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March 2002 Abstracts

The Automatic Train Operation Equipment with Expert System

Masahiko Mitsukawa
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Recently, the subway which required one-man operation has come to be constructed.

In the Automatic Train Operation system, it is important to operate the train accurately. But the improvement of riding comfort and the energy saving are attached to importance compared with before.

To achieve more highly developed operation ,and to satisfy such a demand, we apply the expert system to the Automatic Train Operation system.

In this discourse, Automatic train Operation Equipment with Expert system is described.

The Latest Report of Non-manufacturing Robots

Shoichi Hamada
Manufacturing Science and Technology Center, Chief Research Scientist HRP Department

MSTC (Manufacturing Science and Technology Center) is engaged in the following project that aims to develop the two types of robots for non-manufacturing:

(1) A robot system for supporting at the nuclear disaster

This robot system was developed on the occasion of the JCO accident to execute countermeasures against calamities in place of people by means of remote control. This system consists of two "monitoring/surveying robots" that observe the situation of a disaster and work, three "light/medium/heavy work robots" that execute counter- measures at a disaster, one "heavy weight carrier robot", and the each remote control device. It is designed to make each robot collaborate on work under the critical situation such as the narrow space in nuclear facilities in addition to the high level radiation at the stricken area.

It is desirable that nuclear disasters will never occur, however, people would be relieved if such kind of robots hurry to the scene of the accident.

(2) Development of a human-friendly humanoid robot

This project is to research how the biped robot system work in the actual scene. For two years since 1998, the base research called "platform" (the main body of a robot and its remote control device) had been developed. A three-year research plan to apply its work started in the 2000 fiscal year.

The main body of the robot was based on and revised a humanoid robot made by Honda (P3). Its remote control device was developed to operate with high presence as if a person were inside of a robot. Five kinds of application of this robot are chosen to be developed for carrying out dangerous work or what robots can do instead of men: "Plant Facility Maintenance", "Care Service", "Operating Industrial Vehicles", "Management of Buildings and Homes" and "Cooperative Outside Work".

All of people concerned are tackling the development to realize a dream-like humanoid robot that can cooperate and coexist with human beings.

Use Experience of a Microwave Based Consistency Transmitter

Tetsuya Mochizuki
Honsha Mill , Yoshinaga Div. , Daishowa Paper Mfg. Co., Ltd.

This paper introduces the operation experiences of a microwave based consistency transmitter in the recycle board plant in Daishowa Yoshinaga mill.

The microwave based consistency transmitter has an advantage in the coarse screening line because of having no projection. This time, we verified the accuracy and the sensitivity compared with the existing rotating type transmitter.

Result for The Testing Regarding Pulp Consistency Meter

Katsuya Kawata

Process Control and Automation Committee, JAPAN TAPPI
Oji Engineering Co., Lt.

There are so many Pulp consistency meter for Pulp and Paper Industries. The type of them are "rotary blade", "blade", "microwave", "optical". We tested those 6-types of consistency mater that are installed on the pipe line under the same conditions.

We used 3-types of pulp for this test（NUKP, LBKP and DIP). And this tests were such as "measurement for consistency change", "measurement for flow velocity change", "measurement for pressure change", "measurement for clay add". You will find the result for the above tests.

Application of Quality Control Measuring Instruments in High DIP Use

Susumu Ohsawa
Nippon Paper Industries Co.,Ltd. Kushiro Mill

Quality control of the deinked pulp, DIP plant has recently become more important than before as recycled pulp use grows higher. Although ash content and residual ink are also important factors in addition to brightness among some quality indexes of DIP, it is hard to measure those exactly and we have had no good measuring instruments until now. In this paper we describe successful results of newly installed retention meter RMi and brightness meter CORMEC, KAJAANI in the various DIP process lines.

Experience of a New Grade Change Control System

Shunji Matsushita
Oji Engineering Co.,Ltd Yonago Division

We have applied a new grade change control to 1 M/C in Yonago mill. It was originally developed by Oji paper and Yokogawa Electric Corporation added some improvement to it. In this paper, we explain the difference between the new grade change control and the old one and the effect of the new control referring to the process of the improvement.

Besides, we also adopted the new caliper CD control and we report the control method and effect of it.

FOUNDATION Fieldbus-Present Condition and Issues

Kazuhiko Matsumoto
Fushiki Mill Nippon Paper Industries Co.,Ltd

FOUNDATION Fieldbus was announced as "one of the greatest technological innovation to the next generation". In Japan, FOUNDATION Fieldbus Association was established in 1994, and standard application products have been released since 1996.

Numbers of industrial plants using the Fieldbus system started their operation in 1999, and also in Fushiki Mill, since "N-DIP modernize construction" had been authorized in October 2000, we started to investigate the system. The investigation was on these three points: 1.Flexibility to extended industrial plants(=high leveled adaptation), 2.Product repletion(=PID control function built in Fieldbus products), 3.Integereation with DCS system(=possibility through engineering from DCS system). Then, technical training, designing, engineering, field test, and all kinds of simulation had been enforced, and finally we have succeeded to operate the system in April 15th 2001. Now, I would like to report the present condition and issues of "New Fieldbus System".

Development of the Fault Report System

Kazushi Nishiyama
Mitsubishi Paper Mills, Ltd

The Fault Report System was developed and introduced into the No.5 coater of the Hachinohe Mill in 1999. This system provides three useful tools. First tool is for making a matrix-type fault report from present fault data and second one is for making a similar report from previous fault data. Third tool is for analyzing fault data. Here we describe the purpose of introduction and the function of this system.

The Actual Results of Smart Valve Controller (ND800)

Yutaka Yokoyama
Oji Paper Co., Ltd.

A control valve is important device in operation. However, we could judge whether a valve was normal only by the result of the process value.

The automatic diagnostics system of the control valve by Intelligent Positioner was introduced in Matsumoto mill.

As for preventing the sudden trouble of the valve, of course we are expecting the reduction of the total cost in such cases as the reduction of the maintenance cost.

Consideration of the Latest Technology for Drive Control

Michio Kawamura
Yaskawa Siemens Automation & Drives Corp.

Recently, the application area of the variable speed drives for the paper making plants are expanding and methods of application are changing due to the rapid progress of inverter and servo technology.

On the other hand, the requirements toward the environment, such as correspondence to the low noise, the decrease of the electromagnetic noise, repression of the harmonic electrical current, become severe.

As consideration of the latest technology for drive controls of Yaskawa Siemens Automation & Drives Corp., technology of synchronous drive with MASTERDRIVES MC, technology of 3-level PWM control for environment harmonic control with VARISPEED G7 are mainly described in this papers. HOLLOW SHAFT AC SERVO DRIVES and inverter mounted SIMODRIVE POSMO A DRIVES are briefly explained as advanced drive technology.

Remote Type Smart Positioner to Offer Solution in the field－ Smart Valve Positioner Remote Type AVP3000 Alphaplus －

Minoru Fukuda
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Valve positioner in process control is required high reliability and the durability. Because that the operation gives direct influence in a process and the control valve itself being put with severe environment condition. The Spread of Smart Positioner（Valve positioner which carried a microprocessor in electro-pneumatic positioner) was hard compared with Transmitter and Electro-magnetic flow meter. Recentry Smart Positioner becomes use much as a result of having acquired an experience, and Smart of Control valve progresses.

This report is introduces technology and feature of Remote type AVP3000 Alphaplus which was developed in order to solve a problem in the field.

Test Methods of ISO Brightness and Color

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Pulp and Paper Testing Committee, JAPAN TAPPI

Currently, there are two methods of brightness determination in JIS. One is JIS P 8123 (Testing method for brightness by Hunter of paper and pulp) and one is JIS P 8148 (Paper, board and pulps－measurement of diffuse blue reflectance factor (ISO brightness)). JIS P 8123 was commonly used in Japan but was not popular in the world. In order to globalize the standard, JIS P 8148:1993 was prepared based on ISO 2470:1977 and revised at 2001 to adapt ISO 2470:1999. It is important to popularize this method in the Japanese pulp and paper industry.

There is no method of color determination in P sector of JIS. At present, ISO 5631 (Paper and board－Determination of colour (C/2°)－Diffuse reflectance method) is under translation to JIS by JAPAN TAPPI.

In this paper, the outline of JIS P 8148:2001 the determination of ISO brightness and ISO 5631 the determination of color are described.

Development of Super Water-absorbent from Cellulosic Materials (3)-Improvement of water absorbency-

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Water absorbents were prepared from bleached hardwood kraft pulp by carboxymethylation (CM-LBKP) and cross-linking with polyethylene glycol diglycidyl ether having different chain length by two stages method. Water retention value reached up to as high as 670 g/g for deionized water, and 64 g/g for 0.9% saline solution (physiological saline). Higher D.S. of carboxymethyl group of LBKP was advantageous for a higher water retention value, when D.S ? 1.42. Water retention value of cross-linked CM-LBKP decreased with the increase of the amount of bound cross-linking agent.

Key words: cellulose, carboxymethyl cellulose, super water-absorbent, cross-linking, water retention value.

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April 2002 Abstracts

A Laboratory Study of Damaged Wastepaper

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LION Corporation

Wastepapers turn yellowish-colored and damaged when exposed to UV light and kept at high temperature during summer. When the damaged wastepapers are used as raw material, the quality of recycled paper becomes remarkably inferior. Generally, paper mills try to suppress the effect of damaged wastepapers to quality by increasing the amount of chemical used during process, especially increasing the amount of hydrogen peroxide is quite common.
There are two possible factors for the quality deterioration by using these wastes.
a) Adhesion of ink to fiber: Ink removal efficiency becomes low.
b) Increase of fine inks: Ink collection efficiency becomes low.
In this presentation, the cause of damaged wastepaper deterioration and solutions for suppressing its effect to the quality of recycled paper are discussed.

What Papermakers Need to Know
Where to get Environmentally Approved, Quality Fibre

Allan G. Jamieson
AOK Innovations Pty. Ltd.

It has been shown that the papermaking quality of wood supplied to an integrated fine paper mill is of more economic importance to the mill than is the price paid for the wood. Papermakers, therefore, should take close interest in defining specific technical quality requirements for fibre raw material. It is now evident, though, that it is also necessary for the papermaker to ensure that the raw material has suitable environmental credentials, i.e., that it is obtained from a resource that is managed in a fully sustainable manner: Sustainable not only ecologically but also in the context of economical viability and social desirability.
This paper examines two emerging man-made forest resources in Tasmania; "seedling" plantations and "seed" plantations (also called regrowth forest). It is concluded that Tasmania can supply high quality pulpwood fibre possessing excellent environmental credentials.

Scale Deposit Problems and their Contorol in ECF Bleach Plants

Hirotaka Tanabe
Yokkaichi laboratory, Hakuto Co.,Ltd.

Technologies of kraft pulp bleaching have been greatly developed in recent years because of environmental consideration. New ways of bleaching are ECF and TCF bleaching. ECF bleaching does not use both elemental chlorine and hypo chloride, and TCF bleaching does not use chlorine compounds at all. In Europe and U.S, almost pulp plants have completed to change their bleaching ways to ECF or TCF. Many pulp plants in Japan are also trying to change to ECF bleaching.
Basically, scale deposit problems often occur in bleaching plants. In order to apply ECF bleaching and to promote a closure of process water, the tendency of scale problems in ECF bleaching comes to be one of the most important concerns.
In this report, we showed characteristics and control methods on calcium oxalate and barium sulfate scale which should be especially considered for ECF bleaching.

