass boiler from its one year period of operation.

### An Evaluation of Light Scattering Property in Printing Paper

Masayuki Takishiro, Yukio Kotori and Shinichi Inoue

Process Development Laboratory, Corporate Research Center, Mitsubishi Paper Mills Limited

Light scattering phenomena in paper can be represented by the Modulation Transfer Function (MTF) of paper. In this paper, a new technique for measuring the MTF of paper is introduced. We have developed an experimental instrument for measuring the MTF of paper. It can project a sinusoidal test pattern on sample paper. The reflection intensity distribution of the projected sinusoidal test pattern is measured by the CCD camera. The MTFs of different type of printing paper were discussed.

### Improvement of Pulpwood Productivity of Fast Grown Eucalyptus and Acacia Tree Species in Southeast Asia

Shinichi Sukeno

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

This paper explains the historical activities of the Forestry Research Institute of Oji Paper Co., Ltd. in improving pulpwood productivity of plantations in Lao PDR and Vietnam. Improvement of productivity in Vietnam has been attained by selecting and planting hybrid clones of *Acacia mangium* x *A. auriculiformis*. The clones were selected for good growth performance. Then, high wood density clones were selected from them. In Lao, *Eucalyptus deglupta* x *E. camaldulensis* showed the best performance in clonal trials and we have confirmed that it has satisfactory pulpwood quality. There is no pure Eucalypt species with satisfactory performance in Lao. Therefore future direction on Eucalypt breeding is in making inter-specific hybrids. We have collected and are field testing various Eucalypt genetic resources from which we are planning plus tree selections of pure species for the production of hybrids in the near future.

### The Making of Paper Contributes to Local Environment

-Paper Made from Bamboo-

Masato Kawata

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

Kagoshima Pref., where the Sendai Mill is located, has the largest bamboo forests area in Japan, and typical species named Moso bamboo covers an area of 7,600ha. Since well controlled bamboo forests produce a good quality of bamboo shoot, it is said that we need to eliminate bamboo older than five years every year. However the eliminated bamboo has been left in the forest usually. Kagoshima Pref. has been in the process of establishing an efficient system of recycling the eliminated bamboo, in order to maintain healthy bamboo forests and to contribute to producer's profit.

Sendai mill has focused on this local peculiarity and has begun production of paper made from bamboo pulp, from the global view points such as protection of environment, prevention of global warming.

Development of On-line Fiber Orientation Control

-Improvement of the Quality of Copy Paper-

Hidenori Yatomi, Michihiro Fujiyama and Yoshisada Yamabe

Yatsushiro Mill, Nippon Paper Industries Co., Ltd.

Junji Yamamoto, Hidenobu Todoroki, Katsumasa Ono and Takashi Ochi

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

Takashi Sasaki and Hirofumi Sano

P&W Solution Dept., Yokogawa Electric Corporation

A new automatic control system for fiber orientation has been developed. In this system, the fiber orientation on both paper surfaces is measured continuously, and the edge flow valves and the slice lip actuators at the headbox are manipulated automatically to minimize the differences of orientation angles between the felt and wire sides of paper. We confirmed the validity and stability of the system on the actual paper machine. By this automatic control system, the average degree of twist-curl of paper is able to be reduced to less than half before and it is possible to produce copy paper with low degree of twist-curl continuously. Moreover, this system is quite efficient to shorten the time needed for adjusting the machine conditions to have enough quality for the copy grades after the startup of paper machines. This system has been installed in an actual paper machine and has been effectively controlling the twist-curl of copy paper since the beginning of 2007.

A Report on 2008 Engineering, Pulping, Environmental Conference and International Bioenergy and Bioproducts Conference

-August 24-29, 2008 in Portland, USA-

Shisei Goto, Reiko Oshima\*1, Hiroyuki Nagatani\*2, Hitoshi Okada\*3 and Kunitaka Toyofuku\*4

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\*2Oji Paper Co., Ltd.

\*3Japan Pulp & Paper Research Institute, Inc.

\*4JAPAN TAPPI

2008 Engineering, Pulping, Environmental Conference and International Bioenergy and Bioproducts Conference (24-29 August) were held for six days under the auspices of TAPPI in Portland, USA. Probably it is the first event for TAPPI to hold two conferences in succession. There were 98 presentations on EPE and 30 presentations on IBBC. Five persons including Mr. Toyofuku, as representative of JAPAN TAPPI, attended the conferences. Before and after the conferences, we visited, a felling spot of Weyerhaeuser and head office of TAPPI.

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Vol.63 No.2 Abstracts

OptiFeed Family  
-To Improve Quality, Performance and Efficiency on Paper Machines-

Leif Piippola  
Metso Paper Inc.  
Hidehiko Yamazaki  
Metso Paper Japan Co., Ltd.

A modern stock preparation system strives toward good end product quality, improved papermaking line runnability and efficiency, both in terms of production and energy.

Wet end chemistry strongly influences the production efficiency and profitability of paper and board making, and thus represents a considerable part of operating costs. Stability forms the basis for quality and runnability while flexibility contributes the most to efficiency. The best solution cannot only be found through sub-process optimization but through sufficiently broad process integration.

The majority of stock preparation and approach systems are still based on conventional technology where large volumes, long delays and instability problems prevail. But these systems have some major drawbacks, such as the uncontrollability of separate dead volumes in tanks. Immediate problems with these systems include instability, such as consistency variations, stock and filler proportioning and the extended time required for grade changes.

OptiFeed is a streamlined, single platform concept where automation and process design complement each other. The idea is to make stock processing stable and flexible, thus enabling improved production line quality and efficiency compared to conventional wet end management systems. Well engineered components and optimally dimensioned process-not too big, not too small-saves energy and prevents consistency deviations as well as pulsation. The OptiFeed system integrates separate key elements of the mill area in a unified high-efficiency concept, applicable to the entire stock preparation system or to approach flow system alone or components within it.

This paper will present the implementation and benefits of the OptiFeed system in approach flow system management. The focus will be on deaeration and mixing processes, and automation solutions.

New Chemical Mixing Method after Machine Screen with TrumpJet™ System

Jouni Matula  
WETEND Technologies Ltd.  
Akira Ejima  
Matsubo Corporation

A new innovation, developed TrumpJet Technology is used to inject papermaking chemicals efficiently into headbox stock. The mixing is greatly improved and consumption of chemical is reduced. The injection liquid is circulated headbox stock or white water instead of fresh water. Several installations operate with good results and improved quality of production.

Cost Saving Case Study by Installing New TrumpJet™ Chemicals Mixing System

Ryohei Watanabe  
Hachinohe Mill, Mitsubishi Paper Mills Limited

We have tackled 'Optimization of wet-end' at No.7 paper machine (7PM) in Hachinohe mill since 2005 spring. In this paper, we introduced the cost saving case study of a 35% reduction in retention aids and expanding wire and felt lives by the improvement in retention by installing New Trumpjet™ chemicals mixing system to a retention aid. Additionally other new installed plan was also described.

## The Recent Technology for Elimination of Pitch Trouble by Using the Organic Polymer Coagulants

Hidetoshi Sakamoto and Kenji Sakai  
Shonan Research Center, HYMO Corporation

In this report, we introduce the recent methods of our pitch analysis: “micro-pitch image analyzer system” and “stickies image analyzer system”, and the recent investigation of the use of Cationic Polymer Coagulants.

Cationic Polymer Coagulants prevent growth of the micro-pitch and fix them onto pulp fibers.

We found some of the coagulants have an ability to decrease adhesive property from the surface of the micro stickies particle or large size stickies.

The coagulants showed different characteristics in adsorption onto the micro-stickies particles, and the most effective coagulant should be selected depend on addition point in paper making process.

## Operating Experience of Stock Preparation for Paperboard Making

Tomoki Nariyasu  
Soka Mill, Nippon Daishowa Paperboard Co., Ltd.

In a recent global environmental protection tendency, the energy-savings are one of the most effective subjects, which simultaneously can reduce cost under the extraordinary oil price increase circumstances.

In the board mill, pulpers and refiners are known as high energy consuming equipments in the recycled pulping and the stock preparation process. This paper describes our recent operation experiences of high efficiency refiners replaced which successfully reduced power consumption in the stock preparation process.

## Operating Experience of Mishima PM N10

Toru Hioki  
Mishima Mill, Daio Paper Corporation

8 percent of the coated paper demand in Japan is cost competitive paper which is produced with the latest production lines in China and Europe. And, Japanese LWC market is shifting to lighter weight products. We have built our N10 paper machine at Mishima Mill in order to have advantages in quality and cost against imported paper, and to meet the demand for lighter weight paper. N10 machine has both blade coater and roll coater to switch the coating process depending on paper grade. And it also has on-line multi-nip calender. It is the first on-line blade coater for us.

We had some troubles caused by many interlocks for automatic systems. However, we didn't have serious operation or mechanical troubles which we had worried about, such as threading and start coating at coating section at high speed, gloss appearance with multi-nip calendar, and roll damage at online multi-nip calender. Now it runs very well.

Since N10 machine is a new type of machine which has gapformer with forming suction roll, press section equipped with transfer belt, we had been worried about sheet formation and two-sidedness. We have got planned quality of paper. And we have produced LWC which has enough stiffness we planned, by coating at roll coater after starch is coated at size press section.

## Operating Experience of Ishinomaki PM N6

Hironori Asano  
Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

PM N6 in Ishinomaki Mill has been in operation since November 1, 2007, and it is mainly producing MWC and LWC at 1600m/min speed. The wire width and designed speed of PM N6 is similar to PM N2 in Yatsushiro Mill. On-line blade coating station and hot soft nip calender are equipped in PM N6, which are similar to PM 9 in Iwakuni Mill. The production ability of PM N6 is 1.5 times higher than PM 9. It is designed for pursuing high productivity and cost competitiveness with various latest technologies. We achieved successful start-up by our cultivated technical knowledge and experience of on-line coat machine and the most advanced technology such as tandem-type 2-stacks shoe press, 6-stacks HSNC.

This paper reports the outline and the latest operation experience of PM N6.

#### Startup Progress Report of Niigata New N9 Paper Machine

Akihiro Ogawa

No. 7 Production Department, Niigata Mill, Hokuetsu Paper Mills, Ltd.

Focus on to the Wide width, High speed and Specialized in A3 grade production, N9 Paper Machine which 4th Oncoater machine in Hokuetsu Niigata mill has been successfully progressed from Stock on Wire at the beginning of June 2008 to On Reel, Color coating, Gloss Calendering and Rewinding. The quality identification and the print test for commercialization have been done at any time, the improvement and the stabilization of a quality have been tried on the basis of the customer evaluation. Through N9 operation, the development of the efficient production system including existing three Oncoater-machines has been convinced. In this paper, we introduce the point of machine selection, the effect of introduction of new equipment and the trouble cases etc.

#### Construction of Oji Paper TOMIOKA N-1

Kotaro Shinoda

Technology Div., Oji Paper Co., Ltd.

TOMIOKA N-1 is the all online paper machine which has on-machine coater and on-machine calendar. This is under construction now in Oji Paper Tomioka mill. Our purpose of this innovation is to increase productivity of WFC which has growth market and to lead other competitors globally. Oji Paper Tomioka mill was selected for the construction site, because it has many old machines and has some merits such as variety of pulp, low cost of energy, and logistics matters.

On adoption of all online machines, there are many challenges such as sheet break at blade coater, calendar roll damage with color defects and vibration in high speed calendering. In order to solve these problems, TOMIOKA N-1 has been designed with the all new concept and latest technology.

This paper will present the outline of TOMIOKA N-1 especially the process of introduce this machine and the concept of new design. In addition, some troubles about construction work and latest progress on the site will be shown.

#### Enhanced Paper Quality and Productivity Thanks to ModulePro, Innovative Moisture Apply System

Hideomi Uchikawa

Voith IHI Paper Technology Co., Ltd.

When we discuss the quality of the paper, there are key parameters. The parameter about the moisture is important, and there is a great deal of the case caused by moisture in the paper when problems occur in production.

It is thought that the outstanding matters on the moisture measurement technology were almost solved if we watch it macroscopically because high performance moisture sensor resisting harsh environment was developed by the present.

But when we try to do automatic moisture control and absolutely need reliable moisture apply system as an actuator which is a device for letting paper to be absorbed from a large quantity of water to small quantity precisely.

Voith Paper wanted to solve this issue immediately as a total paper making process supplier, and tried to find a solution using various conventional moisture apply systems. However a result to be satisfied with was not provided. Therefore Voith Paper did the test repeatedly at his own high speed paper machine in Heidenheim using a trial moisture apply system developed by Voith Paper for searching true mechanism of the water absorption into paper. Based on the result Voith Paper has developed innovative moisture apply system, ModulePro.

By this report I introduce summary of ModulePro and application report on an anti-curl measures, improvement of calendering, moisture profiling results etc.

#### A Participation Report of the 2008 Marcus Wallenberg Prize Ceremony

Hideki Fujiwara

Nippon Paper-Pak Co., Ltd.



The 2008 Marcus Wallenberg Prize Ceremony was held on October 6 in Stockholm, Sweden. First, I would like people of pulp & paper industry in Japan to recognize the significance of the prize through the background, as well as the great ceremony. Secondary, I would like to encourage researchers in the Japan and Asia region to nominate because I am invited one of ambassadors to the Marcus Wallenberg Prize Selection Committee.

#### New Automatic Control System for Fiber Orientation and Improvement of the Quality of Copy Paper

Junji Yamamoto, Hidenobu Todoroki, Katsumasa Ono and Takashi Ochi  
Pulp and Paper Research Laboratory, Nippon Paper Industries Co., Ltd.  
Takashi Sasaki and Hirofumi Sano  
P&W Solution Dept., Yokogawa Electric Corporation

A new automatic control system for fiber orientation has been developed. In this system, the fiber orientation on both paper surfaces is measured continuously, and the edge flow valves and the slice lip actuators at the headbox are manipulated automatically to minimize the differences of orientation angles between the felt and wire sides of paper. And the system can also estimate the change in the basis weight profile caused by the change of the slice lip shape, and manipulate the dilution control valves at the headbox to compensate the disturbance.

We confirmed the validity and stability of the system on the actual paper machine. By this automatic control system, the average degree of twist-curl of paper is able to be reduced to less than half before and it is possible to produce copy paper with low degree of twist-curl continuously. Moreover, this system is quite efficient to shorten the time needed for adjusting the machine conditions to have enough quality for the copy grades after the startup of paper machines. This system has been installed in an actual paper machine and has been effectively controlling the twist-curl of copy paper since the beginning of 2007.

Keywords: automatic control system, fiber orientation, headbox, copy paper, twist-curl

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The Trend of Industrial Instruments to Open Network Architecture  
-FDT/DTM for Intelligent Device Integration-

Shinji Fukui  
FDT Group Japan (OMRON Corporation)

Plant System has been constructed with various types of field network for many years and now devices that are connected with field networks becomes very intelligent. This contributes higher functionality and performance of the plant system. On the other hand, there is a great demand for improvement asset management in plant system. DT/DTM (Field Device Tool/Device Type Manager) was developed as an open technology to solve these issues, and now standardized as IEC62453-1. FDT/DTM is not dependant on any specific type of field networks. FDT/DTM is also provides much higher functions than device description languages such as EDDL. This paper explains the technology of FDT/DTM and its solution and history of development.

The Introduction and Application of Latest IT Technology in Site Business  
-Field Innovation at Maintenance & Inspection Field-

Hiroshi Kihara  
Public Sector System Dept. II, Public Enterprise System Unit, Fujitsu Kansai Systems Ltd.

Recently, the security and safety of site workers are urged in various industries and fields. However, introduction of IT itself is behind in the severe environment. Manufacturers also cannot provide such practical products despite the needs for the security and safety. Under such circumstances, we developed and launched the solution product with latest IT technology, "Field assist tool" in May 2007, due to provide the security and safety to the site workers.

Firstly, functions were seeds-oriented and developed to the needs-oriented finally with many customers' support and cooperation. Consequently, we achieved to complete the only safe and secure IT solution product in Japan at present.

As a big feature of this tool, adopting the wearable terminal equipment for the site worker, the portability of the terminal was improved. Moreover, as a software feature, the communication function for the site worker support and the voice recognition function for easy operation are installed. Those functions which highly needed by customers were selected from a number of candidates.

This paper describes the introduction of the background along the way of the product development and the functional overview, including the usage of this tool and the roadmap.

Possibility of Machine Vision in the Pulp and Paper Industry

Norihiro Nanko and Takuya Okumura  
Cognex K. K.

The pulp and paper industry is thought to be one of the industries to which the automation is the most advanced. However, still fewer than another industry when seeing from the viewpoint of introduction of the machine vision system is current states.

Here, it introduces what kind of thing can you able to do in the pulp and paper industry, and where it is by introducing the machine vision system the possibility of the improvement of the site based on In-Sight and Checker that is our machine vision.