Advanced Spray Coating Technology- OptiSpray ?

Vilho Nissinen
Metso Paper, Inc., Finland
Hidehiko Yamazaki
Metso Paper KK

Over time we have seen a decrease in the trend of paper product prices. In recessionary times, low value products lose their profit marginal quite easily. To achieve good profitability, the value of the product must increase while at the same time production costs decrease. The dream of every papermaker is to produce a high-value product with economic raw materials while maintaining good runnability at high speeds.

The demand for lower impact in the paper coating process is well known, as are the difficulties in blade coating. Film transfer technology has taken a big step in the right direction. The weaker base papers can be coated. Still there is heavy web contact with many dependencies and interactions between coater and paper in the film transfer nip. The coat weight variations caused by unevenness of the base paper and changes in the cross directional tensile profile over the coater are ready examples.

Thanks to film transfer technology, the coated and improved newspaper grades are already available. With the help of an improved print image, four-color newspaper printing will gradually attract the commercial advertising business. Even traditional newspapers will be four-color printed on light-weight coated news grade, making them as attractive for product advertising as the newspaper inserts are today. Every cold-set newspaper printing house is seeking business use for available day time hours.

Now, Metso Paper launched its new OptiSpray technology. The OptiSpray coating process is based on a controlled, high-pressure spray application of coating or surface size directly onto the surface of the paper or board, without any direct machine contact. The coating is simultaneously sprayed at high speed on both sides of the paper web. OptiSpray achieves excellent coverage of the base paper.

The Development of New High Speed Paper Machine Series

Akihito Nagano
Mitsubishi Heavy Industries, LTD, Paper & Printing Machinery Division

A new Mitsubishi high-speed paper machine development project has started in 1999 and concluded with product offering to the market in October 2001. The new product is known as MJ series and is designed to complement the current MH series Mitsubishi paper machines.

The goal of MJ series paper machine is to produce quality paper at 2000 m/min operation speed while being an operator friendly product. The MJ series has been developed in the course of the intensive elementary study, program simulation, model test, and final verification on our pilot paper machine in Mitsubishi R&D center of Mihara, Japan.

This paper presents the concept and features of the MJ series paper machine.

Drainage of Forming Part－V.I.D. Formation System－

Kazunori Nagatomo
Kobayashi Engineering Works, LTD.
Licenser AES Engineered Systems(U.S.A.)

Various types of gravity and vacuum augmented foils have been used as typical drainage equipment for conventional Fourdrinier machines.

In any type of drainage equipment, filtration mat formed in the early stage of drainage is a limiting factor for the drainage efficiency in the later stage. When we call this dewatering process as "filtration drainage", paper makers already have made the possible efforts to overcome the negative effects of "filtration drainage". It seems that the efficiency of conventional drainage equipment has reached its limit.

This paper deal with a device, V.I.D. technology with its thickening drainage process, which has been developed to provide the solutions for various issues of conventional forming Application of DIA-BIOFRINGE to the Treatment of Paper Mill
Wastewater

Hisao Murakami and Katsumi Sone
TOKAI PULP & PAPER CO.,LTD.
Yasuyuki Takagawa
MITSUBISHI KAKOKI KAISHA,LTD.

The DIA-BIOFRINGE, an aerobic biofilm system which uses strings with ribbons fixed to the metal frames and swaying in the water are used as biofilm media, has many advantages such as no backwash operation required, quick startup, and flexibilities in reactor design.

TOKAI PULP & PAPER CO.,LTD. recently introduced the DIA-BIOFRINGE into their wastewater treatment plant to treat paper mill wastewater. In the demonstration test carried out prior to its construction, a stable BOD removal have been obtained at the BOD backfill volumetric loading of 1.5 kg-BOD/m3･day. Furthermore, it was confirmed at the test that preliminary SS removal, usually necessary in ordinary biofilm systems, are unnecessary. Thus, the introduction of the DIA-BIOFRINGE is proved to be very advantageous from the fact that the system is totally simplified and small investment in auxiliary units of the system.

technology. Examples of its field applications are also given.

Introduction of EBARA Water and Heat Recycling Systems

Yuji Tsukamoto
Ebara Corporation , Environmental Engineering Group

Based on its long experience and advanced technology, EBARA CORPORATION has proposed and delivered mainly to the industry of foods and drinks EBARA water and heat recycling systems which combine thorough on-site surveys with profound water and wastewater technology and energy saving technology and take into consideration even the production lines. In these water and heat recycling systems, the wastewater and the waste heat, which were used on a one-time use basis and discarded in the past, are regarded as "Renewable resources", that is, these wastes are treated by the optimum renewal technology for reuse or cyclic use. This can not only reduce the loading on the environment but also contribute to reducing the water and vapor to be used in the plant. The results have already been highly evaluated, and we started in the last year to propose these systems to the pulp and paper industry. At this opportunity, we would like to introduce our water and heat recycling systems.

Conversion to ECF Bleaching－A Comparative Study with Focus on the First Bleaching Stage

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Marcelo Moreira Leite
Kvaerner do Brasil Ltda., Brazil
(Translated) Michio Imai
Kvaerner Pulping KK

In the present paper, an investigation of some different ECF bleaching sequence is presented, and the results compared. Special attention is paid to the importance of the first bleaching stage after oxygen delignification, i.e. the so-called delignifying bleaching stage. Two different mill-oxygen-delignified HW kraft pulps were subjected to a number of different bleaching sequences. The first pulp was bleached according to D(EO)D, D*(EO)D, (ZD)(EO)D, Z(EO)D and after interpolation evaluated at 89% ISO brightness, and the second pulp according to D(EP)D, D*(EP)D, (ZD)(EP)D, A*ZD(EP)D and after interpolation evaluated at 87% ISO brightness. The "*" here denotes a treatment at high temperature and log retention time. Both the use of D* and Z efficiently reduced the yellowing tendency of the pulps when compared to the conventional D-based ECF sequences. Based on the laboratory trials, consumption figures were adjusted to reflect mill operating conditions and the differences in operational costs between the different sequences were calculated. The sequences with D* were economically very attractive, showing high savings in operational costs compared to the reference D(EO)D and D(EP)D sequences, especially when the target brightness was somewhat higher, i.e. 89%. Considering the unit costs, the required investments needed for Z-based sequences were found to be difficult to justify, especially when the target brightness is somewhat lower, e.g. 87% ISO.

Keywords
hardwood, Eucalyptus, ECF bleaching, chlorine dioxide, hydrogen peroxide, ozone, hot acid treatment, hexenuronic acid, brightness reversion

Sectioning Technology of Papers for Observation and Analysis by Using OM, SEM and EPMA
(1)Sectioning Technology for Optical Microscopy

Tadahira Hamada

In order to obtain the information about inner structure of papers being concerned in production, development and printing of papers, observation and analysis of paper sections by using OM, SEM and EPMA are very effective means.
In this paper, sectioning techniques for optical microscopy were descrived.
Many sectioning techniques have been developed to obtain sections without serious artifacts such as the damage of fine structure and breakdown of section during sectioning and following preparations. In observation by opyical microscope, the specimens are desirable to be sectioned as this as 1～10 μ m in thickness, so embedding of specimen using plastics such as methacrylate resin, epoxy resin and so on before sectioning is usually essential to prevent such artifacts.

Cross section which is cut at right angles to the plane of the paper is widely utilized to observe paper structure in thickness direction but it is only representative of a minute portion of the specimen. To improve the disadvantage of cross sectioning, oblique and parallel sectioning were introduced.

The former is carried out by cutting at a small angle to the plane through the paper, the latter is carried out dividing the specimen to several layers parallel to the plane of the paper. The information of wider area can be obtained by these procedures.

Effect of Blending Ratio of Amphoteric and Anionic Latex on Print Quality of Coated Paper

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Effectiveness of amphoteric latexes was studied to solve the problems of binder migration and uneven binder distribution in coating layers. The addition of amphoteric latex was effective in improving rheological properties of coating color in alkaline region through strong interaction with other coating components. As a result, coated papers made with amphoteric latex showed better printing qualities, such as paper gloss and surface smoothness.

Keyword ：Amphoteric latex, Binder migration, Rheological property, Coated paper,Printing quality

Methodology to Use Flatbed Image Scanner for Formation Analysis of Paper

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Abstract

Versatility of a desktop flatbed image scanner with a transparency unit as an image input device for formation analyses is exhibited and discussed. Optical density of scanner output is defined as the logarithm of the ratio of gray level in full transmission with no material to that at a given site (pixel) of a sample. Optical density of the scanner output under satisfied prerequisite conditions showed an excellent agreement with that of Elrepho type reflectometer and the pre-calibrated values noted on a standard film though the proportional constant is reduced from 1 due to aged deterioration of the light source after 1 year, maintaining linearity. For stacked paper sheets, however, there remains distortion in the output characteristics, that is, non-linearity even after the calibration. So, unlike Elrepho type, optical density squared is empirically almost proportional to the basis weight of paper. In application, formation of handsheets loaded with calcium carbonate from softwood and hardwood pulps at different retention times is quantitatively analyzed with the light transmission images obtained by the scanner. The formation index, the standard deviation of optical density squared correlated better with the subjective ranking by 6 panelists than that of optical density or of gray level. Optical density squared divided by the basis weight shows the highest Kendall's coefficient of correlation. In summary, the standard deviation of gray level is found to lack in validity as a formation index except comparison between papers with close gray levels.

Keywords:Formation index, Gray level, Light transmission image, Optical density, Subjective ranking

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Techniques for Reducing the Environmental Load in Vehicle Transportation- On the Hybrid Electric Vehicles －

Ken-ichi Shimizu
National Institute of Advanced Industrial Science and Technology

To reduce the global warming effect, it is important to reduce the energy spent in transportation sector, especially spent by the vehicles. Because, over 20% energy is spent in transportation sector, and more than 80% energy in transportation sector are spent by the vehicles.

Effective way to improve the energy efficiency of the vehicle is to introduce the electric motors instead of the internal combustion engines. Motor driven vehicles (or motor assisted vehicles) such as electric vehicles, hybrid electric vehicles and fuel cell vehicles (or fuel cell hybrid vehicles) are expected to become widespread near future.

This paper describes current status of EV technologies and technical trends in hybrid vehicles / fuel cell vehicles.

Fuel cell vehicle has a lot of subjects to be solved before popularizing, for example, costs and life of cells, efficiency in actual driving conditions, selection of fuel source, infrastructure for fuel supply and so on. On the contrary, hybrid electric vehicle will be most promising low emission and high efficient vehicles to be put into practical use near future. Various types and levels of hybridization may exist and will be accepted corresponding to the variety in utilization.

Features of the HEVs on the market and prototype HEVs developed by the manufactures or developed in the governmental project are also listed. These features lead to the fact that the fuel efficiency can be improved up to twice of one in conventional internal combustion engine vehicles' by hybridization.