The Operating Experience of Integrated Network System for PM N10 in Mishima Mill

Junichi Suzuki  
Mishima Mill, Daio Paper Corporation

DCS and QCS have been the primary systems for labor-saving and quality control system in paper production automation over the last 30 years. But as needs have arisen, peripheral support systems (like ITV, PBX, paging, etc.) have had to be retro-fitted into production sites to maintain or improve production quality and control. Last year our PM N10 machine for coated paper and LWC went online at our Mishima Mill in Ehime, Japan. With this site, we planned from

day one to improve the flexibility of the system by allowing for seamless integration of such support systems into the main network control grid through the use of "off-the-shelf" technology like high-speed LANs, sophisticated webcams, and VoIP technology.

The integrated system consists of ITV, PBX, and a paging system along with three mobile DCS systems. Our goal was to see noticeable improvements in operating efficiency and labor requirements due to this interoperability among control and support systems. In this article we offer our evaluation of this integrated network after its first year of operation.

#### The Introduction of the Safety Support System

Yutaka Yokoyama and Katsushi Furui Gifu Mill, Oji Paperboard Co., Ltd.

The DCS of The Ena factory was renewed to "CENTUM CS3000" that was the latest model in 2005. The improvement of the DCS operativeness in the manufacturing premise and the maintenance of the watch environment were achieved by this update. It improved the efficiency of the field operation by these. Then, we examined what DCS could be operated by the wireless system. Wireless LAN network decided to be constructed in the factory, and we started development a mobile DCS. Mobile DCS is a system by which the operation and the watch of its own plant become possible. If it is a range where the electric wave of wireless LAN reaches, we can operate it from tablet PC and the portable terminal. As a result, the operation of the plant by the few people became possible. However, the problem was caused that worker's position in the site including patrol was not able to be recognized. The safety support system from which the worker acquired information. The address and the movement of the body (state of the acceleration). Now was introduced from a wireless terminal by the cooperation of Yokogawa Electric Corporation.

#### Experience of the Power Plant Optimum Operation System

Masayuki Saito Hachinohe Mill, Mitsubishi Paper Mills Limited

Power Plant of the paper mill is operated with two or more boiler and turbine. The equipment should efficiently use many kinds of fuels. The fuel has coal, a crude petroleum, a black liquid, and waste, etc. The equipment should satisfy the supply of the electric power of the factory and steam. Moreover, the power generating cost should be assumed to be minimum. This time, the system that requested the best load balance of the boiler turbine was introduced. The system decreases the energy cost. Moreover, the operator's operation reduction is done. This system has decreased the difference of the operation of the boiler and the turbine by the individual variation. It introduces the equipment introduction.

#### Development of On-Line Fiber Orientation Control and Practical Using

Michihiro Fujiyama Yatsushiro Mill, Nippon Paper Industries Co., Ltd.

We have succeeded in the development of the online sensor which measured the fiber orientation of the both surfaces of the paper in 1993. And it has been able to help improvement of the curl quality for more than 10 years. In this time we have developed a new online control system of the fiber orientation on both paper surfaces as world's first practical use technology in cooperation with Yokogawa Electric Corporation. In this system the edge flow valves and the slice lip actuators at the headbox are manipulated automatically to minimize the difference of the fiber orientation between both surfaces of the paper continuously. And it can also compensate the disturbance in the basis weight caused by the change of the slice lip shape.

Now we have been using this automatic control system on an actual copy paper machine since the beginning of 2007 and the curl quality of the copy paper has been improved and stabilized.

#### Introduction of Web Defect Inspection System with Color Distinction Function

Yoshihiro Tamura

Ashikaga Mill, Nippon Daishowa Paperboard Co., Ltd.

Now, the demand to the improvement in quality from a user increases further. Especially the quality demand of the surface defect of the packing material of food is remarkable. The raw material used paper foreign body and the foreign body in the approach piping generate "Color defect". And "Red defect", is even the thing of about 1mm in the size is pointed out.

The WIS that was able to be the color distinction was adopted to make user's demand product last year.

This reports on the introduction details of this system and the operation experience until today this time.

#### Introduction of Moisture Sensor

Takamasa Mizutani

Kasugai Mill, Oji Paper Co., Ltd.

It is observed that many of actions are taken for reducing power consumptions and/or higher efficiency in the paper machines recently. Among such actions, the improvement of de-watering performance in the press part is especially highlighted as the approach for higher efficiency. While the information of the press part is getting more important, various efforts are taken to monitor the % moisture and its related valuables. Previously there was no tool which was good enough to measure %-moisture in the press part. Under such situation, it had to be formulated by the mathematical transactions with the ordinal operational information.

In 2007 Kausgai Mill made the modification on the press part of 4 M/C in order to realize the efficient operation both for fine paper and bulking paper. In this modification, the pressing pressure needed to be changed according to the grades and %-moisture at the press outlet became the important index for the operation.

Also the renewal of the dryer hood and ventilating facility was done with the approach of the energy saving. This required the monitoring of the amount of the water evaporated in the dryer, which was important for the efficient energy saving. Thus it was planed to install the moisture sensors at the outlet of the press and pre-dryer with expecting more reliable operation and energy saving through understanding the situation of the %-moisture in the sheet at these points.

The case of 4M/C with installing the moisture sensor is described below together with another case for the other machine.

#### The Latest Fiber Analysis and Applications

-The Process Optimization by Online Fiber Shive Analyzer-

Naoto Takigawa and Tuomo Kalkaja

Metso Automation

Optical sensor based fiber and shive analysis devices came first time available for pulp and paper industry end of 1970's and early 1980's. Those analyzes were installed during that time to the laboratories and fiber length measurement came standard tool to describe pulp quality. Early 1990's on-line fiber measurement analyzers with automatic sampling came available. Also during 1990's fast camera and data processing technology development allows use of matrix cameras and much more information was available from fiber quality. During these millennium analyzers has got more improvements which has done analyzers more fast, more repeatable and require less maintenance. Also more accurate image analysis methods have been developed and more different fiber quality variables are measured.

#### BTG's Rotating Consistency Transmitter Twin Torque Using New Technology

-History in Developing and Features & Benefits of BTG MEK-3000-

Yoshio Ishitsu BTG Division, Spectris Co., Ltd.

With 80 years' experience in consistency measurement, BTG can claim unrivalled expertise in this core facet of the pulp and papermaking process. In 1928, we launched the world's first inline consistency transmitter. In 1960, we brought to market the first generation of transmitters to use our patented rotating shear force technology. Over the intervening years, during which we have developed further generations of state-of-the-art transmitter, this measurement principle has been adopted as the industry benchmark for top of the range performance.

With the MEK-3000 Twin Torque BTG unveils the next generation of rotating shaft force transmitters, offering a major advance in consistency measurement. Twin motors-the centerpiece of BTG's patented design-deliver a host of unique advantages that will lift your performance to a whole new level. Outstanding versatility makes the Twin Torque suitable for a huge range of applications, from the most routine to the most difficult. And since the standard version adapts itself to just about every challenge, there are fewer product iterations to deal with, simplifying operation and maintenance.

Easier, smaller, smarter, lighter-the Twin Torque lives up to its tagline, combining exceptional ease of use with small size, outstanding signal processing and lightweight design.

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

Pulping Technical Committee, JAPAN TAPPI  
Mitsuhiro Sugino, Nippon Paper Industries Co., Ltd.  
Tsukasa Watanabe, Oji Paper Co., Ltd.  
Kouji Shioya, Kishu Paper Co., Ltd.

In recent years, the importance of DIP has been increasingly augmented by the rise of social demand for efficient use of resources and environmental consideration. However, as a matter of fact, the technical information about DIP production and equipment is insufficient. Therefore, the pulp technological committee conducted questionnaire survey on current situation of DIP operation and equipment of domestic DIP plants in order to offer and share technical information among our industry. In this report the results of the questionnaire are presented.

#### Characteristics of Eucalyptus Woods from Plantations in South Africa for Kraft Cooking

Mitsuko Homma, Shiho Takahashi, Akiko Nakagawa-izumi and Hiroshi Ohi  
Graduate School of Life and Environmental Sciences, University of Tsukuba  
Keiichi Nakamata  
Technical & Development Division, Hokuetsu Paper Mills, Ltd.

Eucalyptus woods (*E. nitens*, *E. smithii*, *E. grandis*, and *E. macarthurii*) grown in South Africa as pulp and paper grade hardwoods, which are expected to be raw materials used in a Japanese pulp mill, were investigated to clarify their characteristics for kraft-anthraquinone (AQ) cooking and totally chlorine-free (TCF) bleaching. *E. smithii* wood had the highest density (0.665 g/cm<sup>3</sup>) next to *E. macarthurii* wood. It was shown that *E. smithii* wood was most easily delignified and had the best response to cooking and bleaching. The Klason lignin content of *E. smithii* wood was 22.8%. It was a little higher than that of *E. nitens*, but much lower than that of *E. grandis* and *E. macarthurii*. Furthermore, *E. smithii* wood gave the highest syringaldehyde to vanillin ratio (S/V ratio, 4.18) by alkaline nitrobenzene oxidation analysis. Therefore, *E. smithii* wood should show good delignification during cooking and bleaching. All eucalyptus full bleached pulps gave high brightness, *E. smithii* showed the highest brightness (86.7% ISO).

Keywords: eucalyptus, density, alkaline nitrobenzene oxidation, kraft-AQ cooking, hexenuronic acid

#### Photochemical Bleaching of Kraft Pulp by UV Radiation

Kazuhiro Kurosu, Shoichi Miyawaki and Takashi Ochi  
Pulp and Paper Research Laboratory, Nippon Paper Industries Co., Ltd.

Potential of ultraviolet (UV) radiation as a bleaching method for kraft pulps were investigated. Some conditions that improve bleaching efficiency based on a consumption of electricity were revealed. It was shown that photochemical bleaching efficiency was significantly improved by hot acid pretreatment that is often adopted in ECF bleaching sequence of hardwood pulp. It is thought that removal of iron ion from the pulp by hot acid treatment before UV irradiation contributes to better brightness enhancement by UV.

Simultaneous treatment by UV and ozone, which is a well-known system in water treatment area as advanced oxidation processes, was revealed to be highly effective method for photochemical bleaching. It is suspected that hydroxyl radicals are generated in UV/ozone treatment, and that they react with carbohydrates as well as lignin, resulting in considerable damage to fiber. However, this UV/ozone treatment did not seem to have a detrimental effect on strength of the pulp. When mill bleached hardwood pulp was treated by UV with ozone, brightness was enhanced from 86 to 91% while tensile strength of the treated pulp was almost the same as that of untreated one.

Although the efficiency needs to be improved further and more thorough understanding of the reaction mechanisms of photochemical bleaching is required, it is suggested that photochemical process has a possibility to be adopted as a certain part of industrial total chlorine free (TCF) bleaching sequence.

Keywords: photochemical bleaching, UV, hot acid treatment, ozone, advanced oxidation processes, hydroxyl radical

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Vol.63 No.4 Abstracts

Development of Salt Tolerant Eucalyptus by Genetic Engineering

Etsuko Matsunaga  
Forestry Science Research Laboratory, Nippon Paper Industries Co., Ltd.

Recently, the serious global warming has been promoted mainly by the human activity. In order to reduce impacts of these problems, it is needed to develop the Elite tree that can be planted in the agriculturally unused field. We have developed an original transformation method and applied it to economically useful Eucalyptus species, *E. camaldulensis* and *E. globules*. As a result, we succeeded in developing some lines of salt tolerant Eucalyptus species. These plants have been cultivated in a special-netted house for an environmental biosafety assessment. In this assessment three lines of transgenic plants were admitted to be planted at the isolated field in Tsukuba Univ. and are now growing without problems.

Operating Experience for New Chip Bin  
Kouji Sagawa  
Takaoka Mill, Chuetsu Pulp and Paper Co., Ltd.

Quality of wood chip is big impact on fiber line operation and quality of pulp for Kraft pulping in pulp & paper industry. It has been requested to use the planted chip and waste chip more in point of environmental reason, but it has been given bad impact on fiber line operation and pulp quality. Pulp & paper industry has to use waste chip more in future. This paper presented experience to use the waste chip in Chuetsu Pulp, Takaoka Mill, and also presented experience of Andritz Help Bin.

Utilization of Calcium Carbonate by the Causticizing Process for Filler and Coating Pigment

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

Precipitated calcium carbonate is produced as a by-product in the causticizing process of the kraft pulping process. Nippon Paper Industries, Co., Ltd started to use this calcium carbonate by the causticizing process (CCC) as filler 27 years ago. There are many advantages in using this CCC as filler and coating pigment in paper. One of the advantages is that the lime kiln operation can be reduced or eliminated, resulting in the reduction of fuel oil consumption in the calcination of calcium carbonate. The benefit of this reduction of fuel oil consumption is significantly increased with increased oil price. Furthermore, the accumulation of non process elements (NPE) in the lime cycle, which has recently been the big problem, can be avoided. Nippon Paper Industries, Co., Ltd. has established the technology to use this CCC as paper material throughout the research and the technical development for many years. In this report, the outline of CCC is shown. Then, the coating pigment production technology and the morphology-control technology developed in our company are presented. Subsequently, the influence of the implementation of CCC technology on the reduction of NPE accumulation in the lime cycle and the reduction of fuel oil consumption in the lime kiln operation are discussed with the results of our research.

Improvement of Effluent Qualities with ECF Bleaching and Next Challenges

Hitoshi Takagi  
Japan Pulp and Paper Research Institute, Inc.

The production of ECF (Elemental Chlorine Free) bleached kraft pulp has reached to near 90% of the total bleached kraft pulp production in Japan. The process change to ECF bleaching decreased the emission of organic chlorine compounds (chloroform, polychlorinated phenolic compounds and dioxins) from bleached kraft pulp mills dramatically.

AOX discharge was decreased by 80% with ECF bleaching, but a small amount of AOX was generated in the chlorine dioxide bleaching process. As the chlorate concentration in the bleach filtrates from the chlorine dioxide bleaching process was high, the impact of chlorate to the environment should be estimated.

Next challenges to improve effluent qualities will be reductions of COD, BOD, TSS, heavy metals, color and odor in the effluent from pulp and paper mills. Especially, BOD reduction is a key to the removal of toxicity to aquatic organisms. Effluent minimization will also be a future imperative.

#### Operating Experience of Pulp Handling Plant

Yuji Arika

Osaka Mill, Kishu Paper Co., Ltd.

Kishu Paper Osaka mill is along the Kanzaki River in southern Suita-city, Osaka. It is a mill producing speciality paper and making various kinds of products in small lots. All the pulp of raw material is using sheet pulp, unites it with the kind of paper, and uses various pulp brands properly. Although the worker was doing sheet pulp handling work before, operation became possible automatically by introducing this equipment. This report is introduction of the equipment, and operation experience. At this mill, the case where chose pulp classification and some kinds were blended according to a brand installed handling equipment by most for these increase in efficiency. Many problems depended on complicated combination when operating till today occurred, and although trial and error were repeated, it was able to work quickly.

#### Operation Experience of Felt Washing Cleaner

Akira Maeda

Edogawa Mill, Oji Paperboard Co., Ltd.

There is a certain tendency in the environment surrounding Japanese White Paper Board Industry that saving of wrapping paper, shifting to softer wrapping material and materials further downgrade are proceeding in the market. The Printing and Paper receptacle manufacturers are shifting their manufacturing to small lot production or other kind products to realize cost reduction in order to comply with the increased quality requests from the end users. In this circumstance, paper manufacturers are requested further quality improvement and cost reduction of the products.

The paper makers have been trying to extend the life of fabrics in the press section. In this report we introduce our operation experience of the first felt washing cleaner "Projet type P" in Japan, which has been installed to PM5 to avoid build-up of contamination in the fabrics. The Projet type P has provided the improvement of paper quality and the reduction of a production cost.

#### The Operating Experience of PM N1 OptiSizer

Jun Azetaka

Yoshinaga Mill, Nippon Daishowa Paperboard Co., Ltd.

Yoshinaga mill, Nippon Daishowa Paperboard Co., Ltd produces 660,000 tons of paperboard and paper annually as "an urban recycling mill" using recycled paper as the main material, making good use of abundant groundwater from Mt. Fuji and the conditions of locations near the Tokyo area.

PM N1 was reconstructed in January 2007. In this reconstruction, OptiSizer by Metso was installed instead of the 2 rolls size press.

This report describes the outline of PM N1 and the operating experience of OptiSizer.

#### The Operating Experience of Mini Shoe Press

Hidefumi Ariyoshi

Hachinohe Mill, Mitsubishi Paper Mills Limited

Hachinohe Mill, Mitsubishi Paper has the capacity of approximately 900,000 ton of papers per year. We have seven paper machines in Hachinohe Mill, and installed Mini shoe press of MHI in No.2 (2PM) and No.6 (6PM) paper machines with the aim of production increase and steam saving in August 2007. Mini shoe press is compact type of shoe press covering some faults of standard shoe press, and has high dewatering performance.

This remodeling brought dryness up, speed up and higher machine efficiency, and we achieved the aim of production increase and steam saving. This report is described about the outline of remodeling and the effect of Mini shoe press at 6PM.

#### The Method for Measuring Chloride Content in RPF

Koichi Katayama, Takahiro Yamamoto and Terunobu Fukui  
Yonago Mill, Oji Paper Co., Ltd.

Yonago Mill installed a clean energy boiler in July 2005, whose main fuel is RPF (Refuse Paper & Plastic Fuel). The clean energy boiler (RPF boiler) makes use of mixture of recovered paper that is hard to be used as a raw material for recycled paper and waste plastic, which contributes to reduce the amount of waste and CO<sub>2</sub> emission.

In the meantime, the RPF boiler has one problem such as a boiler corrosion by chloride contained in RPF.

Here, we report the method for measuring chloride content in RPF by means of fluorescence X-ray analysis. Fluorescence X-ray analysis is a rapid method to measure chloride content in RPF, and it enables us to measure all samples from tracks delivered to the mill.

#### How Technological Innovations Changed Newsprint and the Making Process of It -Survey on Technological Developments in Newsprint Production in Japan-

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Museum of Nature and Science  
Executive Director emeritus, JAPAN TAPPI

The basic paper making process was invented in China in A.D. 105. Its raw materials were reclaimed clothes and woody glasses, and paper was hand-made. The process evolved to modern paper making one through the age of the industrial revolution, using wood as raw material and making sheet with machinery force. With adding new applications such as packaging and tissue in the 1920's, the paper industry developed to one of the largest industries. Due to its largeness, the paper industry has had to reconcile environment. The industry has, in its character, a sustainable carbon recycling system, in which carbon passes from wood to paper, which is recycled, to carbon dioxide after energy recovery and again to wood.

Though Japan is ranked the third in paper and paperboard production due to the rapid expansion of China, it is still an important player in the world. The fact that the industry has been competitive against imported products in spite of scarce domestic resources (wood and energy) suggests that there should have been many kinds of technological developments which made the industry prospering. The author intends to clarify the characteristics of those developments by surveying those of newsprint which is a representative product in volume as well as in technological development.

The paper is serialized in four parts, and this is the first of them. Commentary on basic technologies in this part will help to understand the survey starting in the coming issues.

#### Preparation of Hexenuronic Acid to Estimate the Discharge of AOX during ClO<sub>2</sub> Bleaching

Kengo Magara, Tsutomu Ikeda and Shuji Hosoya  
Forestry and Forest Products Research Institute \*  
Izumi Shibata and Akira Isogai  
Graduate School of Agricultural and Life Sciences, The University of Tokyo

In this study, we investigated the applicability of 4-O-methylglucuronoxylan (xylan) and cellouronate as raw materials for preparing hexenuronic acid groups by alkali-cooking. We also investigated the generation of AOX during chlorine dioxide (ClO<sub>2</sub>) treatment of the prepared hexenuronic acids. Based on Telesman's procedure, suitable conditions for alkali-cooking were established for xylan and cellouronate. In the ClO<sub>2</sub> treatment, xylan or cellouronate cooked in alkali solution generated AOX in different amounts, which might depend on the solubility of the polymer in acidic solution. In the ClO<sub>2</sub> treatment, xylan separated from wood hemicellulose must be removed due to the influence of lignin on AOX generation. Hence, hexenuronic acid groups in alkali-cooked cellouronate can be applied as a standard compound for estimating of the discharge of AOX during ClO<sub>2</sub> bleaching.

Keywords : 4-O-methylglucuronoxylan, cellouronate, alkali-cooking, chlorine dioxide, AOX

#### Functional Dynamics of Quinine Compounds During Modified Kraft Cooking (Part I) -Distribution of Quinone Compound during Kraft Cooking-

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Graduate School of Life and Environmental Sciences, University of Tsukuba

Tomoya Yokoyama and Yuji Matsumoto

Graduate School of Agricultural and Life Sciences, The University of Tokyo

By the use of specially designed laboratory cooking equipment, the behavior and the fate of a cooking additive during the kraft cooking process was examined for three quinone compounds, 9, 10-anthrahydroquinone (AHQ), 9, 10-anthraquinone (AQ), and, 1, 4-dihydro-9, 10-dihydroxyanthracene (DDA). After prescribed time of cooking with one of these additives, quinone compounds present in the following three fractions were determined as the form of AQ. Fraction A: present in free black liquor, B: present in washed liquor, and, C: present in extracted with chloroform from washed chips. By a kraft-AQ cooking, about 47% of the initial dose was found in fraction B and C at the initial stage of the cooking. In the middle stage of the cooking, the amount found in fraction A and B decreased considerably, but that in fraction C was almost constant. By kraft-AHQ or kraft-DDA cooking, the amount found in fraction B was smaller and that in fraction C was larger than kraft-AQ cooking, suggesting that AHQ and DDA can be more efficiently penetrated into chips than AQ. Further addition of white liquor containing quinone compounds at the middle of cooking caused the decrease in the amount of quinone compounds contained in the fraction C. All these results suggested that quinone compounds present closely to chips are rather isolated from other part of cooking liquor.

Keywords: kraft pulp, anthraquinone, modified cooking, black liquor

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Present State of Overseas Plantation

-Forest Tree Improvement Beginning with Selection of Target Species-

Kazuya Ito

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Sources of imported wood chips to Japan have gradually been replaced with trees out from plantation in accordance with increasing area of overseas plantation. Quantity and quality of wood fiber should affect not only cost of manufacturing but also quality of papers. As breeding can improve characteristics of forest trees, it attracts much more interest to get superior trees with much better cost performance or unique characters to make differentiated manufactures. Fast growing trees such as Eucalyptus and Acacia are main target species for overseas plantation. Introduction of clones into their plantation has been resulted to be better growth performance of trees planted. As one of main target for breeding is getting much more pulp from unit area of plantation, improvement of wood quality such as basic density and pulp yield should be important for getting such a target. Moreover, hybrids between species may create trees with much resistant to stresses such as drought and disease. Methods for early selection of superior trees may accelerate process of breeding to get final results with less time.

Keywords: Eucalyptus, Acacia, Breeding, Clone, Hybrid, Basic density, Pulp yield

Variety of Lignin Structure in Wood Cells and Its Effects on Delignification

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The University of Tokyo

Wide variety of lignin structure is observed not only among different wood species, but also in different layers within a single cell wall, or, in different types of cell in a same wood. General rule found for the wide variety of lignin structure among different wood species can be also found for different cell wall layers, or, different type of cells. Namely, when a certain cell wall layer, or, certain type of cell has lower lignin content, its lignin is richer in  $\beta$ -O-4 structure, especially of erythro type, and, syringyl type of aromatics. Because these characteristics found together with lower lignin content are favorable for delignification reactions during pulping and bleaching, anatomical aspect of lignin structure is important to understand the pulpability of woods.

Keywords: lignin, delignification, pulping, cell structure

Historical Development of Kraft Pulp Cooking

Kazuhiko Ando

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Many digesters in Japan were installed in the 60's and the 70's which were called the highly economic growth era. They are around 30 to 40 years old or too old. However many of them are still operating by now. They are getting further old year by year. But we have maintained the high competitiveness of them as taking several maintenances and upgrades. On the other hand, recently, many brand-new large fiberlines have been installed in South America or Southeast Asia. Such competitors will threaten us with higher competitiveness by brand-new equipments. In this report, I introduce a summary of the kraft pulp cooking methods last 40 years which consists of Conventional cooking, MCC, Lo-solids cooking, Compact cooking and so on. New model of digester are made several improvements for the yield, the quality, the maintenance, simplification and so on. On the other hand, AQ and PS were improved well and the new electrolysis polysulphide generator has been developed to raise the concentration of PS recently. We would like to make further improvement for the kraft pulp cooking with the pulp & paper industries, the machinery industries and the chemical industries together.

Keywords: Conventional Cooking, Lo-Solids Cooking, Compact Cooking

## Trend of Bleaching in Kraft Pulp

Yosuke Uchida

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Chlorine and chlorine compounds had been used for bleaching of kraft pulps for many years. Since 1990s, many kraft pulp mills in all over the world have converted conventional bleaching with chlorine to ECF (Elemental Chlorine Free) bleaching in order to eliminate AOX (Absorbable organic halogens) produced in bleaching process, which have influence on the environment.

In this report, the trend of bleaching agents in kraft pulps is reviewed from the point of relationship between these agents and the residual lignin structures in kraft pulps.

## Modern Kraft Pulping Technology Developed by Metso Paper

Yan Ju

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

Metso Paper has developed modern kraft pulping technology in which COMPACT COOKING™ G2 cooking system, pressure diffuser (PDW), DeltaKnotter™, DeltaScreen™, TwinRoll Press™, oxygen delignification stage-OxyTrac™, and high consistency ozone bleaching stage - ZeTrac™, etc. are included. With Metso's modern kraft pulping technology it can be fully meet the requirement for a fiberline with huge capacity up to 5000ADt/day, homogenous cooking with the mixed chips, increasing pulp yield. And it can reduce water and energy consumption, minimize discharge of filtrate which is related to decrease the environmental load. Moreover, it can also be easy to convert the bleaching plant from element chlorine free bleaching (ECF) to total chlorine free bleaching (TCF). With installation of ZeTrac™ stage it will be easy to recover a part of filtrate from the bleaching plant, and change bleaching plant to total effluent free bleaching (TEF) when development of a suitable way to minimize the problem of accumulation of non-process elements in the system in the future.

Keywords: COMPACT COOKING™ G2, OxyTrac™, ZeTrac™, DeltaKnotter™, DeltaScreen™

## Andritz Latest Fiber Line Technology

Kanji Hagiwara, Chiaki Kawakami

Andritz Latest Fiber Line Technology, Andritz K.K.

Andritz has developed new technology for the fiber line over decades. This paper presents (1) Botnia, Frey Bentos Mill in Uruguay, one of the latest Kraft Mills (2) Evolvement of pulping technology and latest technology of cooking process (3) Andritz pulp washing equipment (DD Washer, DD-10, AWP Wash Press) (4) IDEAS Computer Simulator and the patented BrainWave advanced control system.

## Expectation to the Paper Industry in the Oil Resources Exhaustion Century

-Learn from a Past-

Hiraku Nihei  
Japan Paper Association

The Japanese pulp and paper industry has made energy-saving efforts since the two oil crisis in 1973 and 1979, becoming one of the most energy-efficient in the world pulp and paper industry. Also the industry has promoted conversion from heavy oil boiler to new energy boiler. As a result, there are limited options for global warming measures.

High oil prices in recent years has eliminated the industry's efforts made in the past. Volatility of oil prices seems to signal the beginning of oil exhaustion. Oil prices will continue to fluctuate greatly.

In Japan, pulp and paper mills are deployed nationwide. Therefore, the industry can make efficient use of biomass which is distributed widely in small quantities nationwide. For sustainable development of the industry, biochemical industry which makes full use of wood chemistry will play an important role.

#### Energy Utilization of Biomass

Kenichiro Hada  
Environment, Natural Resource and Energy Division,  
Mizuho Information & Research Institute, Inc.

Bioenergy has been anticipated for the significant contribution to the mitigation of greenhouse gas and the energy security. Bioenergy is more competitive than the other renewable for its can produce liquid, solid, and gaseous fuels. This paper gives the some topics of the bioenergy, as shown below: (1) an overview of both national and international trends of bioenergy, (2) the developments of cellulosic-derived liquefied biofuels, (3) sustainability for utilization of bioenergy.

Keywords: bioenergy, biofuel, BTL

#### Basic Concept of Pulping Technology for Recovered Paper

Masakazu Eguchi  
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Recently, Japan is struggling with severe circumstances with regard to waste paper handling - recycled paper cost has increased due to the outflow of waste paper to overseas markets, along with the energy cost increase brought by the high oil price. On the other hand, the sudden economy recession hits papermakers to face the dramatic drop of the total demands for both graphic and board papers. Furthermore, the papermakers have to be aware of the additional costs as they cannot ignore the growing concern to the environmental protection at the world wide level. Accordingly, there seem only negative factors increasing the production costs. However, even under these circumstances, there are many possibilities for operation cost down in the stock preparation process.

At first, the technology in the secondary fiber system is a technology to remove contaminants. As you know, there are lots of contaminants and fibers in waste paper. They should be separated depending on the differences of the own property in each stage. For this purpose, generally three methods are applied. 1) Screening and/or washing process - removing contaminants by the difference of their shapes. 2) Cleaning process - removing contaminants by the difference of their gravity. 3) Flotation process - removing contaminants by the difference of their hydrophilicity.

If paper can be perfectly defibered prior to these methods, it would be more efficient to remove all kinds of contaminants, which would result in saving the energy. This process to defiber the raw material is called "secondary pulping process" and a pulper is an essential component in this process.

In this paper, we will introduce new pulping technology, the low consistency "Intensa Pulper" and the high consistency "TwinDrum", and our basic concept for handling recycled paper.

#### Andritz Waste Paper Treatments Pulper System Technology

Yosuke Takeshita  
Sales & Technical Group 2, Andritz K. K., Japan



Today the recycled fiber cost is increasing due to more export to China and in addition the recycled fiber resources are getting scarce, and consequently the cost of recycled fiber has considerably increased. Andritz has developed and improved the Fiber solve Tab type pulper & FiberFlow Pulper design with new PRO concept over the recent years. This report shows the Theses Fiber solve pulper and FiberFlow PRO concept. The new FiberFlow Drum Pulper is able to accept more lower grade recycled fibers and improve the pulping capacity more than 40-50% compared with conventional FiberFlow Drum and also minimize the fiber loss as low as 0.5%. It is possible to improve and upgrade the existing conventional FiberFlow Drum Pulpers with the new PRO technology. Andritz has upgraded already many conventional FiberFlow Drum Pulpers overseas with the PRO technology for improving performance.

Pulping Concept for Deinking Plant

-The AIKAWA's Theory and the Newest Technologies-

Kazumi Fujita

Technical & Engineering Department, AIKAWA IRON WORKS CO., LTD.

The pulper is a process of the beginnings of the DIP plant, and it is important facilities having both two sides of "the impurities removing" and "ink detaching / dispersion ". Because the high consistency pulper system which had been developed by AIKAWA ahead of the world, had been adopted it by most of the European DIP plants, there is the history that the other pulper makers followed it. The newest HeliDisc rotor and Double Dumping Screen for the high consistency pulper system had been refined especially for impurities removing and energy saving, won the 2002 Sasaki Prize in Japan. This system was able to get very high support, and most DIP plants which have been equipped after 2002, adopted this system. In this report, I will explain AIKAWA's basic concept and our newest technology for the high consistency pulping system. And, I will explain comparison with our system and the conventional continuation type drum pulper.

Keywords: High Consistency Pulper, HeliDisc Rotor, Double Dumping Screen, Drum Type Continuance Pulper vs. High Consistency Batch Operation Pulper

Basic Concept of Screening Technology for DIP process

Masakazu Eguchi

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

The principle of screening is to remove contaminants from the difference of their shape. Key components are a basket, a wiper and a casing. Regardless of this simplicity, screens are commonly used as a most effective equipment to remove out contaminants, but because it is a simple principle, a variety of detail design changes or improvements are made time by time.

Nowadays, it is a world-wide common sense that Centrifugal screens (=outward, Hereafter, referred to "CF") are applied not only to DIP line but also applied to machine screens. However, only in Japan, this has not been a case, because, in Japan it has been ruled by a stereotype idea for long time, that HC slot screens, which are normally applied to Stock Preparation line, are not convenient and not suitable, if they are applied to machine screens in approach flow line. But such idea is not a correct idea - now the world wide fact shows that the improved CF approach screens are applied to the latest paper machines.

This paper focuses on the basic and system concept of our CF screen and its system which have been developed through the various experiences in the world market.

Andritz Waste Paper Treatments Screen System Technology

Yosuke Takeshita

Sales & Technical Group 2, Andritz K. K., Japan

Andritz has the leading technology of all kind pulp types treatments process, KP, MP, SP PMA and Waste paper application. For waste paper applications modern pressure screen technology is the key technology of pulp cleanness quality. Andritz Moduscreen series have a long period experience and a lot of installation for all kind pulping process. This report explains this Moduscreen family for waste paper applications. And explain the latest screen Basket technology Bar-tech-WM.

Screening Concept for Deinking Plant

-The AIKAWA's Theory and the Newest Technologies-

Kazumi Fujita

Technical & Engineering Dept., AIKAWA IRON WORKS CO., LTD.

The screen with narrow width slot cylinder is the essential facility for "sticky impurities removing" for a recent DIP plant. The answer of the proposition how remove the tinny stickies, was discovered in the energy saving technologies. In this report, I will explain AIKAWA's concept that "the achievement of the energy saving" must be compatible with "improvement of sticky removal efficiency" that is a good news for DIP screen facilities. And, I will explain the state-of-the-art of super energy saving screens, the outward type MaxFlow screen and the inward type GranFlow screen, which were developed according to our concept.