Efforts to Co2 Reduction Made by Other Countries and Japan's Responses

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Office of International Strategy on Climate Change Global Environment Bureau Ministry of the Environment Government of Japan

Specific consequences for the Kyoto Protocol were adopted at the Parties to the UN Framework Convention on Climate Change (COP7) held in Morocco from October to November 2001. This will lead to establishing sets of rules for the implementation of the Kyoto Protocol and promote the ratification of the Kyoto Protocol in developed countries. Japan began full-scale preparations for the Kyoto Protocol, aiming at ratification taking place in 2002 during the next Ordinary Diet session. We will aim to adjust or establish domestic structures for the ratification of the Kyoto Protocol.

This report provides you for the outline of the Kyoto Protocol, the agreement by COP7, the considerations on domestic measures made by Central Environment Council together with the report on other countries' situations.

Photovoltaic Power Generation Systems- Current Status and Prospects -

Koichi Sakuta
National Institute of Advanced Industrial Science and Technology

The total amount of solar energy we are receiving from the sun is about 10,000 times as much as we are consuming now. As a typical distributed energy source, solar energy is one of the most promising clean and renewable energy for the mankind in the future. Especially, solar photovoltaic power generation systems, which convert solar energy directly into electricity, are attracting many ones attention because of its simplicity and wide field of applications.

After a long period of R&D and various kinds of governmental supporting programs, the cost of photovoltaic systems are reduced significantly, the conversion efficiency is improved and the large scale commercialization has just started. The present status, as well as the future prospects, of R&D and introduction of photovoltaic systems are described.

The Current Agreement and the Future Agenda on the Carbon Sink by COP7

Yoshiki Yamagata
National Institute for Environmental Study

At the COP7 of the UNFCCC, international agreement was reached on the rules for implementing the carbon sink related article of the Kyoto Protocol. Especially difficult was the forest management under the article 3.4 as additional human induced activities. This paper summarizes the agreed rules for counting the sink activities and discuses the future agenda need to be negotiated.

Progress in Saving Energy Consumption in the Pulp and Paper Industry in Japan

Kunihiko Aida
Japan Paper Association

The Japan Paper Association (JPA) has been actively working to save energy since 1997 when it established its "Voluntary Action Plan on Environmental Issues". JPA declared its policy of restraining CO2 emissions as one of the actions: By 2010, reduce the unit of purchased energy for paper products by 10% from that of 1990 level.

JPA has been following through on activities in saving energies from fiscal 1998-1990 as a basic period, and has been making its results public every year. For the convenience of complying data, targets were changed from the calendar year to the fiscal year midway. The following are the results for fiscal 2000:

Unit of purchased energy in fiscal 2000 was smoothly reduced by 7.2% from the level in 1990. However, the reduction in a unit of CO2 emissions remained 4.9% because cost competitive coals have been largely used.

Paper and paperboard production increased by 13.1% in fiscal 2000 compared to that of 1990 level, whereas, increase in CO2 emissions remained at 7.6% from the 1990 level. A breakdown of the 5.5% reduction from 13.1% to 7.6% shows that the pulp and paper industry decreased by 4.2% and electric companies contribute to reducing the remaining 1.3% (from effective generating and transmission electricity).

According to 29 companies that replied to our questionnaires, a total of 23.1 billion yen was invested in energy saving measures for fiscal 2000 and the crude oil equivalent of energy saved reached 176 thousand kiloliters per year. As far as the estimation from 27 companies, 93.0 billion yen will be invested and 4,884 thousand kiloliters per year will be saved from 2000 onwards.

Energy Saving by an Introduction of Inverter to Papermaking Process

Hiroji Kanuka
Hachinohe Mill,Mitsubishi Paper Mills Ltd.

Mitsubishi Paper Mills have been paying an extensive effort to reduce the burden to the environment respecting its own Environmental Charter instituted in 1993. Mitsubishi Paper Mills' Target for the reduction of CO2 emission is to achieve the 20% reduction from the emission volume in 1999 until 2005. As the CO2 emission volume of Hachinohe Mill constitute 70% of the total emission by Mitsubishi Paper Mills, reduction of CO2 emission in Hachinohe Mill is of the highest priority.

Aiming the continuous reduction of energy consumption, Hachinohe Mill started the investment for the "Measures to reduce purchase energy per unit production" in year 2000.

This paper reports the results of our first step investment to reduce about 1,000 kW electricity consumption mainly by an introduction of 80 units inverters to the papermaking process.

Results of the introduction of the generator using the steam from the accumulator of digester as the second step investment and the other activity regarding the energy saving are also reported.

The Energy Conservation Measure and The Industrial Waste Reduction Measure in DIP Manufacture Process

Yuji Takashima
Chuetsu Pulp and Paper Co. Ltd.

At the Futatuka factory of the Chuetsu Pulp Industry Co., LTD., 170,000 tons of newspaper papers are produced yearly as the main product. As its main raw materials TMP and DIP are being produced. In response to the global environmental problem , as well as the recycling campaign, we have been promoting the use of DIP, of which the consumption of energy is low and which is gentle to the earth's environment. Furthermore, in order to develop this feature, we have been promoting energy saving and the measure against industrial waste at the initial stage of the used paper pulpering process. There, we are aiming at improvement in processing efficiency, the measure to reduce the volume of steam for warming, as well as the fiber yield.

Installation of Continuous Pre-coat Renewal for Lime Mud Filter－ Saving Heavy Oil on the Lime Kiln System －

Kazushi Ueda
Asahikawa Mill, Nippon Paper Industries Co., Ltd.

The No1 and No2 Lime Mud filters of Asahikawa Mill started in 1960 and 1972 respectively. To release plugged filter, accumulated lime mud have been blown off using blower machine so as to renew pre-coat layer periodically.

Air blowing is not completely efficient so hydrochloric-washing work is necessary for these filters. Furthermore, the moisture of sludge fluctuates, and rotary kilns are thrown into unstable operation, therefore consumption of heavy oil tends to increase. After installing CPR (Continuous Pre-coat Renewal), lime mud feed is stabilized and pre-coat blow-off is avoided.

This paper describes results on saving heavy oil achieved from the installation of CPR system.

Activities of Energy Conservation in Power Plant

Shigeki Izumi
Tomakomai mill. Oji Papar Co.,Ltd.

Tomakomai mill thermal power station consists of seven boilers and 13 turbines and can provide you with all of mill electricity demand by self generation including hydraulic power generation.In a boiler plant, the thing which passed increased the above than operation for 25 years and I took into account the present driving results and did a review and did update to a reasonable fan more in turn since 1997. In addition, you should have promoted saving energy more and carried out a start stop in the

weekend of a boiler turbine. I introduce the details to the following.

Energy Conservation for Medium Consistency (MC) Pumps in Kraft Pulp Line－Conversion Effects into Energy Saving MC Pumps－

Masayoshi Tsukano
Niigata Mill, Hokuetsu Paper Mills Ltd.

Hokuetsu Paper Niigata Mill, that started up the first full-scale ECF bleaching plant in Japanese pulp and paper industry, intends to achieve minimum impact mill due to concerning coexistence with the local community and environmental aspects. This time, we are planning to strengthen a capacity of Medium Consistency (MC) pumps in order to increase a part of the fiber line. However, MC pumps consume most of all electric power in the fiber line because they are running on large-scale and high-voltage motors. We are going to convert MC pumps into energy conservation types in the middle of December 2001. We believe that the new pumps are expected to make great impacts for the energy consumption rate and cost cut. The conversion plan is still in process; therefore the backgrounds of the conversion MC pumps and the estimation of the amount of saving electric power are reported.

The Energy Conservation with the Heat Pipes Finned Tube Heat Exchanger－Recovering Exhaust Heat of Coating Machine Dryer－

Chiyonobu Sasaki
Nakoso Mill, Nippon Paper Industries Co.,Ltd

Nakoso Mill in the southernmost point of Fukushima lies to Iwaki City on about two hours from the metropolitan circle. This mill is a medium scale factory in Nippon Paper Industries Co.,Ltd, it owns one paper machine and five coating machines.

The energy situation of this mill producing in the information papers results an annual power consumption 79,298 MWh (on private electric generation 66,623 MWh), generation of steam 66,623 MWh (heavy oil consumption 36,200 kL) from February, 2000 to February, 2001. The energy intensity doesn't show remarkable improvement in spite of many energy-saving projects, because of increase of energy consumption by investment in plant and equipment in order to cope with more and more variety of products to supply user needs. This mill has been tackled for attainment of the target of energy conservation in whole this company (10 % reduction of energy consumption per unit products based on 1990 levels to 2010). This paper reports on recovering exhaust heat of coating machine dryer, has been planned for energy-saving measures of coating machine occupied the majority of steam consumption.

Energy-Saving Technology and Examples at YONAGO N-1 Paper Machine and N-1Coater

Ikuo Tsumori
OJI Engineering Co., Ltd

N-1 Paper machine and N-1Coater at YONAGO mill,OJI Paper,has been in operation since September1997.The new line has the capacity of 700tpd of woodfree coated paper. The paper machine and the coater incorporated the state of the new technology, such as double shoe press in the paper machine, and Janus calender in the coater, to achieve high productivity and high quality of paper. This article introduces some examples of energy-saving technology at the paper machine and the coater .

Elastic Bending Analysis for Plate of Single-Wall Corrugated Fiberboard-On Rectangular Concentrated Uniform Distribution Load Applied at Optional Position in Plate of Supporting Edges-Satoru Matsshima

Guest Professor, Research Center of District Corpration, Ehime University
Shigeo Matsushima
Professor Emeritus, Ehime University

An elastic analysis of stress and deformation was attempted for the anisotropic plate of the single-wall corrugated fiberboard (SWCF) supported by four edges under the uniform concentrated rectangular distribution load p0 applied in the optional range of the plate. Distributions of stresses and deflections etc. on the outer surface of jute liner (JL) of the SWCF plate obtained by this analysis were discussed, and these characters were done obviously. Obtained results are as follows.

Large values of deflection and normal stresses (in machine and cross directions) on the JL sur-face of the SWCF plate concentrate remarkably in the loading range and are zero in plate edges.

The value of its deflection increases with the increase of the distances from the loading center to the four edges. The maximum value of the deflection is near the center of the loading distribution,and increases with increases of four distances from the its load center to the four edges. And maximum values of normal stresses are at the loading center, and increase with the increase of the loading concentration. The maximum value of supporting forces in edges is at the shortest position from the center of the distribution loading. Large absolute value of shear stress on the JL sur-face concentrates remarkably near the loading range, and this stress near the loading center dis-tributes antisymmetically to its center.

Key Words: Computational Mechanics, Structure Analysis, Elastic Bending, Strength of Corrugated Fiberboard, Elastic Stress Analysis, Structure Strength, Numerical Analysis

-Influence of Coating Pigment on Inkjet Printing Qualities-

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Characteristics of inkjet-grade paper coating were evaluated by applying various coating layers on a plastic substrate instead of paper. The poly(ethylene terephthalate) (PET) film had to be hydrophilized by precoating. Precoating with poly(vinyl alcohol) (PVA) was found effective for this purpose, but resulted in crack formation after the main coating. This problem could be avoided by adding optimized amount of clay to the precoating color. Four types of silica gel, a plate-shaped aluminum hydroxide, and a plate-shaped clay were tested as main coating pigment, with PVA as binder. The latter two pigments gave poor inkjet print qualities due to slow absorption of ink leading to significant dot gain and mottling. On the other hand, silica gel pigments generally gave satisfactory print quality, but it showed certain variation with the type of pigment. The time dependence of water contact angle against various coated layers showed correlations with dot shape and optical properties in inkjet printing.