Keywords: MaxFlow Screen, GranFlow Screen, Two-Inlet Technology, Stock Dilution Part, NW Super-1&2 Screen Cylinders, Gladiator HC (GHC) Rotor, Outward Type Screen vs. Inward Type Screen

Alkali Pretreatment for Producing Bioethanol Fuel from Lignocellulosics Part 2

-Bioethanol Production from Waste and Recycled Materials-

Tsutomu Ikeda, Tomoko Sugimoto, Masanobu Nojiri, Kengo Magara, Shuji Hosoya and Kinji Shimada

Department of Biomass Chemistry, Forestry and Forest Products Research Institute

Our group has proposed producing bioethanol from lignocellulosics using alkali pretreatment and enzymatic saccharification. Our previous studies showed that low-cost materials must be used to reduce the production cost. In this study, we evaluated the suitability of low-cost lignocellulosics, such as waste and recycled lignocellulosics, for bioethanol production.

Sugi branches without debarking yielded a little lower glucose than sugi. However, it was suggested that sugi branches have sufficient potential as low-cost lignocellulosics for bioethanol production. Alkali pretreatment removed most of the phenol resin which was included in plywood, so enzymatic saccharification of plywood pulp proceeded smoothly, and the glucose yield of plywood was similar to that of sugi. A large amount of screen knots was produced after alkali pretreatment of particle board which contained melamine-urea resin, and small resin particles remained in the pulp hindered enzymatic saccharification. As a result, the glucose yield of particle board was less than half that of sugi. Medium density fiberboard (MDF) which contained urea resin gave a high pulp yield after alkali pretreatment. However, only a small amount of MDF pulp was saccharified after enzymatic saccharification, and the glucose yield of MDF was only about 10%. A large proportion of sugi leaf was dissolved by alkali pretreatment, so the pulp yield of sugi leaf was very low. Furthermore, only a limited part of sugi leaf pulp was saccharified, and the glucose yield of sugi leaf was only 2.8%. These results indicate that sugi leaf is not a good lignocellulosic for bioethanol production.

Keywords: bioethanol, pulp, branch, plywood, particle board, medium density fiberboard

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#### The Latest Trend and Future View of Electric Vehicles and Fuel-Cell Vehicles

Norikazu Ogino  
FCEV Center, Japan Automobile Research Institute

As issues on energy security or global warming have been emerging large, hopes on the next-generation cars such as electric vehicles is growing larger and larger than ever.

This article introduces electric vehicles and fuel-cell vehicles which recently attract a great attention inside and outside of Japan, action by the government, development of those vehicles, significance of their spread from both efficiency and CO<sub>2</sub> aspects and problems they will face.

#### Energy Saving by Review and Optimization of Existing Facilities

Toru Azumi  
Nikko Mill, Oji Paperboard Co., Ltd.

An energy cost rises with the high crude oil prices of these days, and the companies are coming under serious influence of the paper manufacture industry that energy many consumption model is industrial together in profit side.

In addition, as global warming preventive measures, the paper pulp industry reduces a fossil energy basic unit per the product ratio 13% in 1990 by 2010 and I advocate CO<sub>2</sub> discharge basic unit 10% reduction and take it over in the policy in each carried out energy saving activity to reduce an energy basic unit by the ISO14000 acquisition in the sunlight factory in 2002 carried out energy basic unit 15%, 1,500kW (CO<sub>2</sub> conversion 6660t/ year) as reduction target.

#### Water Conservation and Energy Saving Program with Process Analysis by Applying Sealing BAT -Improve Continuous Digester Production Performance by Using of Sealing Best Available Technology-

Kenji Matsunishi and Ryuji Oka A. W. Chesterton Co., Ltd.

Cold water getting into Kamyr Continuous Digester System will not only drop thermal efficiency, but also reduce production capacity. This system has been up-graded in many years to increase production efficiency, but still there is some blind spot, such as rotating equipment's sealing system. Fortunately, water is almost free in Japan. But this fact has been prevented Japanese Pulp mill's improvement. In some countries such as Europe and USA, these countries have been forced to make production under water usage limitation. Sealing technology has been improved with these regulation and found, water saving will lead to improve production and energy saving for pulp production. This idea has been known as "Water Saving Sealing Solution" or "Waterless Sealing Solution" since 1997. These are such as waterless gland packing, 3rd Generation Dual mechanical seals, Dual Flow meter for Dual mechanical seals, Barrier tank system for Dual mechanical seals, Spiral Track flow controller system, etc.. We have been surveyed sealing water usage at 17 pulp mills in Japan since 1998, and found there are still many up-grade points exist. As a result of survey, lowest sealing water contamination into digester is approx 20m<sup>3</sup>/day, and highest is over 200m<sup>3</sup>/day, and most of them are between 40m<sup>3</sup>/day-70m<sup>3</sup>/day. These are equivalent of 200kL-300kL fuel oil/yr., and 540t-950t/yr CO<sub>2</sub> emission. By applying newest best available sealing technology, we can reduce approx 80-90% of sealing water contamination. Then we can up-grade digester thermal efficiency, reduce thermal energy, increase production capacity, and increase equipment reliability. This presentation will show our result of mill survey in Japan and solution to improve.

#### Steam Saving by Chilled Water Temperature Optimization in R8 Process

Toshikazu Ishii  
Nippon Paper Industries Co., Ltd.

There are many chlorine dioxide preparation plants in our industry. The chlorine dioxide gas is absorbed in chilled water for use in the pulp mills' bleach plant. Some energy consumed in water cooling process could be saved by raising the chilled water temperature. Two mills (Fuji and Iwakuni) demonstrated this idea. Each of these mills has successfully raised the temperature from 5°C to 10°C (5°C increase) without any noticeable negative effect. Steam usage for ejectors (vacuum evaporation system) has been reduced 25%-50% in summer, 100% in winter.

#### Case Study of Steam Saving by Installing the Mini Shoe Press

Naoyuki Sekine  
Hachinohe Mill, Mitsubishi Paper Mills Limited

In August 2007, we installed Shoe Press in No.6 paper machine of Hachinohe mill, with the aim of production increase and steam saving. We adopted Mini Shoe Press developed by MHI (Mitsubishi Heavy Industries, Ltd.). We could improve dryness capability and steam saving by high dewatering performance of the Mini Shoe Press.

Additionally, the dirt of canvas roll in dryer was decreased and the sheet running was stabilized. As a result, we could optimized drainage balance at dryer and achieved big steam saving equal to effect of Mini Shoe Press installing.

This report is described about steam saving by installing of Mini Shoe Press and optimization of drainage balance at dryer.

#### Steam Trap Management System -Steam Cost Reduction-

Hideo Dairaku  
MIYAWAKI Inc.

In the last year, there were so many problems occurred, such as rise in cost of raw materials since the year before last, rise and fall in oil price, and world recession caused by financial crisis. It seems that difficulties last in this year, therefore, we think that we must get back to origin again and it is the time to firm the foundation. "Origin" and "Foundation" in your industry are costs of motive power, especially the remarkable consumption of electrical energy and also steam energy. "Steam Trap Management System" that we introduce this time, is able to check "stages of deterioration of steam traps" accurately. Deterioration of steam traps is one of major factors of steam energy loss, and as a result of practical use of the data, "Steam Trap Management System" is use as tool for visual management.

#### Energy Saving by Waste Heat Recovery from Sludge Incinerator

Kengo Tajika  
Kasugai Division, Oji Engineering Co., Ltd.

Oji Engineering Co., Ltd. is the shared service company of Oji Paper Group. Our main job is to do the series of commissions that are from developments of basic plan to material procurements, constructions and the test runs also. Not only we should own the responsibility as the member in Oji Paper Group, but having with the accumulated technology and the know-how in the constructions or the operations experiences from paper, pulp plants, power plants, environmental equipments, we have been extending our business to the leading multi-engineering company. The Kasugai division on the premises of Kasugai mill, Oji Paper Co., Ltd. is responsible to engineering of Kasugai mill.

In the area of global warming countermeasures, we are actively promoting energy conservation according to the environmental action plan of Oji Paper Group titled "To reduce fossil fuel-based energy consumption and carbon dioxide emissions per unit of production by 20% relative to the fiscal 1990 levels".

In this report, we introduce an example of energy saving by introducing the waste heat boiler to the sludge incinerator.

#### Water Saving of Existing Divisions for New Machine Water Use -Water Saving by Filtrate Machine Waste Water Increase-

Yasunobu Watanabe

Stock Preparation Division, Niigata Mill, Hokuetsu Paper Mills, Ltd.

New N9 Paper Machine in the Niigata Mill of Hokuetsu Paper Mills, Ltd. has been in operation since last September 2008. Water saving was a one of important issue of N9 Paper Machine construction. Water saving of the existing divisions was necessary to produce water for N9 machine start up, pulp production improvement and other new equipment introduction.

We have achieved necessary water saving since we increased machine waste water recovery and introduced new sand filter in last April 2008.

Energy cost reduction in entire mill is a matter of great urgency due to recent remarkable sudden rise of raw material and crude oil price. In this report, we introduce the achievement of energy-saving by reducing the amount of water usage and waste water since we have done the waste water filtrate facility construction.

#### Reduction of Steam Consumption Rate by Heat Recovery of Turbine Condenser Cooling Water

Hideki Akaike

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

While the concern about environmental problem is growing recently as global warming advances, the reduction of CO<sub>2</sub> discharge, which is Greenhouse gas, is regarded as important. Therefore, for the individual company it became an important subject to reduce energy cost. In September, 2006, for the purpose of not only the reduction of CO<sub>2</sub> consumption but also the saving of energy cost, we installed the circulation fluid bed type boiler which uses mainly Tire Chips, RPFs, small pieces of Woods and Coals as fuels at Takaoka Mill Futatsuka Site. This article reports about the improvement of the steam consumption per ton of paper both by the installation of this waste fuel using boiler itself and by the water conservation measure we did in 2008.

This time, it introduces the energy-saving example which the investment cost was smaller.

#### CO<sub>2</sub> Reduction Solution to Achieve Corporate Environmental Target -Energy Saving Application for Cogeneration System and Compressed Air Supply System-

Kazuo Ueki, Kiyoshi Segawa and Michihisa Suzuki

Yamatake Corporation

Under the Kyoto protocol, Japan is required to cut its output of carbon dioxide and other greenhouse gases by 6 percent from 1990 levels between 2009 and 2012. To achieve this target, Japanese government's policies are revised Energy Conservation Law, continuous subsidy, promotion for clean development mechanism and so on. Also Japanese Federation of Economic Organizations is leading that each company should set their target for CO<sub>2</sub> reduction and action plan.

Pulp & paper is one of the biggest industries for CO<sub>2</sub> emissions and set the target is cut CO<sub>2</sub> by 20% from 1990. This will be a big contribution to achieve Japanese goal. So far fuel switch is main activity for CO<sub>2</sub> reduction. And next step will be optimal control for their utility plant to reduce CO<sub>2</sub> furthermore.

Yamatake has built on its core of measurement and control technologies to maintain its position at the forefront of Japan's automation industry since our founding in 1906. Saving through automation, has been the key to Yamatake's business policy, and we have consistently maintained a commitment toward environmental protection. Pulp and Paper industry is consuming a lot of steam, power and air. For more CO<sub>2</sub> reduction these utility generation are key part. In this paper you will find our practical optimal control approach for cogeneration plant and air compressor.

#### Insect Control and Energy Saving by Light Effects

Kazumasa Kamezawa

Ikari Corporation

The conventional way to control pest insects is to treat by insecticide. However, growing concerns about environmental problems and improvement of quality control has made chemical treatment undesirable and requires structural insect control instead.

Among non-chemical insect control methods, we will introduce insect control by light control which is also energy-efficient.

There are various kinds of light sources which emit a lot of UV in factories. Especially, mercury lamps emit very strong UV, which gives negative influence to all the illuminated area. High-pressure sodium lamps have a lot of problems as well. Therefore, it is very important to be careful to use such lamps in order to control insects.

#### A Report on the ICPPB 2008

Kunitaka Toyofuku  
JAPAN TAPPI

The ICPPB 2008 (International Conference on Pulping, Papermaking and Biotechnology 2008) was held in Nanjing, China on November 4-6, 2008 hosted by Nanjing Forestry University and TAPPI.

There were presentations more than 100 in 9 sessions. Total number of participant was approximately 320. Since China is remarkably developing country in paper manufacturing and as hosted by Nanjing Forestry University is highly regarded in Chinese paper research field, JAPAN TAPPI cooperated with TAPPI in this conference. There were participants more than 70 from the foreign countries, USA, Japan, and etc.. In addition, I visited South China University after the conference. I report in conjunction with the meeting.

#### How Technological Innovations Changed Newsprint and Its Making Process -Survey on Technological Developments in Newsprint Production in Japan (Part II)-

Kiyooki Iida  
Senior researcher in 2007, Center of the History of Japanese Industrial Technology, National Museum of Nature and Science, Executive Director emeritus, JAPAN TAPPI

Part one of the series presented a short history of pulp and paper industry, background of selecting the theme and introductory briefing on basic technologies. Part two presents how newsprint and the way of producing it have been evolving in the past 60 years, along with fiber source development in 60 years.

After the collapse of the industry in the World War II, demand for newsprint has been increasing along with GDP growth. News printers innovated their technology from letter press to offset press. They also asked to reduce the basis weight of newsprint to save cost and resources. The industry, having been trying to satisfy printers' requests, had to develop fiber sources successively to meet the growing demand and had to be competitive against imported newsprint by improving its productivity. With technological efforts, the industry has kept supplying to the most of domestic market.

Regarding fiber source development, it started with using red pine for groundwood pulp. Then, hardwood was used to fill the need at an early stage of expansion. Chips imported overseas followed next. Then, recycled pulp or deinked pulp has become a major pulp source in newsprint production. These were technical breakthroughs originally developed in Japan, which made the industry survive in the competitive world market.

#### A New Method for On-line Measurement of Fiber Orientation Based on Dielectric Anisotropy

Masahiro Kurosawa, Ikuko Furukawa, Hidetada Sawamoto and Shinichi Nagata  
Technological Initiatives Research Laboratory, Oji Paper Co., Ltd.

The development of a new on-line fiber orientation sensor has reached the final stage for practical application. The measurement principle of the on-line sensor is based on the dielectric anisotropy which is detected from the interaction with polarized microwave. A strong point of our sensor is ability to measure the fiber orientation of the entire paper sheet, not just at its surface. The prominent performance of the sensor was proven by the experiments on an actual paper machine. The accuracy of the on-line sensor in respect of orientation angle and magnitude was evaluated by comparing with typical off-line methods such as microwave method, MOA, and ultra sonic velocity method, SST. The data from the on-line sensor are in good agreement with those from MOA. These two measurement methods are based on the same measurement principle, dielectric anisotropy. On the other hand, SST, which is based on the anisotropy of modulus of elasticity, shows smaller orientation angles and bigger orientation magnitudes than those from the on-line sensor and MOA. We examined the difference in detail and confirmed that SST tends to indicate stronger fiber orientation because it reflects not only fiber orientation but also the residual stress which is caused by restraint during the drying process on the paper machine. That is, our on-line sensor has successfully detects the actual fiber orientation, excluding the effect from the residual stress in the paper sheet which is usually caused by the tension in the machine direction.

One of the most difficult problems in installing this sensor system on paper machines was to maintain the uniform surface contact between the sensor head, consisting of five dielectric resonators, and the running paper sheet. To solve this problem, unique contacting mechanism which employs foil effect has been introduced to replace air suctioning through small holes at the sensor head surface.

The installations of our sensor onto a paper machine will enable automatic adjustment of the fiber orientation on the wire part, which leads the production of high quality paper.

Keywords: fiber orientation, on-line measurement, dielectric anisotropy



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Vol.63 No.7 Abstracts

Report on Results of Follow-up Survey on JPA's Committed Action Plan for FY 2007 and Efforts against Climate Change in the Japanese Pulp and Paper Industry

Naoki Ikeda  
Japan Paper Association

The Japan Paper Association (JPA) has been actively working to save energy since 1997 when it established its "Committed Action Plan on Environment". JPA declares its policy of restraining CO<sub>2</sub> 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 CO<sub>2</sub> 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 2007, as well as energy consumption, CO<sub>2</sub> emissions and the position of the pulp and paper industry in Japan, and information related to Kyoto Protocol such as trial implementation of emission trading.

Development of High Efficiency Heat Pump Modular Chiller and Example

Hidetoshi Wakasugi  
Toshiba Carrier Corporation

Promoting a high efficient electrical heat pump chiller in substitution for cool and hot water supply with fossil fuel can contribute to the reduction of CO<sub>2</sub> emissions, and can contribute greatly as the measures against global warming. We developed the high efficiency large capacity heat pump chilling unit using high-efficient refrigerant R410A by the name of "Super Flex Modular Chiller". This product is consisted of some 30/45USRT modules with X-frame chassis, which was created from study of air-flow analysis data. The optimized air distribution allows 'side by side' installation without deteriorating the chiller's performance. The module can be combined from 3 to 12 modules. As a result, the unit capacity range can be expanded from 90USRT to 540USRT. The main features are energy saving and reduction of carbon dioxide emissions by the high part load efficiency.