Keyword：inkjet paper, pigment coating, silica gel, contact angle, water absorption,　dot area

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June 2002 Abstracts

The Latest Demands for Waste Paper Treatment Technologies
Improvement of Recycling Fiber Characteristics, Appearance Quality, Further Energy Saving and Ash Removal to use Low Price Furnish

Takeshi Kanazawa
Aikawa Iron Works Co., Ltd.

According to increase of recycling rate of waste paper as a raw material of paper and paper board production, various technical problems have been discussed. The latest demands relating to waste paper treatment technologies are focused in this paper, and the typical new technologies and its relating equipment for "Improvement of Recycling Fiber Characteristics and Appearance Quality" "Further Energy Saving" and "Ash Removal to use Low Price Furnish" are reported.

Improved Bleaching by Means of Fractional Washing with MCDD Washers

Tamio Fukuzawa, Kanji Hagiwara and Chiaki Kawakami
Andritz K. K.

In2001, two large fiberline projects with a capacity of2000ADMT/D were started up in Scandinavia. These fiberline projects employed only MCDD Washers as washing equipment from the screen room through the ECF bleach system.

DD Washers enable the fiberline to implement highly effective fractional washing throughout the whole brownstock wash and bleach process. The DD washer can divide the filtrate into dirtier and cleaner filtrates. The primary filtrate from the DD washer contains more COD and transition metals. The secondary filtrate contains less COD and less dry solids. By means of fractional washing and filtrate circulation with primary and secondary filtrates, the organic and inorganic substance profiles in the fiberline process can be maintained at a lower level. Unlike the high consistency pulping process, the processes with MCDD washers operate in the medium consistency between the washing stage and the reactors. Therefore, filtrates are not required to recycle back for pulp dilution before the reactors, which prevents inorganic and organic substance build-up during the process. Due to fractional washing and MC pulping process with MCDD washers, bleaching chemicals can be saved and the risk of scale problems can be minimized.

Optimization and Control of Hydrogen Peroxide Bleaching

Bertil Olsson

BTG Pulp & Paper Sensors ABHydrogen peroxide bleaching is nowadays used not only for mechanical pulp but also for chemical pulp in delignifying OP- or PO-stages (the notification depends of if oxygen or peroxide is the dominating one).

The method discussed in this paper is primarily developed for bleaching of mechanical pulp, but is in principal applicable also for bleaching of chemical pulp.

If the bleaching is carefully optimized with respect to total alkali, the brightness will be dependent on the peroxide consumption.

The peroxide consumption is basically a function of pulp consistency and reaction time during bleaching. Mathematical models developed by Dr. Moldenius for hydrogen peroxide can be used for both one- and two-stage bleach plants.

In both cases a system with recycling of residual peroxide is used and compensating the flow of fresh peroxide to obtain a constant feed into the bleach tower.

This requires an accurate measurement of the total amount of residual peroxide going back to the input of the bleaching tower.For this purpose, the analyzer RPA-5000 is used. The function of this analyzer will be presented in the beginning of this paper.

Paper Strength Agents for Paper Board The Effect of Paper Strength Agents in the Highly-Closed System

Yuichi Hayashida
Research & Development Division, Harima Chemicals, Inc.

Recent paper industry makes every effort to improve the productivity and toreducethe environmental loading by using new paper machines and waste paper as raw materials and recycling the water used for the papermaking system.

However such a situation causes the rising of the electric conductivity, which makes it difficult to get the effective performance for paper strength agents.

In this paper, we report that the effect of various dry strength agents which can demonstrate effectively in such a worse condition.

Keywords ; paper strength agent , paper board , highly-closed system

Embedded Control Solutions
A New Approach To Paper Machine Controls That Improves Process Performance and Product Quality
Hideomi Uchikawa and Jiro Isobe
Voith Paper Automation Japan Ltd.

QCS (Quality Control System) and CD actuator suppliers have been focused on providing solutions for the existing paper machine market for the last 30 years. These systems have proved to be highly effective at reducing MD and CD variations, resulting in significant increases in production, savings in raw material and energy, and improvements in sheet quality. Almost all paper machines are now equipped with QCS and CD actuator systems. A closer examination of QCS and CD actuator systems reveals their past and present limitations.

Applications of Robot Technology to the Paper Making Industry
Koichi Kato
Marol Co., Ltd.

Marol Co., Ltd.; well known for the manufacturer of Marol Brand hydraulic steering systems, auto-pilot and engine remote control systems for marine use, also designs and manufactures special purpose robots for industrial use. The company introduces three of their custom applications for the paper making industry.

① Palletizing Robot for Handling Carbon-less Duplicating Paper Rolls
This was developed to grip the outside of the roll efficiently without any transference and to handle rolls of different sizes and weights at random.

② Custom Designed Automatic Grinder/Cleaner for Backing Roll of Existing Coater
This was developed to clean the surface and remove scratches from Backing Roll. The device can be operated during operation and the surface of the roll can be kept clean as required. The device has functional flexibility so it can be operated under various conditions.

③ Custom Designed Automatic Grinder/Cleaner for Heat Roll of Existing Soft Calendar
Researching various materials led to the development of this grinder that can withstand heat and grind the roll to remove contaminant and finish the roll to the required surface roughness. The device can be operated during operation and the surface of the roll can be kept clean as required. The device has functional flexibility so it can be operated under various conditions.

New Development of QCS Integrated with Machine Monitoring System
Nakano Reijiro
Sales Development Dept. Honeywell K.K.

To remain profitable, today's papermakers must increase their machine speed and efficiency, while maintaining a high-quality and uniform product. Often times, however, faster speeds result in more frequent web breaks and also in more short-term quality variations. The Honeywell-Measurex TMMS (Total Machine Monitoring System) Product Quality Monitoring application module uses parallel processing to continuously and simultaneously measure the machine direction sheet quality variations from the product scanner. And WMS (Web Monitoring System) includes a set of high-speed video cameras positioned along the machine to continuously monitor the web.

Typically rotating components such as fan pumps, screens, Calender rolls, Press rolls and felts causes paper quality short-term variations. Feedback from TMMS is used to increase machine runnability and efficiency by providing information required for decisions to adjust felts, change press loadings, and remove, repair or grind rolls, and adjust stock approach components. With the resulting set of high-resolution pictures of the web break from WMS, operators can focus on the specific problems which cause web break, and then make the necessary changes in machine operation to optimize paper machine performance and efficiency.

The Honeywell-Measurex new QCS (Da Vinci) successfully integrated with TMMS and WMS will supply new features of total machine diagnostics as well as CD and MD quality controls to keep maximum efficiency of the paper machine.

Development of Automatic Watermark Drawing with Computer Systems
Kimio Hiyoshi and Katsumi Takada
Fuji Industrial Research Institute of Shizuoka Prefecture
Toshiyuki Onoda
Sanokikai Co., Ltd.
Katumi Kuboshima , Hiroshi Haneda and Masamichi Toyofuku
Specialists Community in Shizuoka

We previously reported that we had drawn directly watermark on cylinder paper machines. But the following problems were arisen .
・It is difficult to remove the drawing materials that were seeped into the inside of cylinder paper machines.
・The watermark was removed by organic solvent.
・There is big risk if we draw watermark on cylinder paper machine.
Therefore, we investigated watermark that the method of drawing on transfer paper.
The following results were arisen.
・The new system is more simple than that of last year.
・It is possible to control the line of watermark by the velocity of drawing and the shape of the pen.
・The watermark of transfer paper is transcribed to the cylinder paper machine by the flatiron .
・New removal liquid of watermark was invented.
・The removal liquid is aqueous solution and doesn't harm for our health.
We were able to use the cylinder cover of the watermark repeatedly.

The Maintenance Management System "eHOZEN"
Masami Tabuse
Yokogawa Electric Corpolation

The package software eHOZEN had been developed to support the plant maintenance work for production plants and equipments. The plant maintenance management system manages various informations such as the equipment database that defines equipment specifications and also the historical database that includes maintenance and fault information. The plant maintenance management system requires to support reliable maintenance management information and to improve maintenance performance and maintenance technologies. Yokogawa Electric Corporation and System Plaza Inc. developed the new product "eHOZEN" that was redesigned the functionalities from the old version of Client/Server configured plant maintenance management system and added the Web capabilities. This paper shows the features and functions of new "eHOZEN" and includes examples of performance improvement process of maintenance management work by applying the plant maintenance information management system.

New Technology for Slimecontrol
Takumi Sugi and Taro Iizumi
Kurita Water Industries Ltd.

The trend in paper making to use more recycled fiber in the furnish, maintain the pH of papermachine at neutral, reduce fresh water consumption. These changes accelerate the slime problems in the paper making propcess. Under these circumstances, new technologies for slime control were developed.

New inorganic slime control agent is more effective than the organic agent like DBNPA. New monitorng tool and the identification method of microorganisms used DNA are developed to optimize the slime cntrol program in paper mill.

These techniques ensure that the greatest slime control effect is achieved at minimum cost.

FMT-IJ: Marketable Composite of Calcium Carbonate and Silica Directed for the Inkjet Industry.
Uchiyama Hirotaka
Fimatec, Ltd.

Inkjet printers are widely used in the world today because of the ease of printing in full color. With the increasing ability of everyone to access the Internet, use digital cameras, etc… The demand for inkjet printers is on the rise.

To achieve good color print quality, fine quality inkjet paper is a necessity. Presently, inkjet paper is commonly coated with silica. Silica's characteristics include: high brightness, good ink absorption, and good color appearance. On the other hand, the disadvantages include 1) difficulty to produce the coating with a high solid content percent slurry and 2) the difficulty in handling of the raw material. Accordingly, the disadvantages of using silica result in increased costs.

To solve these problems, FIMATEC has developed an improved wet ground calcium carbonate (WGCC). This improved WGCC has a higher brightness, lower viscosity, higher solid concentration and good cost performance.

FIMATEC has optimized the improved WGCC's particle size distribution and modified its surface with specific cationic polymers to achieve better inkjet printability.

FIMATEC has incorporated both the improved WGCC and silica to produce FMT-IJ. FMT-IJ has the beneficial characteristics of both GCC and silica, therefore leading to higher brightness, higher solid concentration, lower viscosity and good color appearance. Additionally, FMT-IJ is also advantageous in that it requires less binder than the counterpart silica slurry.

Present Status and Prospect of Pulp and Paper Industries in Thailand Structural Framework and Activities of Pulp and Paper Companies in Thailand (Part 1)

Yoshinari Kobayashi
Dr. Kobayashi Engineering Consultant Office

In the past two decades since my first stay in Thailand in the 70s, the structure and raw materials of pulp and paper industries in this country have drastically changed. In the 70-80s the Thai industries were based on non-woods, i.e., sugarcane bagasse, bamboo, kenaf and rice straw. After the high economic growth period in the late 80s, the industries were converted into eucalyptus-based modernized ones. The overall paper production capacity was annually 3.65million tons and the consumption amount was around 2 million tons, which indicated that the country intended paper export orientation. Once the industries were mainly occupied by subsidiary companies of Siam Cement Conglomerate, but new comers, such as Phoenix Pulp and Paper Co., Indian-technologically-assisted company, and Advance Agro Co. belonging to Soon Hua Seng Conglomerate have entered in these industries in the late 80s and early 90s. Japanese paper companies which established mills in Thailand were also described.