Energy Saving with Lighting Lamp and Shade

Shinya Soeki  
Technology Div., Oji Paper Co., Ltd.

Generally the mercury-arc lamp is used for the lighting of a paper machine building. We replaced this by the ceramic metal halide lamp and the lamp shade of high efficiency reflector. As a result, the large amount of the electric power used was reduced, maintaining illumination conventionally. By replacing 4000 sets of lights at ten mills, it became 860kW power saving and 7 million-kWh electric energy per year was reduced.

Integration of Real-time Energy Conservation Monitoring

Kazutaka Fujita

Pulp & Paper Account Sales Dept., Yokogawa Electric Corporation

The energy conservation environmental solution at which Yokogawa Electric Corporation, aims achieves three elements of energy conservation based on the experience and the knowhow of "Measurement", "Control", and "Information" that is our center technology. That is, the usage condition of "Show it": energy is measured to the truth and it expresses it numerically. "Analyze it": the uselessness of energy is analyzed, informationized based on the data expressed numerically, and it makes it to visible. And, it is in "Solve it": informationization and the control and the reduction of the uselessness of the energy made visible.

This time, the balance of production and the electric power demand is in real time understood by the proposal. It proposed the solution of the energy management system for the achievement of Integration of Real-time Energy Conservation Monitoring in the paper mill. The energy balance of the plant was considered.

#### Energy Saving in the Activated Sludge Process

Tomoki Osada  
Yashio Mill, Rengo Co., Ltd.

In order to meet increasing social demands on environmental conservation, Rengo engages in resource and energy saving activities under "Eco Challenge 009", the document setting forth the environmental vision of the company. Under the vision, the company targets to reduce 22% of CO2 emissions from the 1990 level by year 2009. As part of the company-wide effort, Yashio Mill has focused on energy saving in activated sludge process. The outline and details will be introduced below.

#### Improvement of Heavy Oil Consumption in No.1 Lime Mud Kiln

Hideo Masuda  
Asahikawa Mill, Nippon Paper Industries Co., Ltd.

Asahikawa Mill of Nippon Paper Industries is located at almost the center of Hokkaido. Asahikawa area had several advantages for the pulp & paper business. It was easy to collect rich wood logs, wood chips and used papers from various place in Hokkaido and to use enough water from Ishikari river. Therefore the mill was established at that area in June 1938.

Our time-honoured tradition and profound technology make the Asahikawa mill's products reputed in the market. Among the products there are lightweight coated paper, fine paper, communication paper, base paper of copper clad laminated board, wall paper base and so on. The Asahikawa mill introduced environmental management system and achieved ISO 14001 certification in June of 1999, and we have positively used local resources, are always paying attention to the environmental program, based on Nippon paper group's charter on the Environment.

In Asahikawa mill, we produce mainly KP, and use the black liquor for recollection of heat and White liquor. On the other hand, after the biomass boiler is started from 2008, the ratio of oil consumption is almost in lime mud kiln. In this report, I describe about the reduction of energy consumption in causticizing process, and the improvement of Heavy oil consumption in No.1 Lime Mud Kiln.

#### A New Development of PAM Based Micro-particle Polymer Dispersion

Daisuke Fujioka  
Research and Development Department, Paper Chemicals Division,  
Arakawa Chemical Industries, Ltd.

From environmental protection point of view, use of recycled fibre has been increasing in Japanese paper and paperboard industry. Demand of used paper has been increasing not only in domestic but also overseas. Quality of recycled fibre which has been used in domestic is getting lower and papermaking condition has become worse. Even in such severe condition, paper chemicals i.e. sizing agent, paper strength agent have to work effectively. In this report, newly developed PAM based polymer which will keep high coagulation force and will give final paper strong dry strength is described. New type PAM based polymer make it possible to obtain good results under severe condition. This new polymer agent is not aqueous solution but it is high molar weight polymer dispersion. Higher level of paper strength is achieved when the new type polymer is added in wet-end, and one-pass retention of fibre and sizing efficiency are also encouraged.

## Eka's Compozil Fx System for High Speed Fine Paper Machines

David Lovell, Marek Gorzynski, Christian Przybyla, Yoshikazu Sonehara and Shigeharu Harakawa  
Eka Chemicals, Asia Pacific

The Compozil Fx system was developed to meet the new customer demands of modern fine paper making. These include machine speeds in excess of 1,500 mpm, target ash contents in excess of 30%, increasing use of recycled fibres, achieving stable retention with excessive dewatering and the retention of more challenging fillers. The Compozil Fx components are added and controlled to achieve agreed specific customer goals. A key advantage of Compozil Fx is the ability to "decouple" the retention and dewatering characteristics of traditional systems, thus providing the optimum balance between retention, dewatering and formation. This in turn has allowed the customers to enjoy cost efficient, stable retention at paper high ash and high machine speed conditions, leading to stable machine runnability optimum sheet quality. The ability of Compozil Fx to do this has allowed it to become the system of choice for modern fine paper machines in Asia/Pacific.

## Innovatively Optical Surface Roughness Tester "OpTiSurf"

-Evaluation of the Paper by the Measuring Equipment and the Analysis Programs-

Yoshiyuki Kawabata  
Customer Service, NOMURA SHOJI CO., LTD.

The OpTiSurf revolutionizes the measurement of surface roughness of paper! Using advanced optics and algorithms, it quickly quantifies the optical roughness of entire sheets.

The surface roughness of most paper grades is an important property. Roughness strongly influences the sensation of handling the paper, which can have complex effects on the subjective assessment of quality, depending on the type of paper and its application. Roughness has a direct effect on print quality for most printing technologies, and it is often related to other physical properties of practical significance such as friction or glue adhesion. The surface roughness is typically determined by air leak methods. These methods are time consuming and can lack adequate precision. The OpTiSurf offers a fast, repeatable, objective instrumental determination of surface roughness of paper.

The OpTiSurf was developed by Amcor Research & Technology under the auspices of Australian Paper.

## Power Saving and Improvement in Fiber Recovery, for Screening Stage

-MaxFlow-0, 1, 2, MaxSaver and GHC-Rotor-

Kazumi Fujita and Okumura Junhiko  
Technical Department, AIKAWA IRON WORKS CO., LTD.

The MaxFlow Screen family, MaxFlow-0, 1, 2, MaxSaver is the newest AIKAWA standard outward screen series. MaxFlow family is adopted in all kind of paper stock preparation systems as the coarse & fine screen, as main & reject treating screen, as the hole & slot screening stages. The unique structure of MaxFlow screen body, equipped with NW Super-2 screen cylinder & Gladiator HC (GHC) rotor, produces superior low power consumption and high fiber recovery efficiency. In this report, AIKAWA presents the introduction of MaxFlow family and the case study of application merits of them.

## Energy Saving by "Intensa Pulper" of Stock Preparation System

Takeshi Murakami  
Stock Preparation Engineering Dept., VOITH IHI Paper Technology Co., Ltd.

In recent years, various technical innovation was achieved in the field of secondary fiber system. As result, power consumption of the secondary fiber system has been reduced to 100 to 130kWh/T from 200kWh/T of more than ten years before. Such improvement has been mostly derived from progress of the screen technology, particularly the LP Screen that was developed by Voith IHI Paper Technology (VPIT) is significantly contributing to the progress. Regarding the low consistency pulper which will be most important machine as well as the screen in the secondary fiber system, there have been few technical innovation for about 30 years. However, the Intensa Pulper which has been developed and released by VPIT is really innovative machine and might change the design concept of the secondary fiber system from now on. Energy consumption of the OCC treatment system is now going to be reduced to 50kWh/T by application of the Intensa Pulper.

A New Pitch Control Agent for Press Felt  
-MAINTECLEANTM Series-

Masayuki Serizawa  
Development Group, Maintech Paper Tech Co., Ltd.

Recycled pulp usage and neutral papermaking, closed system tend to increase in recent years. This tendency causes serious pitch troubles at wet-end such as deterioration of paper quality and decrease of productivity due to frequent down time for M/C cleaning.

Maintech has developed a spot prevention program, a total solution that passivates all surfaces in the paper machine where the deposition could increase spots. Mills can take considerable advantage of this program. Our technology of wet-end deposit control, a continuous application of chemical additives (Polymer based agent, MAINTECLEANTM) directly to press felts / felt rolls removes deposit well and establishes a protective coating that prevents deposit buildup. Elimination of deposits in the press felt increases not only paper quality but also productivity.

This report describes an effective solution agent for press felt deposition.

Research on Ink Peeling-off of High Gloss Coated Paper

Takehiro Yoshimatsu, Masayuki Kawasaki, Daisuke Sakakibara and Fuminari Nonomura Pulp and Paper Research Laboratory, Nippon Paper Industries Co., Ltd.

The ink peeling-off can be caused when high gloss coated paper is printed by web-fed offset press. At the bookbinding process, the printed area come into contact and rub against each other under the pressure. This is a serious printing problem because the small dots where ink was peeled off will become the white dots on printed area. This phenomenon is quite different from the ink rubbing that occur on matte coated paper. The purpose of this research is to investigate the ink peeling-off generation mechanism. The following properties were evaluated, morphology of paper surface with the scanning electron microscope, micro-order roughness at the pigment's particle with the optical interference type microscope, and the ink dryness on paper surface etc. As a result, it was concluded that the ink peeling-off is generated easily when micro-order roughness is fine and the penetration rate of ink is slow because anchoring effect of ink vehicle into coated paper is thought to be weaken.

Keywords: ink peeling-off, high gloss, micro-order roughness, ink dryness

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Outline and Operational Experiences of the Vertical Washer “Zekoo”

Saeko Akiyama, Takefumi Ide and Kiyoshi Yoda  
TAIZEN Co., Ltd.

To realize the target value, 62% of recycling old papers for 2010, the paper industry companies have made continuous efforts but situation of the paper industry is getting very tough, and will be tougher in future.

Recycling method of old papers are mainly conducted in kneading, which is incidentally our specialty. With this method, quality of old paper pulp has been dramatically grown. However, quality differs depending on which washing equipment is used. And we needed to make a washing machine of higher washing effectiveness.

And so we have developed the machine with higher washing function through centrifugal dehydration, and kneading function, and water displacement washing effectiveness. This new vertical separate type washing machine Zekoo (called, Vertical Z) has already been introduced at the convention in 2005. It has been 7 years since these machines have been used by customers. In the 7 years, we have improved the machine several times, and we are proud of the machine, which contributes to high quality of old papers.

In this document, we introduce advantageous in using the machine practically, and instillation samples in addition to construction, performance and operational data of the Vertical Z.

COMPACT COOKING™ G2 Technology

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

Metso Paper's fiber business line has developed COMPACT COOKING™ G2 system that has become the most popular continuous kraft cooking process. COMPACT COOKING™ G2 system can fully meet the requirements to, (i) build a new fiber line both for hard wood and for soft wood, (ii) increase the capacity for the existing cooking system, (iii) modify the existing cooking system for the purposes of increasing cooking yield, bleaching ability, and pulp quality as well as for the purposes of reducing energy consumption and environmental load.

The Practical Solution for Canvas Cleaning with AOKI-CLEANER

Toshio Kameyama  
AOKI MACHINERY Co., Ltd.

Environmental issue is concerned world widely. Japanese pulp and paper industry has concentrated to utilize the recycled paper at most since the 1960's for the shortage of domestic wood resources, and currently not only cost performance but also for the preservation of wood resources and green earth. The more utilization of recycled paper is causing the worth quality of recycled paper, however the pulping process has developed in recycled paper dramatically, the paper machine area, especially dryer canvas area have not resolved in heavier contamination originated by sticky material such as hot melt, acrylic resin, pitch, etc.

“AOKI-CLEANER”, blade type canvas cleaning device, compared with conventional “net type” and “high pressure water and/or air type”, is the newest type canvas cleaner which is overcome those something wrongs. “AOKI-CLEANER” by introducing your paper machine, you will be satisfied with reducing sticky trouble amazingly, and further cost reduction, improving operation efficiency and product quality, together with result in the preservation of green earth.

This report describes the superiority of its performance from practical solution of paper machine operation.

The Improvement of Formation and Paper Properties by Controlling the Structure of Polymer Additive

Yoshiya Yamaguchi  
Shonan Research Center, HYMO Corporation

Recently the retention aid system is required for applying papermaking process using high ratio of fine fiber pulp or calcium carbonate filler at the high speed machines. For these papermaking processes, the poly-acrylamide (PAM) with higher molecular weight that is inappropriate for good formation is applied to achieve good retention. Furthermore, the improvement of not only retention performance but also paper properties is requested from a point of view of making paper of high quality. Under those circumstances, the use of straight-chain PAM has limitation in performance, and use of the structure -controlled-polymers would be effective for these problems.

We have developed the several structure-controlled-polymers with different polymer production technology; Himoloc RX, ND, FR and FA.

- RX: Structure-controlled reverse emulsion polymer having ultra high molecular weight
- ND: Nano-cluster-type dispersion polymer
- FR: High cationic charge density dispersion polymer with wide molecular weight distribution
- FA: Anionic micro particle dispersion polymer for dual system

In this report, we discussed how the structure-controlled-polymers were effective for the improvement of formation and paper properties.

#### Control of Scum Marks Appearing onto Paperboard with Stock Additives

Yuka Miyoshi  
Paper Chemicals Department R & D Division, YUKA SANGYO CO., LTD.

Nichiyu Solution Inc. has been selling nonionic polymer-based stock additives called "DETAC", which are especially optimum to solve stickies related problems deriving from recycled paper by modifying deposit surfaces to hydrophilic and non-tacky for its stable dispersion. This paper will propose that "DETAC" functions modify wax surfaces to hydrophilic to improve dispersibility, and will introduce that middle layers' furnish treatment by "DETAC" is optimum for controlling scum marks appearing onto paperboard.

#### Chemicals and Technologies to Reduce the Amount of Inorganic Coagulant for Wastewater Treatment

Satoshi Takebayashi and Minoru Watanabe  
Chemical Division, Kurita Water Industries Ltd.

Inorganic coagulants are effective to remove suspended solids from pulp and paper wastewater. However, cost reduction of chemicals and sludge disposal has been focused because both of them are highly increasing. We will introduce the application technologies to reduce inorganic coagulant consumption.

- 1) Using organic coagulant to substitute the electrical neutralization function of inorganic coagulant.
- 2) Monitoring and optimization system to control dosage of inorganic coagulant.

#### Energy- saving and High-efficient Progressive Cavity Pump -The Best Pump for Coating Color Transfer-

Takeshi Kawamura  
HEISHIN Ltd.

Because of smooth dynamics, the progressive cavity (PC) pumps produce flow on a continuous basis. They are popularly used to transfer coating colors, pulps and chemical liquids etc. at paper plants. New energy saving and high efficiency PC pump called "D type" are served to transfer mainly coating colors. Its rotor has oval cross section and its stator also has blunt triangle. Due to its shape, in D type six cavities are discharged per cycle, compared with two in N type. D type pumps little pulsate and can transfer delicate liquids without damaging and bubbling.

#### The Non-Cooling Cartridge Mechanical Seal for Pulp Pumps

Hidekazu Takahashi  
Customer Service Dept., Eagle Industry Co., Ltd.



In a pulp & paper plant, many numbers of varieties of pumps are utilized such as water pumps, pulp pumps and chemical pumps all through the production processes from digesting to painting. Recently, a mechanical seal has been selected as a standard sealing device for such pumps. A cartridge seals are coming into wide use for work improvement, for being easy to handle and for installing correctly. And then the cartridge seals are used not only non-flushing use but non-cooling use in a plant. I will introduce the latest technology trend about the non-cooling cartridge mechanical seals for the pulp pumps.

New pH Electrode with Digital Communication

Yasuo Watanabe

Process Analytical Division, Mettler Toledo K.K.

Last year, Mettler Toledo introduced the new digital pH electrode which is called "ISM sensor". But at that time, we had not so much experience and also available transmitter was limited due to the concept electrode. Now as Mettler Toledo developed the advanced ISM system, we introduce the benefit of this new system.

Cost Saving Concept for Coated Woodfree Papers

-Single Blade vs. Double Coated MSP-Blade-

Peter Dahlvik and Guillermo Bluvol

Research & Technology Services, Omya

Greg Welsch

The Dow Chemical Company

Alexander Hipp and Pekka Salminen

Dow Europe S.A.

This paper presents a case study based on pilot coater trials comparing single to double coating. The single coating relates to the common procedure of surface sizing/pigmentation followed by blade coating. In the double coating approach, the surface sizing is replaced by MSP precoating on which a blade topcoat is applied. The double coating concept also evaluates the ratio of precoat to topcoat and the impact of running higher dry solids in the precoat.

The obtained results demonstrate that higher solids content and therefore a faster immobilization of the coating allows reduction of the water soluble binder. Significant energy savings can be achieved through the reduced drying demand when running higher coating formulation solids. This could also translate into increased coater speed in cases where drying limitations may exist. Calculation of the related production cost (coating formulation and drying energy) indicates significant savings potential. In addition to the cost benefit, the proposed double coating concept also resulted in improved optical properties.

Insect Control of Paper Manufacturing Plant in the Pursuit of Efficiency and Effectiveness -Consideration of the Characteristics of the Plant, Build A Custom-made Measures-

Yoshimi Ichihara

Earth Environmental Service Co., Ltd.

Our company is performing investigation/measure support business for protecting a product from an insect over many years in paper manufacturing plant all over the country. As a result of investigating many factories, the mechanism to which an insect is mixed with a product is not a general way. It is various. It has turned out that there is a characteristic tendency for every factory or its production equipment.

The prevention plan with few results of an improvement is not analyzing the "insect pollution scenario" in a factory in many cases. "Measure which is easy to implement" and "The general measure" is implemented. As a result, in the case of some factories, it had become an opposite effect. In order to reduce insect mixing efficiently effectively, it is important to clarify the "insect pollution scenario" in a factory, and to assemble a measure program rationally along with the scenario. The main point is three points. It is analyzing the causal relationship between the product which the insect mixed, and a manufacturing process and manufacture environment. It is defining the turn of a measure based on a scientific basis. And it is making the organization where a related employee's can participate.

## Model-based Predictive Adaptive Control of Pulp and Paper Mill Processes

Junji Mizuki

Project Engineering Group, Andritz K.K.

This paper describes the application of a model based predictive adaptive process controller on a number of challenging pulp and paper mill control loops including paper machine reel brightness control, lime kiln temperature profile control, Recaust Area Control, Extraction Stage pH control, Digester Control and Pulp Dryer Control. These loops are difficult to control due to the time delay present in the response. Consequently, many of these processes are manually controlled resulting in inefficient operation and increased operator work load. Paper making includes many such processes that cannot be well controlled with conventional PID techniques. Model predictive control provides a practical alternative to achieve significant reduction in process variability to reduce operating costs.

## FILTOMAT

-Case Study for Optimization of White Water Filtration-

Kazuhito Gomi

Altech Co., Ltd.

Paper production requires tons of water; and, among involved companies, reduction of the water has been main issue to tackle with for decades as it is the key to lead decrease in operation cost and negative effect on the environment. One of major answers for the issue is to apply filtration technology to white water, however, existing technology has critical disadvantages in some aspects such as initial cost, foot-print and maintenance works.

In this paper, purpose and problems of recycling white water with existing technology are reaffirmed, and optimization of white water filtration technology with FILTOMAT is introduced with test result and on going operation status.

## A Report on Anselme Payen Award Symposium in 237th ACS National Meeting

Toshiyuki Takano

Graduate School of Agriculture, Kyoto University

The 237th American Chemical Society National Meeting was held on March 22-26 in Salt Lake City, UT, USA. Prof. Fumiaki Nakatsubo in Kyoto University was awarded an Anselm Payen award 2008 in division of Cellulose & Renewable Materials of the ACS National meeting, and Anselme Payen Award Symposium was held on March 22-24 in the division.

## How Technological Innovations Changed Newsprint and Its Making Process

-Survey on Technological Developments in Newsprint Production in Japan (Part III)-

Kiyoaki Iida

Senior researcher in 2007, Center of the History of Japanese Industrial Technology, National Museum of Nature and Science, Executive Director emeritus, JAPAN TAPPI

Part one of the series presented a short history of pulp and paper industry, background of selecting the theme and introductory briefing on basic technologies. Part two presented how newsprint and the way of producing it have evolved in the past 60 years, along with fiber source exploitation in 60 years. Part three describes how paper machine for new print production has developed in the past 60 years.

Paper making process by hands, which was a kind of batch process, was invented about 2000 years ago. It was revolutionized to a continuous process called paper machine in the early 1800s. The paper machine greatly improved productivity in making paper and helped printing business to grow in the 1800s and the 1900s. How the paper machine has developed in the past 60 years is a subject of this part. As news printers have been improving printing technology, their qualitative requests to news print have becoming more and more severe. Due to international competition, its production cost has had to be reduced as much as possible. Japanese paper industry, by investing in new technologies one after another, has been improving its productivity with larger machines of faster running speed, satisfying qualitative requests, and supplying to most of the domestic market. Reliable and cooperative relationship with suppliers of technologies in Japan has played an important role in the evolution of paper machine.

Part four of the series will discuss the characteristics of technology of Japanese paper industry against those of other countries.

#### Structural Micro-analysis of Residual Lignin in Pulp by Pyrolysis-GC Mass-spectrometry

Ai Hasumi, Akiko Nakagawa-izumi, Mitsuko Homma and Hiroshi Ohi  
Graduate School of Life and Environmental Sciences, University of Tsukuba  
Keiichi Nakamata  
Technical and Development Division, Hokuetsu Paper Mills, Ltd.

It is difficult to analyze residual lignin in pulp, especially in bleached pulp because of its low lignin contents. However, it would be possible to estimate it by using pyrolysis gas chromatography/mass spectrometry (Py-GC/MS) with an appropriate method.

In this study, the ratios of syringyl units to guaiacyl units (S/G ratios) of wood meals, unbleached kraft pulps, oxygen bleached kraft pulps and total chlorine free (TCF) bleached kraft pulps were measured by Py-GC/MS. All samples were prepared from four kinds of eucalyptus woods, *Eucalyptus nitens*, *E. grandis*, *E. macarthurii* and *E. smithii*. The S/G ratios of wood samples were measured at intervals of 10 mm from pith to bark sides. *E. nitens* gave the highest S/G ratios in four woods. Results from all wood samples showed that the S/G ratios were slightly lower in bark side than pith side. It is important to know total ion peak areas of lignin degradation products from pulps for measurement of the S/G ratios. However, these peak areas were too small to measure directly. In order to estimate these peak areas, we calculated correction factors of lignin pyrolysis products obtained from wood samples, which were equal to the total ion peak areas divided by the main fragment ion peak areas. Then, the total ion peak areas of lignin pyrolysis products from pulps were estimated by multiplying the correction factor and the main fragment ion peak areas from pulps together, and the S/G ratios were measured using guaiacol, 4-methylguaiacol and 4-vinylguaiacol as guaiacyl type compounds, and syringol, 4-methylsyringol and 4-vinylsyringol as syringyl type compounds. The result showed that the S/G ratios were decreased during pulping and bleaching. This result was correspondent to earlier studies on residual lignin with a different method. It was shown that this method was applicable for the calculation of the S/G ratios of bleached kraft pulps.

Keywords: pyrolysis, gas chromatography/mass spectrometry, bleached pulp, residual lignin, S/G ratio

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#### Optimization of Quinone Compounds Impregnation in Kraft-quinone Cooking

Junji Tanaka  
Kawasaki Kasei Chemicals Ltd.

SAQ has been used as a cooking additive in many KP mills. This process is known as "Quinone Cooking". The author developed laboratory wood-cooking equipments which can reproduce the modified continuous cooking (MCC) processes of a mill-digester and clarified the optimized MCC conditions using SAQ. As a result, SAQ was most effective when it is added at the beginning of cooking. It indicates that SAQ is very important to impregnate efficiently into wood chips. In this report, the effect of introducing the SAQ impregnation treatment before the cooking process was investigated using the laboratory cooking equipments.

By measuring SAQ in liquor after the impregnation treatment, the impregnate conditions (temperature, time, active alkali dosage, and liquor/wood ratio) were optimized. When kraft cooking after the impregnation treatment was performed, SAQ effect improved more than kraft cooking without the impregnation treatment.

#### Application of Microbial Products and Fluorescence Imaging for Activated Sludge Control

Ryoji Igarashi, Takuji Yamamoto and Hideomi Matsuoka  
Research and Development Division, SEIKO PMC Corporation

Recently, an increasing social awareness of environmental issue has prompted administrative guidelines and regulations of industrial effluent. In this situation, simultaneous pursuit of environmental preservation and improvement of productivity is important for the pulp and paper industry. For stable operation of a plant, it is essential to enhance capability of wastewater treatment. In this report, we propose two effective and convenient approaches for improving wastewater treatment. The first is the application of microbial products in activated sludge, so-called "Bioaugmentation", and its tracking technique. Microscopic FISH (Fluorescence in situ hybridization) analysis of bacterial cells allows for "remodeling" of activated sludge by the microbial products. The second is the analysis method for monitoring physiological activity of bacterial community in activated sludge. Visualization of the physiological activity of bacterial community, which is invisible by conventional light-microscopic observation, should provide a useful indicator for controlling activated sludge treatment. In addition, we show an example of improvement of activated sludge treatment in pulp and paper plant, in which microbial products and fluorescence imaging techniques were used.

Since invention of activated sludge system, it has been unclear how bacterial composition and its physiological state shifts in this "blackbox". In our approach reported here, a remarkable feature is that we can monitor a part of the inside of "blackbox", and can improve the system efficiently.

#### OxiPROTM Technology

-Maximizing Machine Efficiency through Proactive Deposit Control-

Akihiro Maeshima  
Katayama Nalco Inc.

Katayama Nalco Inc. has introduced several innovative technologies to provide solutions to the Paper industry; designed to achieve improvements in operating efficiency, while achieving better product quality & promoting environmental sustainability. Nalco has introduced OxiPROTM technology, the paper industry's first online monitoring system for microbiological control. This technology enables the papermakers to optimize usage of biocides, to make their process more eco friendly and at the same time, improve operating efficiency.

#### A Study on Improvement in Quality of Dry-strength Agents for Neutral Papermaking

Kazuki Tanaka

Research & Development Department, Paper Chemicals Division, Harima Chemicals, Inc.

Recent paper industry makes every effort to improve the productivity and to reduce the environmental loading by using new paper machines and waste paper as raw materials used for the papermaking system. In such a situation, paper manufacturing companies are promoting to increase inorganic filler such as calcium carbonate.

However such a situation causes the rising of electric conductivity, which makes it difficult to get the effective performance for paper strength agents. Because it causes the inactivation and hydrolysis, it becomes the reduced of the adsorption of dry-strength agents on pulp fibers.

Recently, paper manufacturing companies are promoting investment in plant and equipment of high speed new paper machines for enhancing cost competitiveness in the international market. The high speed of paper machine causes the decline in performance of dry-strength agents for drop of the retention.

In this paper, we report that the study on improvement in quality dry-strength agents for neutral papermaking on high-speed paper machines.

Business Risk Management with "Visualization" of Environmental Pollution  
-Environmental Monitoring System "e-FEINS"-

Kenzaburo Makita

FUJITSU FIP Corporation

FUJITSU FIP Corporation was developed e-FEINS (Environmental Monitoring System) of environmental risk management. Environmental Monitoring System analyzes monitoring data in every hour that are transmitted from environmental monitoring station in business place.

Advantage of Environmental Monitoring System is "improvement of Environmental conscious", "swift measure devised to deal with a problem", "reduce reporting hours" and "smooth Communications of in-house, local government, and neighborhood".

Bearing Coating Technology

Kunio Osaki

HI Sales Dept., Industry Division, Schaeffler Japan

There are many kinds of machines which is contributing to higher efficiency of productivity. So many kinds of machine parts/tools are used and some of them have special coating on their surfaces. Now, "coating technology" is the one of most important technology for mechanism parts. Bearing is also one of important mechanism parts, and so many kinds of bearing are used in many rotating/sliding mechanisms.

Some of bearings and related parts have also special coating on surfaces. This means coating is also important technology for bearings. Amorphous carbon coating for anti-wear bearing is introduced in this report.

Significance and Economical Effect of the Glass Lined Steel Tank

Kuniyasu Sasaki

Industrial Machinery Dept., Ecological & Industrial Machinery Div., Itochu Sanki Corporation

Among all plant equipments, stainless tank is the one of the most requisite ancillary facilities. The purpose of the stainless tank is to store, digest, and to react content. Stainless tank has beset paper mills because of its long delivery time and moreover, due to recent dramatical steel price run up, it's become to oppress mill's budget of investment for plant and equipment. Prominent corrosion resistance of stainless steel is essential for pulp and paper industry and in particular, it is often seen that paper mills are forced to use stainless tank as clean water tank, slurry tank or effluent tank etc. Itochu Sanki is pleased to introduce this Glass lined steel tank "Science Farm" to pulp and paper industry in Japan to give mills a chance to seek a solution.

Hyper Shaped Engineered Kaolin in Barrier Application

David I. Gittins  
Research Development and Technology Group, IMERYS  
Tatsuya Asano  
Imerys Minerals Japan K.K.

Materials such as PE, PVDC and fluorocarbons have been used as functional materials to provide barrier properties in coatings for the packaging industry. Recently, the eco-friendly trends, functional materials that are easier to recycle and more environmentally friendly are in increasing demand. As a result there is increasing interest in using water based coatings to move away from the less environmentally friendly functional materials. In this paper, IMERYS has investigated using high aspect ratio kaolin particles in water based barrier coatings as a potential method for a barrier coating that provides improved barrier functionality vs. more traditionally available kaolin materials.

#### Development of Long-life Slitter Knives Using Novel Hard Carbon Films

Teruyuki Kitagawa and Tokumi Ikeda  
Nomura Plating Co., Ltd.

Novel hard carbon thin film (product name: Tough Carbon) was synthesized using gas cluster ion beam (GCIB). The cluster ion is the ion which consists of several hundred to thousand atoms. The irradiation effects of cluster ions are very unique and quite different from those of single ion or those of plasma process. Therefore, the properties of the films which have not been obtained up to the present have been achieved. The characteristics of Tough Carbon are higher hardness (Hv5000), higher adhesion, and lower process temperature, compared with those of the prior films (Diamond-like Carbon: DLC). When these films deposited on slitter knife for cutting papers, the twice or three times longer life time was obtained than that of no-deposited knife. In addition, the method and the equipment for the formation of Tough Carbon, and the details of the film characteristics are mentioned in this paper.

#### The Latest Modern QCS Paper IQ Select - A Step Change in QCS Performance and Application-

Noriyuki Watanabe  
Pulp & Paper System Division, Metso Automation K.K.

Metso Automation announced new QCS, Paper IQ Select with “Patented New adaptive and situation-based scanning”, “Online variability analysis tools based on high speed measurements”, “Detailed edge measurement and scanning”, “Full family of robust multivariable controls” and “Two new intelligent scanners”. Paper IQ Select with new features provide faster grade changes, better recovery from web breaks and lower paper waste. Online variability analysis helps paper makers to improve process stability and machine efficiency.

#### Line Synchronization from Paper Machine to Coater

Satoshi Suzuki  
Surface Inspection Systems Division, COGNEX K.K.

“Line Synchronization” is a new function of Cognex SmartView inspection system. It allows user to easily track defects from one process to another, for example, from paper machine to coater, and enables actions to be taken in real time on the current process based on defects detected in prior processes. By Cognex unique distance code decoding technique, tracking defects is accurate. When using Line Synchronization with Advanced Winder Advisor, it will give a total solution for effective inspections and wider operations in their product flow.

#### Effect of Energy Saving on Paper Mill White Water Using Spin-Klin Automatic Backwash Filter System

Kazuyasu Izawa, Shouji Mizumura and Daigo Hama  
Nihon Pall Ltd.

The pulp and paper industry consumes enormous amount of energy every year; therefore, it has made an effort to reduce energy consumption 25% in ten years from 1981 to 1991. The industry has another target to reduce energy consumption in 2010 by 13% and CO<sub>2</sub> emission by 10% to 1990 by the introduction of additional high-efficient equipments and reconsideration of a manufacturing process.

In this paper, it has been demonstrated that energy saving was achieved by adding Spin-Klin automatic backwash filter system to filter and recycle whiter water which was disposed to drain before. It was confirmed that the reduction of steam consumption equivalent to approximately 4,000 tons of CO<sub>2</sub> emission reduction was achieved. It was confirmed that recycling of clear white water using the Spin-Klin automatic backwash filter system was very effective in energy saving and CO<sub>2</sub> emission reduction.

#### Reduction of Pollutants from Bleached Kraft Pulp Mills by the Process Conversion to Elemental Chlorine Free Bleaching (Part 1) -Organic Halogens in Bleach Filtrates and in Whole Mill Effluents-

Hitoshi Takagi and Miyuki Nakagawa  
Japan Pulp and Paper Research Institute, Inc.

The formation and discharge of organic chlorine compounds in 17 bleached kraft pulp mills, changed bleaching process to ECF, have been evaluated. AOX and EOX in the bleach filtrates decreased by 83% and 70% respectively by the bleaching process conversion to ECF. OX in the bleached pulps decreased from 0.54kg/t to 0.16kg/t. A small amount of AOX and EOX was formed with chlorine dioxide-based ECF bleaching. The average ratio of EOX to AOX in the bleach filtrates became slightly higher from 2.5% to 3.5%. The average percentage of OX in the pulps to the sum of AOX and OX, the total halogens generated in the bleaching process, became higher from 21% to 32% by the bleaching process conversion. These results suggest that organic chlorine compounds formed with ECF bleaching are not so hydrophilic compared to chlorine bleaching. The discharge of AOX and EOX from ECF bleached pulp mills decreased by 80% and 68%. The average AOX discharge from the ECF bleached pulp mills was 0.16 kg/t. This low level was achieved with combinations of ECF bleaching, modified cooking, oxygen delignification and efficient wastewater treatment. The average ratio of EOX to AOX in the mill effluents became slightly higher from 2.1% to 2.8%. The persistent AOX and EOX in the effluents from bleached pulp mills decreased remarkably by the process conversion to ECF bleaching. However the biodegradability of organic chlorine compounds in the effluents was not so improved.