Sectioning Techniques of Paper for Observation and Analysis by Using OM, SEM and EPMA (2)Sectioning Techniques for Scanning Electron Microscopy and Electron Probe Microanalysis

Tadahira Hamada

In previous paper, sectioning techniques for optical microscopy were described .In this paper, sectioning techniques for SEM and EPMA were described and a new preparation technique for paper cross section using a focused ion beam(FIB) was also demonstrated. Several embedding methods using epoxy resin, methacrylate resin and so on are very effective to obtain very thin sections and to prevent creation of artifacts in optical microscopy. But the resin embedded sections reduce the contrast of the image and then distinct micrographs can not be obtained in scanning electron microscopy.

Further more, for observation and analysis by SEM and EPMA, it is not necessary to make a thin section, but to make a bulky section without damage of fine structure.

Instead of embedding the specimen before sectioning by microtome, a procedure in which the specimen is held between two plastics films such as polyvinyl chloride was applied and satisfactory results were obtained at comparative low magnifications (△10,000×) for various papers except thin and porous specimen such as tissue paper.

Recently, a focused ion beam (FBI) technique which has been used for fine processing of semiconductor or metal was applied as an improved method for sectioning papers. By this technique smooth and damageless cross sections of various papers could successfully be prepared.

Changes in Crystallinity and Re-swelling Capability of Pulp Fibers by Recycling Treatment

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An integrated technique was purposed for clarifying changes in amounts of amorphous and crystalline regions of fibers as well as for estimating possibility of their irreversible conversion due to recycling treatment. The crystallinity of fibers in handsheets was moderately changed by the recycling treatment as observed by X-ray diffractometry. Because major part of fibers consisting of the stable crystalline region which was hardly affected by the recycling treatment, the change in crystallinity possibly stemmed from a slight increase in crystallinity of amorphous region of fibers during recycling. The decrease in the amount of the amorphous region by the recycling treatment, which affects the water adsorbability of fibers, was indirectly detected by differential scanning calorimetry. Because of the lack of re-opening of recycled fiber lumens in a wet state, the amount of bound water adsorbed to fiber wall substantially influenced the re-swelling capability of recycled fibers. The loss in re-swelling capability of wet recycled fibers was consistent with sub-morphological changes of fiber wall possibly due to the decrease in the amount of the amorphous region. In this study, FT-Raman spectroscopy could not detect the effect of recycling treatment on changes in amounts of amorphous and crystalline regions of fibers.

Keywords: Amorphous region, Crystallinity, Recycling treatment, Re-swelling capability

Retention Aid Chemicals for High Speed Paper Machines

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Reflocculation and drainage abilities of dual component retention systems, which consisted of coagulant and flocculant, were studied with the Photometric Dispersion Analyzer (PDA) and the Dynamic Drainage Analyzer (DDA). The dual component retention system was found to be superior to single polymer systems in both abilities. It was postulated that the coagulant blocked the adsorption site of the flocculant on the fiber surface and prevented the reconformation of the flocculant chains onto the fiber surface under the high shear turbulence. The shorter the addition interval between coagulant and flocculant, the higher the effectiveness of the dual component retention system. In addition the dual component retention system improved the paper properties. The sheet permeability increased with a decrease of drainage time.

Keywords：Dual component retention system, Coagulant, Flocculant, Reflocculation, "Site-blocking" effect

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July 2002 Abstracts

Outline of pulp manufacturing technology
Makoto Iwasaki
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This paper is consisted by four parts. In the first part, outline of the change in raw material used for paper in Japan was described. In the second part, pulp manufacturing processes such as kraft pulp(KP), mechanical pulp(MP) and deinked pulp(DIP) were briefly introduced in terms of their histories, pulp qualities, flow-sheets and changes of annual production rate. In the third part, the four recent topics of pulp manufacturing technology in Japan were introduced. Such topics were included with AQ added KP cooking, two stages O2 bleaching of KP, deinking process change corresponded to newspaper printing system change from letter-press to off-set, and improvement of DIP brightness from about 50% to 70%+ were introduced. In the final part, the recycling technologies in pulp manufacture both for KP and DIP would be believed more important in the future more than past.

The General Technology for Recycled Pulp
Yoichiro Isono
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In order to protect global environment , save natural resources , recycled pulp has been expanded rapidly in recent years.
The recovered paper utilization rate 56% target in fiscal year 2000 was achieved the two years ago. It is expected to be decided that a new utilization rate target was set up to be 60% in fiscal year 2005 by the Japan Paper Association.
Recently some new technologies for deinked pulp have developed in some fields. These new technologies will be able to achieve the new target.

Waste paper recycling
Yuichi Irinatsu
Kao Corporation,　Performance Chemicals Research Laboratories

Pulp and paper industry is aiming to raise the percentage of waste paper recycling to 60% by 2005 and makes efforts to reach this target. Under these circumstances, developed deinking technology is severely required. The deinking is indeed one of the process industries and is mainly consisted of ink releasing and ink rejecting. To control the ink particle size in each process is very important in order to obtain the good deinked pulp. For example, in the ink rejecting process, more than 95% of larger ink particles than 4 um is easily rejected by the flotation cells. This means smaller ink particles than 4 um are hardly rejected. Residual small inks make the deinked pulp grayer and result in poor printability. Coagulation of the small ink particles decides the deinkability in flotation. On the other hand, ink releasing relates to the penetration of the chemistry into the waste papers. Therefore, the phenomena in each deinking process can be understood by surface science and the deinking agent controls these phenomena.
To achieve the above-mentioned target, lower grade waste papers, such as old magazines, which have not been used as a furnish will be deinked and for these waste paper deinking, developed deinking agents which have better ink releasing and sticky removing abilities will be needed. Based on surface science, we have developed the new deinking agent whose ink releasing ability is improved 20%. The special surfactant has been also developed to reduce the sticky. By using this surfactant, the sticky is removed 1.2 times as much as the conventional deinking agent.
A deinking agent has been thought as a ink removing agent. From now on, concerning the pulp quality as a furnish, we are going to continue to develop the deinking agent as a pulp recycling agent to produce the better deinked pulp.

Foundation of Recycled Pulp Bleaching Technology
Tetsuo Koshitsuka
Mitsubishi Gas Chemical Company Inc., Tokyo Research Laboratory

The amount of production of the hydrogen peroxide in the year 2000 was 145,744t. The demand for pulp is 71,237t and the ratio has reached 48.9%. Also, about 60% of the demand for this pulp has been estimated as demand for recycled pulp. Therefore, recycled pulp is an important field of the hydrogen peroxide market.

Seven kinds of oxidizing agent (chlorine, hypochlorite, chlorine dioxide, hydrogen peroxide, oxygen, ozone, peracetic acid), three kinds of reducing agent (sodium hydrosulfite, sodium borohydride, formamidine sulfinic acid) were described and especially hydrogen peroxide, sodium hydrosulfite, and formamidine sulfinic acid were described in detail as important bleaching agent.

Concerning hydrogen peroxide, the influence of metals, the heat of kneader and catalase were described. The preventative measures were also described.

Concerning sodium hydrosulfite, the decomposition by air, water and combustion by water were described. As a measure, "HS master", which can dissolve sodium hydrosulfite continuously in nitrogen gas atmosphere and can feed it to the pulp bleaching site was introduced. "HS master" was developed by Mitsubishi Gas Chemical.

Concerning formamidine sulfinic acid, the "Fosble System" which is able to manufacture it on-site was introduced. The "Fosble System" was developed by Mitsubishi Gas Chemical.

For Expanding Use of Recycled Magazine Paper The Development of the Suitable Hot Melt Adhesives for Paper Recycling ?

Shigeru Yatsugi
Asahi Chemical Synthetic Co., Ltd.

Recently, by amendment of the Law for Promotion of Utilization of Recyclable Resources (Recycling Law), the Paper Industry have become to have to develop the easy-recyclable products for the creation of a recycle-oriented society.

The Plan " Recycle 60", that is, utilization rate of used papers will reach at least 60% by 2005 in Japan, is very difficult target. Because, Japan’s utilization rate of recovered paper is 57% in 2000, is among top in the world, and utilization rate for paperboard is nearly 90%, which is in a saturation level. But in a paper segment, utilization rate is only a little over 30%. Therefore the achievement of "Recycle 60" depends on increase in utilization rate of recycled magazine for paper, especially for printing and communication paper.

In the field of recycled magazine, hot melt adhesives have been largely used because of excellent processability, but these hot melt adhesives have become to prevent paper recycling.

Therefore, in order to promote the "Recyclable Paper Products Development and Promotion Project" under the supervision of the Ministry of International Trade and Industry, Japan Federation of Printing Industries which was entrusted by Paper Recycling Promotion Center, has organized the "Research Committee for Recyclable Paper Products", for the purpose of development promotion of easy-recyclable hot melt adhesives, and the committee has been reporting and researching the testing methods for easy-recyclable hot melt adhesives, and proposed the future trends.

In this paper, we will report the classification of adhesives for bookbinding, mechanism of adhesion, and consideration of suitable hot melt adhesives for recycling.

And also we will report the authorized convenient testing method (The First Stage Testing Method) to get a approval as Screenable Hot Melt Adhesives (EVA-based HMA) for paper recycling.

The Effects of Recycling on Pulp and Paper Properties

Takayuki Okayama

Department of Environmental and Natural Resource Science, Tokyo University of Agriculture and Technology

The utilization rate of wastepaper in Japan has reached 58.0 % in 2001. However, the use for printing and communication papers has been limited due to concerns about appearance, strength and brightness. To promote the use of recovered paper for higher-quality grades, it is necessary to understand the fundamental aspects on recycled fiber. This paper describes papermaking potentials of recycled pulp fiber.

When a kraft pulp is repeatedly defibrated in water, dewatered and dried for several times, the strength properties of papers, as well as the micro-structure of the pulp fibers, are considerably deteriorated. Morphological changes such as delamination and crack formation in cell wall of pulp fiber are enhanced by recycling treatment. On the other hand, the pore volume in cell wall of pulp fibers determined by the solute exclusion method decreases with recycling. Therefore, the shrinkage of internal pore structure under recycling is not easily reversed. The kraft pulp with a significant decrease in handsheet tensile strength during recycling tends to swell less and reduce their bonding potential.

Variations in strength properties of papers during recycling are closely related to the fiber morphological characteristics. The fiber lumen diameter:fiber width ratio is an important predictive factor of strength properties of handsheet during recycling.

Remarkable increase in water contact angle of kraft pulp fiber is observed by recycling. The recycled fiber is clearly much less hydrophilic than the virgin fiber. This relates to inactivation of the fiber surface by recycling, which is known as "irreversible hornification".

The deterioration of neutralized recycled paper prepared from hardwood bleached kraft pulp by accelerated aging is similar to that of conventional neutralized paper.

Study of Deinking from the Point of View of "It is a Separation-Intensive Technology".

Takeshi Kanazawa
Aikawa Iron Work Co., Ltd.

The deinking process, which was started as a substitute for mechanical pulp along with the energy-saving activity after the former oil crisis and enhancement of action for environmental protection in recent years, has made great strides to the white grade DIP production in place of Bleached Kraft Pulp recently.