Keywords: ECF bleaching, bleach filtrate, effluent, AOX, EOX, chlorine dioxide



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#### Technology of Hot Dispersing System and Broke Pulpers

Kaj Trymel  
Cellwood Machinery AB

Paper is a product which all of us are using daily and as raw material and energy prices are increasing it is important to have the correct tools to handle the current situation. KRIMA Hot Dispersion is one important tool in a modern stock preparation plant to achieve this. The target of dispersion is to disperse, distribute, the dirt in the waste paper invisible in an economic and developing way.

#### The Newest Cleaning Equipments for Dryer Canvas, Press Felt and Wire Fabric

Yoichiro Iwatani  
Technical Sales Dept., AIKAWA IRON WORKS CO., LTD.

In the quality improvement of the product and reduction in costs, it is important to wash the dryer canvas, the press felt, and the wire fabric appropriately. And cleaning equipment is making progress more than before. The latest models are SUPER CLEANER-WET, SUPERCLEANER-DRY, SUMART CLEANER, and FF CLEANER. Here we would introduce the feature of these cleaning equipments and the merit by the introduction.

#### The Experience of Anaerobic Wastewater Treatment System for Pulp Mill Wastewater

Atsushi Nakano, Akitoshi Akazawa and Doryoku Sekiya  
Sumitomo Heavy Industries Environment Co., Ltd.

The EGSB anaerobic wastewater treatment system is a very competitive method compared with aerobic treatment system because of space and energy saving system. We constructed the Biobed EGSB system in Pulp Mill for the treatment of drain wastewater from KP evaporator and operated over one year. The performance of EGSB system is good as for the removal rate of CODCr is about 90% and gas production rate is over 0.3Nm<sup>3</sup>/kg-CODCr, then we achieved the aimed energy-saving effect.

#### Wet-end Control Technology for Environmental Solution

Koichi Tadaki, Tomoko Asada and Kazutaka Kasuga  
Technical Dept., Somar Corporation

Energy and resources saving are important factors in paper machine operation in the recent trend of large-scale high speed machine. Our continues effort to develop retention aids and coagulant "REALIZER" series is aimed at optimization of wet-end by keeping clean operation as well as to improve productivity. During these research and development, we found that the application of wet-end reformer "AXISZ" system could (1) reduce wet-end chemical dosage, (2) reduce effluent load, and (3) reduce other environmental load.

Reduction of sizing agent addition can be achieved by newly developed ASA sizing system "REGSIS". High performance emulsifying agent "REGSIS E" series gives better fixation of chemicals on pulp fibers, which is the additions effect on top of sizing performance. Development of wet-end chemicals focused on less environmental load is the main feature of Somar Corporation, and its performance is verified through number of machine trials. This report describes effect of our latest paper chemicals.

Andritz New Wash Press AWP

Kanji Hagiwara and Chiaki Kawakami  
Andritz K.K.  
Johan Sjorberg  
Andritz Fiberline Division

Andritz has developed a brand new AWP Wash Press. Andritz has delivered many new fiberlines as well as total pulp mill and paper mill systems all over the world for the past decades. It has been seen also important and necessary to upgrade the existing production facilities for increasing production capacity, improving efficiency and replacing obsolete equipment. The Andritz AWP Wash press has various advantages as compared with the wash presses on the market today. The AWP Wash press complements the Andritz Drum Displacer (DD Washer) and offers versatile and flexible upgrade solutions to the pulp mills.

Advanced Mini Shoe Press  
-Integration of Metso Paper & Domestic Technology-

Timo Pirinen and Jori Onnela  
Metso Paper, Inc.  
Ichiro Honma  
Metso Paper Japan Co., Ltd.

There are several considerable benefits that support a press section rebuild by replacing a conventional roll press nip with a shoe press. A shoe press will increase dryness after the press section by several percentage units compared to a conventional roll press. The increased web dryness yields numerous significant benefits.

The press section rebuild scope greatly influences the investment cost. By minimizing the changes to the existing frame structure required to install a shoe press, there will be fewer costs related to machinery and civil work. Machine downtime will be shorter and the machine will go from paper to paper sooner.

Now, after the Beloit and Mitsubishi acquisitions, the Metso shoe roll with the pocket equipped hybrid shoe will be applied as a standard design. A new mini shoe press rebuild has been introduced for small- and medium-sized paper and board making lines. This rebuild solution makes it possible to boost production with a press rebuild with minimal changes to the press section geometry. Shoe press technology is a standard solution today, with hundreds of successful references worldwide. Its benefits are now within easy reach of a larger group of paper and board makers through the mini shoe press rebuild.

This paper will discuss the features of the mini shoe press rebuild, and shoe roll technology and its benefits.

For Sound or Noise in Industrial World Part IV  
-It Thinks about the Noise as Part of TFO from SKF-

Yasuhiko Yamasaki  
Service Division, SKF Japan

“For sound or noise in industrial world” is the forth in this time. It is a compound sound this time. Do you hear the sound of the machine It is sometimes complex. It is limited to distinguish by hearing it by the ear. Separating the compound sound becomes important.

A Brand-new Gamma-ray Level Gauge TH-3000 Can Be Used without any Licence and Controlled Area: Certificated by MEXT

Hiraku Miyashita  
Nanogray Inc.

Before 2005 exemption level of sealed gamma-ray ( $\gamma$ ) source activities is 3.7MBq in Japan. Radiation protection regulation of Japan was changed and the exemption level was reduced in 2005. At that time, new certification system was started by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). The certificated equipments can be used without any licence and controlled area. We already took the certifications by MEXT for all  $\gamma$ -ray density meters,  $\gamma$ -ray level gauges (point detector type) and  $\gamma$ -ray level switches. Recently a brand-new certificated product TH-3000;  $\gamma$ -ray level gauge (rod detector type) is added the line-up. It can be applied level measurement of continuous digester and breaching tower etc.

## Parameters Influencing Flexo Printing on White Top Liner Board

Peter Burri, Cathy Ridgway and Joachim Schoelkopf  
Research & Technology Services, Omya

In this study uncoated and coated white top linerboard were compared in flexo printing. The coated white top liner was produced with two different coating formulations using three different application methods; bent blade, rod, metered size press. All samples were calendered under the same conditions and printed using a flexo printing unit at the DFTA Technology Centre at the Stuttgart Media University, Germany. The print quality was compared to the physical properties of the board surface in order to establish a correlation between pore structure and print quality in flexo printing. It was shown that smoothness alone is not sufficient to result in good printability. Two other parameters of interest also need to be considered, these being the contact angle of the coating, which is a measure of the wettability of a surface, and the water absorption speed.

## Energy Saving Effect by Automatic Dryer Fabric Stretchers

Makoto Matsushita  
KGK Engineering Corp.

In the paper manufacturing process, wires, felts & canvases (hereinafter as fabrics) are becoming very important components because they are directly related to the paper machine run-ability such as paper quality, production efficiency and yield in addition to the economic factors like chemicals and steam consumption in the uniformity, dewatering and drying processes.

Recently it has been proved in many paper mills that the fabric tension monitoring & control contributes to save energy cost, especially less steam consumption. We would like to introduce the effect of Erhard+Leimer Elstretcher and its operation results.

A Report on ISWFPC 2009 Conference  
-June 15 -17, 2009 at Oslo, Norway-

Yuji Matsumoto (The University of Tokyo), Hiroshi Ohi (University of Tsukuba) and Kunitaka Toyofuku (JAPAN TAPPI)

ISWFPC 2009 Conference was held in Oslo, Norway on June 15-17, 2009 hosted by PTF (The Technical Association of the Norwegian Pulp and Paper Industry). There were 63 special presentations on 8 sessions and many posters. Reflecting of economic crisis, there were slightly few participants with 170 people from 21 countries in the world. After the symposium, we visited the Borregarrd's mill which is famous as Bio-Refinery.

How Technological Innovations Changed Newsprint and Its Making Process  
-Survey on Technological Developments in Newsprint Production in Japan (PartIV)-

Kiyoaki Iida  
Senior researcher in 2007, Center of the History of Japanese Industrial Technology, National Museum of Nature and Science, Executive Director emeritus, Japan TAPPI

Part one of the series presented a short history of pulp and paper industry, background of selecting the theme and introductory briefing on basic technologies. Part two presented how newsprint and the way of producing it have evolved in the past 60 years, along with fiber source exploitation in 60 years. Part three described how paper machine for new print production developed in the past 60 years. In this paper, the characteristics of technological development in Japan are discussed, and then are compared with those of other countries.

The Japanese paper industry has been continuously improving its capability of manufacturing to one of top levels in the world. The capability of manufacturing means to have equipment of high productivity, operate it in high efficiency and manufacture product of excellent cost performance, which is what the Japanese paper industry has done. A culture which has been nurtured in mills and is quite unique in the world has helped the development.

The capabilities for other technologies such as energy saving (highest efficiency in the world), environmental conservation (satisfying the most severe levels of regulations), R & D (a top level in product development) and technical training (a source of technical competitiveness) are also discussed. Then the characteristics are compared with those of other paper producing countries. It is positive that every country makes the best of its resources to be competitive in the world.

In Part five, the history of technical development of one newsprint machine which was installed in 1960 as one of largest paper machines in the world and is still running with the highest efficiency will be reviewed as a case study in Japan.

#### Reduction of Pollutants from Bleached Kraft Pulp Mills by the Process Conversion to Elemental Chlorine Free Bleaching (Part II)

##### -Reduction of Chloroform and Chlorinated Phenolic Compounds in Pulp Mill Effluents-

Hiro Iwata

Japan Pulp and Paper Research Institute, Inc.

Chlorinated organic compounds are generated by the chlorine bleaching of pulp. Many of them are persistent and accumulative and toxic. To reduce chlorinated organic compounds, the pulp and paper manufacturing companies in Japan have advanced the ECF conversion of the bleaching process since 1996.

At Japan Pulp and Paper Research Institute, Inc. the environmental impact of the pulp mill effluent was investigated according to the progress of the ECF conversion of Oji Paper Co., Ltd. and Nippon paper Industries Co., Ltd.? Reduction of chloroform and chlorinated phenolic compounds were reported here.

Chloroform production in the bleaching process was decreased by 95% or more, and the main purpose to convert ECF in the bleaching process was sufficiently achieved. The concentration of chloroform in the effluent also decreased drastically, and it came to fall below 0.06mg/L of the water quality standard for drinking water.

Hazardous highly chlorine substituted chlorinated phenolic compounds generated by the chlorine bleaching were reduced by almost 100% with the ECF conversion.? In addition, the generation of chlorinated phenolic compounds has been clearly kept a level by the regulation of chlorinated phenolic compounds of the bleaching filtrate, which is demanded by the cluster rule in the United States.

Keywords: chlorinated organic compounds, chloroform, chlorinated phenolic compounds, ECF

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Paper and Environmental Consideration

-Consideration for Environmental Load Reduction of the Society-

Kazuhiro Hashimoto

Environment and Economy Division, Environmental Policy Bureau, Ministry of the Environment

There are various viewpoints for the environmental consideration of paper production and usage. One is the viewpoint from the side of paper companies, and another is from the environmental policy. When information on these viewpoints is adequately disclosed to consumers, the market will shift toward green production. This is why appropriate environmental communication to consumers is extremely important.

This report introduces a new method of bringing change into the market by Green Purchasing Law.

Newest Modification for Existing Twin Wire Former

Masahito Mukai

Kobayashi Engineering Works, Ltd.

This paper examines two top-wire forming units from a fundamental standpoint, one a roll type top unit while the second is a bladed top unit. Both units are located an identical distance from the headbox and use the same furnish. The fundamental dewatering mechanisms are examined for both the roll type and blade type formers. Both configurations are numerically modeled to evaluate differences in the pressure fields, estimated pressure gradients, and shear between the wires.

The roll type top unit demonstrates constant pressure forming and the characteristics of high drainage velocity under low shear. By contrast, the bladed type former demonstrates web forming brought about by variable, increasing pressure pulses at locations on the former where the wet web is subjected to multiple shear conditions. The effect of these different mechanisms is explored relative to final sheet properties that were measured on representative paper samples taken before and after conversion of the newsprint machine from the top-wire roll to the top-wire blade unit.

Operating Experience of Mini Shoe Press on PM2

Daisuke Taguchi

Hachinohe Mill, Mitsubishi Paper Mills Limited

Hachinohe Mill, Mitsubishi Paper has the capacity of approximately 900,000 ton of papers per year. We have seven paper machines in Hachinohe Mill, and installed Mini shoe press of MHI in No.2 (2PM) and No.6 (6PM) paper machines with the aim of steam saving and production increase in August 2007. Mini shoe press is compact type of shoe press covering some faults of standard shoe press, and has high dewatering performance. This remodeling brought dryness up, speed up and higher machine efficiency, and we achieved the aim of steam saving and production increase.

This report is described about the outline of remodeling and the effect of Mini shoe press at 2PM.

Paper Quality Improvements of Kraft Paper by Installing Breast Roll Shaking System: Form Master

Tsuyoshi Hama

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

Takaoka Mill Nohmachi started the operation in 1949 as Sulfite Pulp Mill. Then started up paper machines after 1956. Currently, it is an integrated mill focusing on coated paper and also producing other grade such as fine paper, kraft paper, white wrapping paper.

No.3 Paper Machine started the operation of unbleached kraft paper since 1968. At present, No.3 Paper Machine manufactures heavy wrapping paper, light wrapping paper and bleached kraft paper etc. In order to improve those qualities, we introduced high speed wire shaking equipment (Form Master manufactured by Metso Paper). I would like to report on the operational experience of this wire shaking equipment and also on the paper quality improvement result of kraft paper by the introduction of this equipment

#### Manufacturing Process and Proper Way to Operate of Forming Fabric

Yutaka Shibahata, Tatsuhiko Yasuoka and Akinori Sano  
Technical Service Dept., Nippon Filcon Co., Ltd.1

Improvements of paper quality and productivity have been accomplished by wider manufacturing width and higher speed paper machines, such as advanced model or modified paper machine as represented as Gap Formers as their counter plan in the pulp and paper making industry for external environmental issues, like raising raw material cost or various and high quality requirements from customers. Forming fabric designs have been developed from single layer fabric to triple or triple weft (3.5 layer fabrics) fabrics which allow various purposes with respected results along with the improvement of paper machines. As a behind scene of those improvements, surely there are three major operation technologies make forming fabrics capabilities as their ultimate level, proper application of forming fabric specifications to meet requirements of paper machines, establishment of high-tech manufacturing processes of forming fabrics having various purposes and optimize fabric runnability to maximize paper machine efficiency.

Let us focus on these three major points of forming fabric above to evaluate forming fabrics in general as follows.

#### Basic Design Concept of Paper Machine Clothing for Press Part

Hirofumi Ishii  
Technical Department, Ichikawa Co., Ltd.

As a specialist of Paper Making Machine's press part, Ichikawa has been supplying Press Felts, Shoe Press Belts, Transfer Belts and Cleaning Detergent since its foundation. Press Part of Paper Making Machine has been changing from Roll-press to Shoe-press type and complete No-Open-Draw sheet running configuration is recently becoming popular with getting higher Machine speed up to 2,000 mpm and wider Machine width up to 11,300mm. In order to meet such severe condition, Machine Clothing is also developed of their quality and function, and has succeeded to improve them indeed.

In this paper we attempt to explain our fundamental design concepts and applications in designing of each clothing for highly-developed Paper Making Machine's demand.

#### Energy Savings by Grooved Belt for Shoe Press

Satoru Nakazato  
Saga Mill, Oji Paperboard Co., Ltd.

In 1997, a shoe press was installed at the third press of PM1 at Saga Mill as part of a project to increase production capacity. The first belts installed after the rebuild were plain type belts. In October 2000, with the aim of improving dewatering capacity, we tested a grooved belt (250cc/m<sup>2</sup>). However, the result was inconclusive, and there was a further question of cost, so we continued running only plain belts. However, while there are many possible explanations, we had the idea that maybe increasing the void volume and increasing the volume of nip splash would be beneficial to dewatering, and from June 2005 we recommenced a trial of a grooved belt (manufactured by Albany, 400cc/m<sup>2</sup>).

The results were good. Steam flow was reduced, and unit steam consumption was improved by 15%. Further, we were also able to reduce electricity consumption by stopping the felt roots blower.

When recommending the use of grooved belts, we started from a fabric having a void volume of 400cc/m<sup>2</sup>. We are currently using fabrics having 450 to 470cc/m<sup>2</sup> and machine operation is good. For the future, we do not plan to be simply content with this improvement, but intend to continue considering, and testing, belt and felt specifications to determine the very best combination in order to obtain further energy savings and higher efficiencies.

#### Operating Experience of the Top Wire Former



Koichiro Hayashida  
Ashikaga Mill, Nippon Daishowa Paperboard Co., Ltd.

In a recent, the quality of high speed corrugating board manufacturing has become higher for medium paper. The formation of medium paper which is made by No.3 paper machine in Ashikaga mill was worse than the other machines, and especially the crack of corrugated board had been occurred by the flock formation. So, for the problem solving, we decided to install the top wire former to get good formation and better properties, lower cost. And also, as there was no refiner in the secondary fiber process, it was no effective to defiber. And the quality of the surface layer was influenced by it. So the flow of the secondary fiber process was modified and we also installed a refiner in the reject part of the secondary fiber process on the same time when we installed the top wire former.

In this paper, we report of the operating experience which installed the top wire former in January 2007 and the effect of getting good formation after the modification of the former in Ashikaga mill PM3, Nippon Daishowa Paperboard Co., Ltd.

#### Operating Experience of PM N1

Yukihiro Yamada  
Tomioka Mill, Oji Paper Co., Ltd.

PM N1, which is the All-Online-Concept paper machine, has been built in Tomioka mill. There are two main purposes to build the machine. One is to increase productivity of the LWC which has the growth market; another is to enhance global competitiveness at this market. We have started the trial operation of the machine at the beginning of November 2008, and then the commercial operation successfully since the February 2009.

During the short operation period, which is still half a year, we have some troubles (two-sidedness, fiber ball and wad burn) at the wet section. This report presents the outline of equipment and latest operation experiences (especially these troubles) at the wet section of PM N1.

#### The Latest Print Technology Trend

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Toppan Printing Co., Ltd.

People began to use the printing technique to transmit information in about the eighth century. The people came to consume printed matter in large quantities in the 20th century. The printing technique has continued to grow up and to prosper for a long term. The information transmission means was replacing of the information terminal recently. However, the technology related to the print is actually applied to the processing technology of an electronic equipment.

Moreover, there is no state-of-the-art licensing-in as a printing technique in recent years. However, the technology of inkjet that digests in the market might take the place of a current printing technique. It is thought that it comes to a big transition stage now. The print technology is summarized as assumption of this text.

A Report on PaperCon'09 Conference & Exhibition  
-May 31 - June 3, 2009 at St. Louis, USA-

Kunitaka Toyofuku  
JAPAN TAPPI

PaperCon '09 Conference & Exhibition was held in St. Louis, Missouri, USA on May 31 - June 3, hosted by TAPPI. PaperCon seems to be our annual meeting for TAPPI. It was co-hosted by PIMA (Paper Industry Managing Association) with various reasons from this year. Originally JAPAN TAPPI becomes the constitution including both. The exhibition is attached to the conference. Before and after the conference, I visited a mill of bio ethanol which is made from corn and North Carolina University.

A Report on 104th Zellcheming Annual Meeting & Expo  
-June 23-25, 2009 at Wiesbaden, Germany-

Kunitaka Toyofuku  
JAPAN TAPPI

104th Zellcheming Annual Meeting & Expo was held in Wiesbaden, Germany on June 23-25, 2009 hosted by Zellcheming (The German Pulp and Paper Chemists and Engineers Association).

Germany is originally an advanced country in the paper manufacture. Annual Meeting is performed every year at the same place in the same time. 1500-2000 people participated in the meeting from the European countries. I would like to emphasize the exhibition is large in scale. Although it was under bad economy, it was successful. 280 exhibitions were performed in the 4,300m<sup>2</sup> area.

Before and after the meeting, I visited Voith Research Center and paper mills in Germany.

Dynamic Mechanical Properties of Paper Containing a Polyacrylamide Dry Strength Resin  
-Effects of Type of the Resin and the Application Method-

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Tatsuo Yamauch  
Graduate School of Agriculture, Kyoto University

Laboratory handsheets made from lightly beaten hardwood kraft pulp containing various amounts of polyacrylamide (PAM) dry strength resin were prepared by both internal and external application methods. The PAMs employed were a cationic PAM in solution and an amphoteric PAM in solution or the dispersion. The internal application was performed by adding the dilute PAM solutions or dispersion to the beaten pulp fiber suspension, while the external application was conducted by dipping a dry paper (handsheet made from the beaten pulp) into the PAM solutions or the dispersion and further squeezing them out with the standard wet press. Attenuated total reflection/Fourier transform infrared analysis combined with a gradual etching method was used to examine the depth profiles of the PAMs within a fiber wall. Both of the PAMs existed mainly near the fiber surface and further were distributed within the fiber wall. The amphoteric PAM by the internal application method was particularly distributed nearer to the fiber surface, comparing with the cationic PAM. Dynamic mechanical properties of the papers with or without PAM and the PAM films were measured at temperatures ranging from 140 to 260°C. With a help of the differential scanning calorimetry measurement, viscoelastic behavior of the PAM added to papers by the external application method was assigned to glass transition of the added PAM, typically shown in  $\tan \delta$  as the clear peak at about 210°C. In the case of addition of the solution or the dispersion by the internal application method, both cationic and amphoteric PAMs were distributed in molecularly dispersed state within a fiber wall, because viscoelasticity of the PAMs within a fiber wall almost disappeared. On the other hand, the external application method at the nearly same retention level of PAM gave the characteristic viscoelasticity, suggesting that the PAMs were distributed not in molecularly dispersed but forming a kind of PAM phase (domain). Comparing with the addition of the solution, the addition of the amphoteric PAM dispersion induced a more remarkable formation of the PAM phase and led to the pronounced appearance of the viscoelasticity of the PAM.

Keywords: distribution, dry strength resin, external application, internal application, polyacrylamide, mechanical properties, viscoelastic properties, paper

Investigation into the Cause of Print Mottle in Halftone Dots of Coated Paper: Effect of Optical Dot Gain Non-uniformity

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One of the printing problems on print quality is non-uniformity of printing density called print mottle. It is known that printing conditions like ink and fountain solution amount, printing pressure and etc. affect print mottle. As far as paper, it has been thought that non-uniformity of ink transfer due to surface roughness of paper, absorption of ink and fountain solution, thickness causes print mottle. When we investigated on print mottle of commercial coated papers, most samples were explained with ink transfer, however we found that print mottle of some samples were inferior nevertheless their non-uniformity of ink transfer were small. The purpose of this research is to clarify the cause affecting print mottle in halftone dots except ink transfer in order to improve the paper quality moreover.

First, we compared the light part and dark part of print mottle precisely using optical microscope. It is known that apparent dot gain (optical dot gain) arises in halftone dots due to light diffusion in the in-plane direction of paper, and optical dot gain also affects printing density as well as mechanical dot gain. We investigated the non-uniformity of light diffusion in the in-plane direction by means of micro-density profile of printed ruled lines. We also examined relationships between the non-uniformity of print mottle, light diffusion in the in-plane direction and coating color coverage on base paper quantitatively by using non-uniformity index.

As results, non-uniformity of optical dot gain was concluded to be one of the important factors affecting print mottle in halftone dots. We found that the non-uniformity of optical dot gain was caused by that of light diffusion in the in-plane direction. Some of the causes of non-uniformity of the light diffusion were thought to be unevenness of coating color coverage on base paper, and difference of light diffusion between coating color and pulp fiber of base paper. It was thought that minimizing the unevenness of coating color coverage on base paper is quite important for controlling optical dot gain as well as ink transfer.

Keywords : print mottle, printing density, non-uniformity, ink transfer, optical dot gain, light diffusion, in-plane direction, coating color coverage

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Vol.63 No.12 Abstracts

#### The Trend of CO2 Emissions Trading

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Kyoto credits (CER/ERU) can be used for participants of EU-ETS, Australian CPRS or Japanese Law Concerning the Promotion of the Measures to Cope with Global Warming, to achieve their own targets on greenhouse gas emissions. Before the end of 1st commitment period of Kyoto Protocol, until 2012, demand for Kyoto credit will exceed supply, although the demand-supply balance is under the control of AAU supply from Russia, Ukraine or eastern European countries. Kyoto credits before issue have several risks against non-delivery to buyers, so the price depends on the stage under the UN process and EUA (allowance of EU-ETS) price.

#### Status and Trend of Environmental Laws and Regulations

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Oji Paper Co., Ltd.

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

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

In this environmental seminar, the environmental laws and regulations are presented, which have been revised for the past several years and have to be watched closely.

It can be said that for ensuring compliance to environmental laws and regulations, it is necessary to understand the purpose and outline of the laws and regulations, and raise the level of efforts.

#### Application of Environmental Hazard Map for Risk Management

Tamiharu Yamashita  
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In 2007, we had some environmental accidents continuously, and it caused uneasiness on neighbors. We made searching origin of accident, and improved environmental plants.

But we had never searched environmental risk in whole mill. We could not expect what accidents would be caused. To recognize risk in Takaoka mill, we prepared environmental hazard map. Environmental hazard map shows us pending problem, and the way to environmental accident-free mill.

#### Progress and Trends in Treatment Technologies of Pulp and Paper Mill Effluents

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Pulp and paper mill effluents used to be treated with coagulation of sedimentation in the early days, but biological treatments such as activated sludge method have recently been installed for removing organic substances as the effluent regulation required higher effluent quality. These biological treatments have contributed to improvement of the effluent quality.

We have developed new processes using bulking-free-process and fluidized-bed biofilm reactors, which have advantages on high-loaded treatments and easy maintenances, based on the accumulated knowledge about the characteristics of pulp and paper mill effluents. We here introduce state-of-the-art technologies, such as methane fermentation process, anaerobic ammonium oxidation process, and MAP (Magnesium Ammonium Phosphate) process for material recycling and high energy-efficiency.

Keywords: wastewater treatment, activated sludge method, methane fermentation, anaerobic ammonium oxidation, MAP, resource recovery, energy saving

#### Space Saving Wastewater Treatment System and the Water Recycling Technology

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The wastewater treatment systems in the pulp and paper mill are usually required to reduce the space by using high efficiency technology. And recently, to reduce the water consumption the technology of water recycle is required. In this paper, the following technologies are introduced.

- 1) Sumi-Sludge® System-Space saving Activated sludge process
- 2) High Filter™-High rate sand filter for White water recycling
- 3) Membrane Bio Reactor "MBR"-Activated sludge process using Submerged micro filter in the aeration tank

Keywords: Wastewater treatment, Activated Sludge Process, Coagulation and sedimentation, High rate Sand filter, Membrane bio reactor, MBR, Submerged membrane

#### Newly Developed Technologies for Environmental Load Reduction

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Though many efforts have been made for reduce the impact to environment, paper industries are still under a strong pressure from both authorities and government all over the world.

Newly developed chemicals and their applications are introduced for treating sorts of COD sources. An effective monitoring system is helpful for stabilizing the treatment of sedimentation or flocculation. The definition of odor index and approach of solving the odor problems from water treatment plant and biomass-fuel yard are introduced.

#### International Trends in Effluent Regulation and Bioassays for Risk Assessment

Katsuyuki Kadota

Japan Pulp & Paper Research Institute, Inc.

Various bioassays have been developed to assess the effects of chemicals and effluents on aquatic biota. Effluent regulations using the bioassays have been implemented in many countries mainly in Europe and North America, lead by pulp and paper industries. Great improvement has been made in acute and short-term effects of mill effluents following the process changes including installation of secondary treatment. Regulatory and research attentions will focus on long-term outcome of effluents with regard to the preservation of ecosystem and biodiversity. In this seminar, international trends in effluent regulations and bioassay tools are discussed. Research activities at Japan Pulp & Paper Research Institute, particularly DNA microarray and biosensor, will also be described.

Keywords: bioassay, effluent regulation, risk assessment, biodiversity, biosensor, DNA microarray

## Olfactory Organs and Trends in the Environmental Administration

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Olfactory perception, or whether an odor is perceived as desirable or undesirable, largely depends on a sense of each person; many studies have shown that performance of olfactory organs vary with each individual. Although the mechanism of olfactory perception system has not yet been completely explained, it is gradually being revealed: Linda B. Buck and Richard Axel, who were awarded the Nobel Prize in 2004, found some specific genes that are connected to olfactory reception, while some other studies are tackling the issue from the gustatory sensation aspect.

In the recent years, in response to the increase of odor complaints, odor control enactment is increasing in Japan primarily from manufacturing plants in the secondary industries. As the Japan Offensive Odor Control Act develops, the basis of the regulation shifted from the malodorous component control to olfactory measurement (sensory evaluation; odor index): By the end of March 2008 total 351 local governments, which is 26.9% of total areas which are subject to regulation, introduced the odor index system.

The Japan Ministry of Environment and the Association on Odor Environment are working for improving the odor environment, not only by preventing undesired odors but also by means of a new, citizen-driven way of town planning, utilizing senses of temperature, light, odor and sound of the inhabitants. It is expected that the tertiary industries or service industries will be subject to odor regulations by local governments in the future, like Yokohama and Kobe, and this tendency will surely have a big impact on the future town planning.

Keywords: Offensive Odor Control Act, odor index

## The Available Utilization of the Paper Sludge Ash

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By the 2010, Japan paper association aim to decrease the last dumping volume of waste materials less than 450,000 ton/year, and to increase the available utilization ratio of waste materials more than 93%. In the pulp and paper industry, most of the last dumping volume in waste materials is the burning ash. Even now, the paper sludge ash is the most volume of the burning ash. We must increase the available utilization volume of waste materials to decrease the last dumping volume. In this paper, it is introduced the available way of the paper sludge ash.

## Environmental Movements for Citizen and Children in Japan

Kunihiko Takeda

Chubu University

The present environmental condition of Japan is not as bad as it should be the subject of important social concern. The statistics on air, water, medical hazards and number of patients by environmental pollutions are in one of the best levels in the world. Nevertheless, environmental concerns are everyday's topics. It is because our environment may become worse in the future.

As we are a member of citizens of the world, we have to do our best to maintain global environment. At the same time, I am a member of the Japanese nation, and also a member of Nagoya citizens as I live in Nagoya. Therefore, I have to act as one of faithful Nagoya citizens in my first obligation. With that view point, I subtitle my speech What do we have to do, and for whom should it be?

## A Report on 2009 International Conference on Nanotechnology for the Forest Products Industry

Shiho Katsukawa

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2009 International Conference on Nanotechnology for the Forest Products Industry was held for four days, 23-26 June, in Edmonton, Alberta, Canada. It was consist of 15sessions with 45 presentations and 4 panel discussions, and poster sessions. There were 180 participants from 12 countries. In this report, several interesting presentations mainly about cellulose nanotechnology are picked up and briefly summarized.

How Technological Innovations Changed Newsprint and Its Making Process

-Survey on Technological Developments in Newsprint Production in Japan (Part V)-

Kiyoaki Iida

Senior researcher in 2007, Center of the History of Japanese Industrial Technology, National Museum of Nature and Science, Executive Director emeritus, JAPAN TAPPI

Part one of the series presented a short history of pulp and paper industry, background of selecting the theme and introductory briefing on basic technologies. Part two presented how newsprint and the way of producing it have evolved in the past 60 years, along with fiber source exploitation in 60 years. Part three described how paper machine for new print production developed in the past 60 years. In Part four, the characteristics of technological development in Japan were discussed, and then were compared with those of other counties.

One newsprint paper machine was installed in 1960 in Kushiro Mill of Nippon Paper Industries Co. The paper machine, which was one of the biggest sizes in the world at that time, is still in operation as a machine of medium size of the present standard, is running at the efficiency of the highest level, and is producing newsprint rolls of the best quality. In part five, the operational data of that paper machine during almost 50 years are presented as a case study showing how technologies were developed in newsprint production in Japan. Furthermore, those who worked with the machine from the start-up spoke on their experiences of operating it.

Finally, the history of technological developments in newsprint production in Japan is summarized in charts.

Adsorption Ability of Albumin and Oleic acid on Hydroxyapatite Synthesized from Paper Sludge Ash (PS ash)

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Naoto Matsue and Teruo Henmi

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PS ash contains large amount of calcium carbonate, which disturbs formation of zeolites from PS ash. As a result, it was difficult to synthesize zeolites from PS ash containing calcium carbonate. We tried to synthesize both hydroxyapatite and zeolite from calcium carbonate and silica-alumina in PS ash in the one batch system, and to synthesize high purity hydroxyapatite from filtrate obtained to be dissolved PS ash with nitric acid. Prepared hydroxyapatite from PS ash was subjected to adsorption examinations of albumin and oleic acid. It was revealed that higher Ca/P mol ratio and large specific surface area of hydroxyapatite were effective for adsorption of albumin and oleic acid on hydroxyapatite respectively.

Keywords: PS ash, Hydroxyapatite, adsorption, albumin, oleic acid