Differently from the waste paper treatment for paper board, the latest deinking process which requires high quality, becomes more complex in order to achieve complete ink detachment with the help of chemicals, removal of hard-to-deink material and stickies. As just described, by reason that technical investigation is necessary in wide-ranging fields, designing of deinking process has given a difficult image for us. In paper making industry, however, the recycling of waste paper stock have been approached since a long time ago by nature, so we can say that the deinking process is a product that has been built from accumulation of these technologies. It is possible to consolidate the process to three ones, that is Pulping, Contaminant Removal, and Upgrading. I think that deinking technology seems to be complicated but it will be understood relatively easy in bringing together these processes by the key word, "Specification Technology". With that, I will describe the latest technology of waste paper deinking on the basis of "Separation" in this study.

The Trend Japan has been Towards a Greater Use of Deinked Fiber for Producing Graphic Paper

Masakazu Eguchi
Stock preparation gr. Application Engineering Dept. Voith IHI Paper technology Co., Ltd.

"Recycle 60" by 2005 was proposed by Japan Paper Association and Ministry of International Trade and Industry December 2000. The trend Japan, also worldwide in recent years has been towards a greater use of secondary fiber and higher recycling rates. This trend has been especially evident in deinking for graphic paper production.

As recycling rates go up, it is expected the quality of the incoming furnish will decrease due to repeated recycling of the individual fibers and demands for high quality graphic paper from the consumer will put increasing demands upon deinking system.

To meet theses increasing requirements, deinking technology continue to improve and advance in all areas including equipments design, systems, and chemistry. The following describes new deinking devices, technologies to help meet the challenges facing deinking system of the 2000s.

The overall goal is to optimize the entire deinking system for more profitable operation.

Present Status of Paper Recycling and Future Subjects

Noboru Takeshita
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Recently the utilization rate of used paper had been increasing dramatically, may achieve 58% in 2001. It was mainly due to decreasing in the market price of collected used paper because of increase in the collecting volume, the increasing cost difference with wood chip, the progressing of de-inking technology, and the stronger demand of recycle product at the market. De-inked pulp is likely to be used for wood free products today. At the poor market situation wood-free coated paper is decreasing in sales, however coated paper which contains recycled pulp has been sold 120 % over the last year. This trend will be continued.

Comparing the energy consumption in the production process for each pulp, used energy of DIP was the lowest, but it came from only fossil fuels. On the other hand used energy of chemical pulp was bigger than that of DIP, but less fossil fuels consumed because some part of energy can be provided by itself.

In order to construct recycling-oriented industry, it is necessary to set up and proceed the two recycling systems, namely a forest recycle to immobilize carbon dioxide and regenerate forest resources, and used paper recycle to save resources and energy.

Japan Paper Association decided 60% as a target of utilization rate of waste paper in 2005. To achieve the figure, it is essential to cooperate between governments, related industries, and consumer. They should make efforts to use more recycle products, to achieve a preferable product quality, to collaborate a complete fractional recovery and an effective recycle system of office waste.

The LCI Calculation Method for LCA of Pulp and Paper Products

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We have been investgating about life cycle assesment (LCA) of pulp and paper products. In this investigation, we have been using to the caluculation of life cycle inventory (LCI) data for LCA from our mill operation data, our laboratory research data and the reference data. In this paper, we introduced firstry, some LCI data from reference literatures, and secondary, about our calulation method of accumulation from practical mill operation data, laboratory research data and some reference data. Finaly, we compared with LCI data about pulp and paper products of literatures and our caluculation results. In this comparison, we found there were neary equal results by our calulation method of accumulation and other methods.

Keywords : LCA, life cycle assessment, LCI, life cycle inventory, energy, CO2,NOx, SOx, pulp, paper, products

An Application of the X-ray Fluorescence Method to Quantification of Ink Printed on Paper Surfaces

Hitomi Hamada, Toshiharu Enomae, Masato Kato and Fumihiko Onabe
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With a view to quantify ink on nip-printed paper, the amount of which is unknown, a newly developed technique using an X-ray fluorescence method was applied. In this technique, the content of copper included in a cyan ink printed on paper was measured as an intensity of its peak in the X-ray fluorescence spectrum. Several kinds of paper were subjected to solid-printing using a universal printability tester with a cyan ink, and then the transferred ink amount was measured by weighing the ink roll before and after printing. The proportional relationship between the so measured copper content and the transferred ink amount measured gravimetrically was confirmed irrespective of the kinds of printing paper. This result suggests that the printed cyan ink amount can be determined by measuring the copper intensity in an X-ray fluorescence spectrum. Further, papers having several levels of smoothness were prepared with a supercalender. The transferred ink amount was found to decrease with increasing the smoothness of paper.

The X-ray fluorescence method was compared with the method of print density calculated from lightness (L*). The coated papers containing the hollow or filled sphere pigments were prepared and solid-printings were conducted on the coated paper by an RI printing tester with a cyan ink. Lightness (L*) of printed surfaces of the coated papers was measured with a spectrophotometer. The print density was not proportional to the transferred ink amount measured by the X-ray fluorescence method, and was influenced by the lightness of unprinted surfaces. In application, the X-ray intensities of copper and coating components of the print with print mottle were measured and mapped using an X-ray fluorescence microanalyzer. For the poor print with print mottle, binder and pigment in the coating were distributed unevenly. This finding suggests that the print mottle may have been caused by the uneven distribution of binder and/or pigment in the coating.

Keywords: Lightness, Print mottle, Smoothness, Transferred ink amount, X-ray fluorescence method

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August 2002 Abstracts

The Latest Drive and Supervisory Control System

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The latest drives system for a paper machine has high speed data link with optical fiber. The various drives data can be shown on the supervisory CRT. On the other hand, Information Technology (IT) has progressing very fast. Internet connecting facilities is getting familiar. The remote maintenance system and alarm messaging system via Internet has been realized.

Sensodec6S Runnability Monitoring System

Kiyoshi Dekula
Metso Automation K.K., Paper Automation Div.

For a number of years on-line machinery condition and runnability monitoring systems have allowed maintenance departments and paper mill operating staff to measure machinery vibration, process pulsation and paper quality in order to detect mechanical deterioration or process stability problems at an early stage. With the analysis tools built into these systems, developing problems have been averted, thereby reducing the occurrence of unscheduled downtime and improving runnability. Preventive maintenance scheduling and papermachine fabric changes have been made more proactive and effective.

Today, industry standards for network communications and emerging industry standards for operating systems and operator interfaces are facilitating the development of millwide networks. With the adoption of these standards, the seams between process control systems, quality control, production management and information systems are dissolving. Operations, quality control, and engineering personnel are now multiple users on the same network.

Similarly, on-line machinery condition and runnability monitoring systems are becoming an integral part of the same network. Distributed architectures and high speed communications allow maintenance and operations personnel to analyze the same process and machinery condition information.

While general information sharing is becoming commonplace, there is a continuing need for machinery condition and runnability monitoring systems to offer their specific users more insight into the complex, dynamic area of machinery condition, process pulsation and paper quality interactions. These task-oriented systems have recently introduced new signal processing techniques and user tools to make predictive maintenance diagnosis and operator interaction more insightful and effective.

Actual Of PaperMachine Operation by PaperMachine/CoatedMachine Operetion Saport Toor

Noboru Negishi
Shinko Kagaku Co., Ltd.
Naoteke Mituishi
Wako Accutech Co., Ltd.
Youhei Shiokoshi
Nippon Paper Unitec Co., Ltd.

It has not put to practical use that operating control is done by measuring wet paper web moisture content of each part on a paper machine, due to technically unavailable to measure moisture of each part and to less affected to web breaks with the variation of web moisture depend on decreasing open draws. While operators have the know-how to indirectly estimate web moisture from monitoring steam consumption of dryers and web runnability.

Now, we have developed new processing technology that indicate easily the moisture content and dewatering rate/dryness after the forming section, all press nips and drying cylinders on real-time. This technology is based on: ①processing technology that can analyze drying trend at dryer section ②available measuring equipment that can measure dewatering rate of individual press efficiently ③personal computer which became cheaper and higher performance, etc.

As a result of applying this technology to real time operation monitoring and operation control over one year, it has been proved to be effective for rational papermaking.

We have commercialized this system as "MOAS" , Machine Operation Analysis System for papermaking and coating.

Color Inspection System－Introduction of Color Age System－

MakotoEndo and Hideto Matsui
Production Management Department, Vision System Division, WIS Group,
OMRON Corporation

I'm going to introduce the effectiveness of Web Inspection System for Colored Web that is based on the experience for several years at Lintec Corporation who has introduced 4 systems earlier than others.

Also, I'm going to introduce the ideas of improvement based on the customer's requests, and the direction of the future trend of Web Inspection System.

Plant Information System Advantage of the Process Data in the Pulp and Paper Industry

Shizuo Itoh
Plant System Div., System Plaza Inc.

The PI System is a set of Server and Client based software programs designed to fully automate the collection, storage and presentation of plant information. PI is frequently used as an integration and development platform for enterprise wide applications.

PI Systems serve plant data to end users and software applications, quickly and efficiently. PI client applications enable personnel to easily implement plant and corporate initiatives such as process improvement, TQC, and predictive maintenance by unifying plant data into a single repository where any individual in a company can view and analyze the same information.

Applications such as production planning, maintenance management, expert systems, LIMS, supply chain management systems can be integrated with PI Systems to bridge the gap between business and real-time production environments.

The PI system from OSI Software has become one of the most successful and widely used process information management systems in the pulp and paper industry.

Introduction of "Dirtformer"- Fast and Accurate Measurement of the On-Line Dirt Count System -

Yoshiyuki Kawabata
Nomura Shoji Co., Ltd.

DirtFormer is fully automatic system for the measurement of dirt count characteristics of recycled and chemical pulps. DirtFormer measurement is based on image analysis with a CCD-camera. Dirt is recognized using contrast: a dirts is a darker area in the sample comparing to the surrounding pulp.

DirtFormer is based on PulpExpert Oy's dirt detection technology, which has been widely used in PulpExpert Pulp Quality Analyzer's DirtCount Unit, Model, which are devices for measurement of dirt count from pulp sheets.

Modern Single Drum Winders

Peter Trilling
Jagenberg Papiertechnik GmbH

According to the demands from printing industry, paper mills are requested to ship roll products with better quality and larger size rewound rolls year by year. In order meet the demands of market, winder makers realized that they should make highly sophisticated winder with full automation. Therefore, the targets are for better quality of rewound roll and automation for saving labor cost.

In order to achieve the target, Jagenberg developed center-winding system for obtaining better quality of rewound rolls and also completed full automation system for core feeding and taping device. Our new winder Vari-Plus is so designed that one operator can cover full operation of Vari-Plus winder.

As to rewound roll quality, it is clear that we can obtain stress free rewound roll because of center-winding with the lowest nip pressure from main rewind drum, thus makes ideal hardness of rewound rolls.

Besides, we can operate winder with better runnability tension regardless rewound roll hardness because we have tension isolating device between running tension and rewind tension. This makes tight tension running and soft winding at the same time, which will be applied for rewound rolls for sheeter. In addition, soft tension running and harder roll rewinding at the same time, which is applied for roll shipping. It also applied for easy break paper like thin paper winding.

Polyacrylamide-based Surface Strength Agents- Characterization of Polyacrylamide-based Surface Strength Agents -

Yumiko Nagashima
Seiko Chemical Industries Co., Ltd.

Polyacrylamide（PAM)-based surface strength agents have been used jointly with starch or polyvinylalcohol（PVA) in the majority of cases. However, as a result of the rise in demand due to various efficiencies required for surface strength agents, PAM-based surface strength agents have been used individually. Individual use of PAM-based surface strength agents results in a couple of problems：firstly, the incompatibility with surface sizing agents；and secondly the decrease in sizing effect at high concentration coating and with large quantities of pick-up solution.

PAM-based surface strength agents have been researched from various viewpoints, and It is confirmed that these problems are resulted from each agent inquiring into their performance and size efficacy is able to be preserved by controlling the hydrophilic ability of PAM-based surface strength agents.

Internal bond strength is one of performances required for surface strength. Internal bond strength is required to protect the blister resistance of coat paper, and the dust from a transverse section prevention of plain paper for copy paper, and high performance paper, and what not.

In this investigation, the penetration of PAM-based surface strength agent into base paper was examined by time-dependent attenuation of ultrasound transmission in PAM-based surface strength agent solution and researched correlation with the behavior of the internal bond strength. And the rise of the internal bond strength by surface application is effected greatly by the penetration of PAM-based surface strength agents solution into base paper. A slight difference of penetration on zero-sizing base paper has an influence on the penetration of PAM-based surface strength agents solution, and internal bond strength.

New Hofmann PAM「H520B」

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N. Sakamoto, T. Matsubara and K. Yoshida
Specialty Resins Div.

Mitsui Chemicals has succeeded in the development of novel type of Hofmann PAM 520B which shows 1)High paper strength, 2)High drainage, 3)High Retention, especially at relatively high pH condition like pH5.5～pH7.5 by full use of our special polymerization technology.

It was found that "Core-Branch structure" which can be achieved by a special branching polymerization technology gives good performance to this novel Hofmann PAM 520B. which is afforded using a unique on-line additive system "Hofmanizer System"

By using Mitsui Chemicals' Hofmann PAM 520B and Hofmanizer System,
a customer can
1)get better unit consumption of paper strength reagent.
2)achieve higher machine speed(～10%) without drainage aid.
3)use cheaper pulp like OCC more.
4)save waste water treatment cost.

Optimization of Wet-end Operation by "Realizer"

Koichi Tadaki, Kenji Tsunekawa, Shuichi Arai, Masa Taniguchi
FC Department, Somar Corporation

Neutral papermaking and high recycle fiber usage in recent years make papermaking more troublesome. Conversion of acid to neutral papermaking reduced popular use of alum. Also recycle fiber usage and worldwide concern in environmental problem brought various contaminations, anionic trash and unwanted ions in papermaking process, which would harm wet-end operation. These harmful materials could deposit on papermaking equipment, and lower machine speed, fiber retention and paper quality. As a result production rate and runnability of paper machine is affected.

"Realizer" developed by Somar will give a solution to the problems associated with wet-end operation. The new chemical assists retention of other wet-end chemicals, thus reducing total chemical usage. It also improves drainage and fiber retention. Optimization of wet-end operation using "Realizer" can be achieved by proper selection of cationic charge, molecular weight and molecular weight distribution. It depends on stock characteristics and other chemical usage. Maximization of the effect with "Realizer" is demonstrated.

HYMO TWINS SYSTEM

Hideyuki Wakamatsu
Paper Chemical Group, Shonan Research Center, HYMO CO., LTD.

Recently, in Japanese paper mills, the papermaking conditions have been getting worse because of higher usage of recycled paper, proceeding mill closure, alkaline paper making or an increase of wire speed.

Under such conditions, retention aids have been required to achieve much higher performance. One of such retention aid systems is the micro-particle system using cationic PAM and inorganic substance.

We have developed various types of dispersion polymers, which have characteristics of high molecular weight, high actives and low product viscosity.

Furthermore we have developed a new retention system, HYMO TWINS SYSTEM, characterized by using both cationic dispersion polymer and anionic dispersion polymer.

HYMO TWINS SYSTEM achieves higher retention and higher drainage than micro-particle systems.

Dewatering machine for paper pulp－ ROTARY PRESS －

Masahiro Ide
Tomoe Engineering Co., Ltd.
Process Engineering Development Section
Machinery & Equipment Division

"Rotary Press" which is a new rotary pressure dehydrator with an unconventional dewatering mechanism, has been developed by Fournier Industries Inc. in Canada, and is going to be imported and marketed by Tomoe Engineering Co., Ltd. in technical cooperation with the Fournier Industries. The Rotary Press, which is a well-balanced machine with high dewaterability for less operating and maintenance costs including energy consumption, has recently been finding increasingly wider applications including sewage treatment in Canada. This paper describes dewatering principles, features, and dewatering performance of the Rotary Press.

Carbonizing Process Plant for Dehydrated Pulp Sludge- CONTINUOUSE HIGH-SPEED CARBONIZING SYSTEM -

Seiki MURAOKA
Tomoe Engineering Co., Ltd.
Process Engineering Development Section
Machinery & Equipment Division

This document is prepared to describe process theory and features for "Carbonizing Process Plant" which comprises of sludge dryer, external-heating furnace with multi-stage screw conveyors and effluent gas treatment system.

It is emphasized that dehydrated pulp sludge should not be disposed at landfill area but reused as one of resources. As one of methodologies for resource recycle, carbonization process, which turns any sludge into carbons under low oxygen circumstance, has been applied. Dehydrated pulp sludge can be dried by the sludge dryer and then fed to the first stage of screw conveyors in the carbonization furnace. While transferring sludge through insides of the screw conveyors with firing from outside of the conveyors, "carbonization process" is proceeded under low oxygen circumstance. It is envisaged that carbons derived from any sludge would be reused.

Tomoe Engineering Co. Ltd. has provided "Carbonization Test Plant" to study process performance including running cost, operability, controllability and maintenance

Present Status and Prospect of Pulp and Paper Industries in Thailand (Part2)
-Supply System of Pulp Woods and Research Organizations of Pulp and Paper-

Yoshinari Kobayashi
Dr. Kobayashi Engineering Consultant Office

The shift of the policy of pulp and paper industries from non-woody raw materials such as kenaf and bagasse to wood chips accelerated plantation of eucalyptus, especially Eucalyptus camldulensis in North-East in Thailand. Phoenix Pulp and Paper Co., Ltd. switched from kenaf to eucalyptus and bamboo after several years' operation in 1987. Advance Agro Co. belonging to Soon Hua Seng Conglomerate has entered in these industries in the late 80s and early 90s with plantation of eucalyptus in their own farmers' network fields. In spite of strong farmers' resistance movement against the plantation, eucalyptus plantation is gradually and steadily prevailing in North-East Area in Thailand. FAO organized a symposium to confirm scientifically the evaluation of eucalyptus plantation. The conclusive argument pro and con eucalyptus plantation provided by FAO was introduced. Finally research organizations concerning pulp and paper as well as afforestation were also mentioned.

Dioxins Levels in Chlorine Dioxide Bleaching of Hardwood Oxygen-bleached Kraft Pulp (I)

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Shuji Hosoya and Kengo Magara
Forestry and Forest Products Research Institute

Kraft pulp and sulfite pulp bleaching mills using chlorine, chlorine dioxide (D) and other chlorinated compounds are under surveillance of the dioxins regulation in Japan from 15 January 2000. The bleaching mills are regarded as "notified establishments" which may pollute water quality. According to it, the dioxins are composed of polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and coplanar-polychlorinated biphenyl (Co-PCBs). The limit for the dioxins emissions to environmental water from the mills is 10pg-TEQWHO1998/L. The limit should be considered ten times as that of the environmental water quality level (1pg-TEQ/L). One of questions is whether water qualities of process sewers in chlorine dioxide bleaching (ECF) mills are less than the environmental water quality (1pg-TEQ/L) or not. Objectives of this study are to clarify the dioxins level of ECF mill sewers and to know more about mechanism of the dioxins formation during ECF bleaching of hardwood oxygen-bleached kraft pulp (LOKP) on a basis of the analysis level for the environmental water quality. Laboratory bleaching was carried out using a mill LOKP (kappa number 9.8), chlorine dioxide from a mill R8 generator and drink water in a laboratory high-share mixer. Active chlorine factors were in the range of 0.14-1.14. The total TEQs of pulps are less than 15ppq for both the D-treated pulps and D and alkali-extracted (E) pulps. Those of spent liquors are less than 0.0057pg-TEQ/L for both the D and E spent liquors. In all cases, 2,3,7,8-TeCDD and TeCDF were not detected.

Keywords: Dioxins, Pulp bleaching, Chlorine dioxide, Hardwood, Kraft pulp

Development of Super Water-absorbent from Cellulosic Materials (4)-Porous Structure of Water Absorbent-

Yuehua Xiao and Gyosuke Meshitsuka

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In this paper, porous structures of the swollen hydrogels of the cross-linked CM-LBKP were examined by solute exclusion technique. Water absorbents prepared by cross-linking of CM-LBKP with different types of polyethylene glycol diglycidyl ethers (PEGDGEs) had very porous structures. The total pore volume of cross-linked CM-LBKP up to 560 Å in width was about 100 times of that of untreated pulps. Increased amount of cross-linking agent bound to CM-LBKP not only decreased the total pore volume, but also decreased the pore size with increased contribution of small pores up to 560 Å in width. Re-cross-linking of the water soluble fraction from the first cross-linking of CM-LBKP seemed to proceed more homogeneously and eventually to give more homogeneous distribution of cross-linkage. Thereby re-cross-linking products had higher water absorbency and lower water solubility.

Key words: cellulose, carboxymethyl cellulose, super water-absorbent, cross-linking, water retention value, pore size, dextran

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September 2002 Abstracts

Sheet Formation Technology on Roll-Blade Former

Hiroshi Iwata and Kazuhiko Masuda
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Mitsubishi Heavy Industries, Ltd., Paper& Printing Machinery Division

The purposes of newly developing for MJ series paper machine are to accomplish higher production and operator-friendly operation at 2000 mpm.

Since the forming section requires stable sheet forming and good quality of paper on high-speed operation, a suction forming roll at initial drainage zone and the wedge-shape blade was opposing counter blade at mid-mat forming zone are incorporated in MJ former.

And today, we are able to propose blade former or roll-blade former according to user needs.

In this paper, we present the results of drainage element studies and pilot machine trials.

The newest high-speed board paper machine－Top Quality at Top Speed－

Kousuke Tano
Machinery group, Paper machinery division, Sumitomo Heavy Industries, Ltd.

Even though targeted speeds are approaching each other on printing paper and board machines, there are many distinct differences in the machine lines.

Two Former achieved essential strength properties for board paper.

Closed transfer without the center roll is more important with low quality waste paper than with virgin pulp.

Surface sizing of boards is different from fine paper. The need to achieve full penetration is essential. Full penetration means weaker runnability properties.

The TurnDry contactless dryer is a great tool in this respect.

Final dryness is reached by two tier felting in order to control the curl of the web.

All these sections and components within each section makes a line ? Opti Concept line for Boards at high speed.

How to Fulfill the New Requirements of the Wet End Process?

Bernhard Mu(‥)ller1,Masakazu Eguchi and Jun Eguchi
Engineering & Development Division, Voith IHI Paper technology Co., Ltd.

The future generation of paper machines will be characterized by increased operating speeds and at the same time higher product quality demands, including machine directional (MD) and cross machine directional (CD) profile stability.

To meet these new requirements, the wet end process (WEP?) around the wet end of the paper machine needs to be redesigned. New machines and tools are presented here for mixing the stock and filler components, for white water dilution, stock cleaning and deaeration, adding of retention agents and for the entire white water handling.

The overall goal is to optimize the entire WEP? for more profitable operation.

Advanced Wet-end Concepts to Stabilize Paper Machine Running

Roland Berger, Lydia Bley and Rainer Rauch
MUETEK Analytic GmbH

Over ten years of experience with on-line charge demand analysis has shown that measurements conducted in white water frequently fail to produce meaningful results. One reason, among others, is that white water contains different charge carriers, such as fines, fillers and colloidally dissolved anionic material. In addition, charge carriers that are neutralized upstream from the white water basin escape detection at this particular sampling point. In view of the ongoing trend towards more complex retention aid systems and the increased use of recovered waste paper furnishes, charge measurements in white water are losing importance. Instead, on-line charge measurements should be performed at the source of anionic trash, for example coated broke, TMP or DIP. Another likely measuring point is after the addition of a chemical aid into the thick or thin consistency stock.

BTF Headbox System A New Dilution Control System for Existing Headbox

Hiroshi Takahashi
Design Sec. , Kawanoe Zoki CO.,Ltd

The demand for improved paper quality is requiring mills to produce paper with less variation in basis weight profile and improved fiber orientation uniformity.

Conventional headbox profile control by slice bending is limited in its ability to meet these demands. Mechanical restrictions limit the precision of the basis weight profile control, and slice bending causes changes in the local flow rate, jet velocity and direction resulting in non-uniform cross machine fiver orientation.

Dilution control systems are therefore becoming more common as a replacement for conventional slice lip control. These systems can provide better CD basis weight control without interaction with fiber orientation.

Latest on-line calender technology Janus MK2 calender

Eiji Ando
Engineering dept., Voith IHI Paper technology Co., Ltd.

Market demands to improve the paper quality and production efficiency, however, off line supercalender is available for highly compressed paper applications, i.e. A1, A2 coated paper and / or SC paper, etc. The supercalenders are becoming bottleneck. Voith Paper developed the Janus calender focusing on-line installation in 1996, it is now improved as Janus "MK2" with state of the art. Following provides an introduction of the Janus MK2. The technical and technological possibilities of this Janus "second generation" to be installed online are presented.

Development of Mitsubishi High-Speed Film Coater

Masahiro Sugihara and Kenji Yamada
Mitsubishi Heavy Industries, LTD. Hiroshima R&D Center
Hiroshi Miura and Toshiaki Miyakura
Mitsubishi Heavy Industries, LTD. Paper & Printing Machinery Division

Mitsubishi High-Speed Film Coater (MJ Film Coater) has been developed as the on-machine film coater and size press for our newly developed high-speed papermaking machine (MJ series). In this development, we mainly focused on the reduction of "misting" which occurs at the outlet of applicator roll nip in high-speed coating. Non-dimensional characteristics of misting phenomena have been got in this investigation. According to the results, the state of the art "Continuous Contact Length Control System" and "Low-Adhesive Applicator", which realize the reduction of misting in high-speed coating, have been developed. In this paper, we report the results of fundamental studies and the outline of our new film coating technologies briefly.

The coating application using the Excellent Flow Modeling Software FLOW-3DR

yoshihiro Miyamoto

FLOW-3DR is a unique computational fluid dynamic program that was developed by flow science inc. in us. FLOW-3DR has a full navier-stokes solver based on the fAVORR (fractional area volume of obstacle representation) finite difference scheme. the true vof (volume of fluid) algorithm is incorporated into FLOW-3DR that provides the reliable free surface flow analysis. FLOW-3DR has a variety of physical models. therefore FLOW-3DR is used in the wide range of industrial area including the inkjet or the coating. in this paper the feature of FLOW-3DR and the direct computation of dynamic contact lines, the application examples for the coating are described.

Tesa EasySplice FastLine
New Flying Splicing Tape Technology for Improved Productivity
Bernhard Gebbeken Dr.-Ing.
Tesa AG
Kashiwabara Yuki and Mukasa Munetaka
Tesatape k.k.

Tesa EasySplice, a new flying splice tape technology for straight line splicing in paper production is introduced. The tape design and function will be explained. In the next step various methods for splice preparation will be presented. Process improvements for offline coaters are: no air pockets during acceleration of the new jumbo roll, no wet areas after coating, less tape and no labels. This means increased productivity for the paper manufacturer due to higher splice security, faster splice preparation, higher splicing speed. Experiences by european customers and their product evaluation will be shown. Also experiences by a machine manufacturer is presented. An outlook is given to the application of flying splice at offline calenders.

Application of New Evaluation Method of Sheet Appearance to Various Coated Papers
Kasuke Fujita, Nobuhiro Matsuda, Hisashi Matsui and Yoshiaki Zama
Polymer Research Laboratories, JSR Corporation

Coated paper is required to have excellent sheet appearance. And it is well known that sheet appearance is affected by gross profile. Evaluation of sheet appearance is generally determined by visual inspection. However the evaluation method is subjective and not quantitative, so that the evaluation of sheet appearance is too difficult. For purpose of quantitative evaluation of sheet appearance, a few methods have been reported.

We reported that we developed a new evaluation method of sheet appearance of coated paper with using Scanning White-Light Interferometer(ZYGO New View system). And we found that the standard deviation of average of surface slope angles(ASSA) was strongly related to sheet appearance. That is, we can conclude that the more distribution of ASSA becomes uniform, the more sheet appearance becomes better.

In this paper, we measured distribution of ultra fine surface profile of various commercial coated papers, and studied influence of the standard deviation of ASSA to sheet appearance.

As a result, we found that the optimal threshold of ASSA at binarization changes with kinds of coated papers and optimal threshold is ±7° for A2 coated paper or ±10° for A3 coated paper. We also found that correlation with sheet appearance is the best, when it is not concerned with the kind of coated papers but the slope angle area ratio(SAAR) at binarization becomes 70%.

Keywords: Sheet Appearance, Coated Paper, Surface Profile, Standard Deviation,Scanning White-Light Interferometer, Surface Slope Angle, Binarization

Reports of 2002 International Pulp Bleaching Conference
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Pulp and Paper Research Laboratory of Nippon Paper Industries Co., Ltd.

A historical and technological review of the 17 International Pulp Bleaching Conferences from 1955 to 2002 confirms that the pre-eminent bleaching conference is indeed international. About half the papers had overseas authors. The "Big Four" countries Canada, USA, Sweden, and Finland dominate, but other countries, such as Brazil, have recently increased their share of papers considerably. The most recent bleaching technology milestones to be implemented in industrial operations are ozone bleaching and acid hydrolysis removal of hexenuronic acid.

Keywords: bleaching, ECF, mill closure, ozone, hexenuronic acid

Environmental Evaluation on Melting Treatment of Paper Products
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At present, there are some environmental problems such as an increase in the domestic waste and a shortage of landfill site in Japan. Especially, the amount of paper products (newspaper, photocopy paper, corrugated board, weekly magazine, gravure magazine, catalog, etc.) accounting for more than 50% of all domestic waste has been increasing. Therefore, the reduction of its incineration ash becomes a pressing task for using the landfill site as long as possible. In this study, the effect of melting treatment on the reduction of paper products was investigated, and the amounts of chlorine in combustion gas and in residual ash generated from each paper product were evaluated.

The melting treatment was found to reduce effectively the amount of paper products, and therefore to be effective for prolonging period of landfill site in Japan. The chemical composition of the slag prepared by melting paper products was mainly composed of several compounds in the SiO2-Al2O3-CaO system, and the slag was suitable for preparing various glasses. Furthermore, the melting temperature decreased in increasing amounts of glass cullet that was mixed with combustion ash. The amounts of Pb and Sb eluted from the molten slag in pure water, salt solution (3.5wt%) and acid solution (pH3) were much lower than those from the combustion ash. In addition, the chloride gas and chloride compounds in residual ash generated from the combustion of paper products were scarcely detected. These results suggested that the amount of toxic chlorine emitted by melting paper products is extremely small.

Keywords：Paper products, Melting treatment, Molten slag, Residual ash, Chlorine

Dioxins Levels in Chlorine Dioxide Bleaching of Hardwood Oxygen-bleached Kraft Pulp (II)
Levels before and after Mill Operation of Chlorine Dioxide Bleaching

Hiroshi Ohi
Institute of Agricultural and Forest Engineering, University of Tsukuba,

Some results of the plant-effluents from chlorine pulp bleaching mills showed the total TEQs are less than the effluent standard: the permissible limit for specified facilities（10pg-TEQ/L), but more than the environmental standard for public water（1pg-TEQ/L). The TEQs of 1,2,3,6,7,8- and 1,2,3,7,8,9-HxCDD are partly responsible for surpassing it. The origin of the HxCDDs in the effluents is thought to be the TeCDD in an agrochemical, but not to be lignin.

In Japan, CNP (chloronitrofen: an agrochemical made from chlorinated phenols) had been scattered in paddy fields as a herbicide. It has been clarified that CNP includes 1,3,6,8-TeCDD, 1,3,7,9-TeCDD and 2,4,6,8-TeCDF. It was found in some results of analysis that concentrations of 1,3,6,8- and 1,3,7,9-TeCDDs in effluents from kraft pulp bleaching plants are relatively high, for example, 100pg/L for 1,3,6,8-TeCDD. The toxicity equivalency factors (TEFs) for 1,3,6,8- and 1,3,7,9-TeCDD are not defined yet by WHO1998, and then their concentrations do not consist of the total toxicity equivalency quantity (Total TEQ). However, the TEFs for 1,2,3,6,7,8- and 1,2,3,7,8,9-HxCDDs are defined as 0.1. Therefore, the total TEQ of the effluent may increase if the HxCDDs form from the TeCDDs by chlorination.

Some results of the plant-effluents from ECF (chlorine dioxide) pulp bleaching mills showed the total TEQs are lower than the environmental standard (1pg-TEQ/L). It was found in some results of analysis that concentrations of 1,3,6,8- and 1,3,7,9-TeCDDs in effluents from kraft ECF pulp beaching plants are relatively high, for example, 440pg/L for 1,3,6,8-TeCDD, which should be impurities in the CNP. Laboratory bleaching using a mill LOKP and chlorine dioxide in the range of KF:0.14-KF:1.14 have shown that 2,3,7,8-TeCDD and TeCDF are not detected. It is considered that water qualities of process sewers in ECF pulp bleaching mills should be less than the environmental water quality (1pg-TEQ/L).

Keywords: Dioxins, Pulp Bleaching, Chlorination, Agrochemicals, Chlorine dioxide, Herbicide, Chloronitrofen,1,3,6,8-Tetrachlorodibenzo-p-dioxin, ,2,3,6,7,8-Hexachlorodibenzo-p-dioxin

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October 2002 Abstracts

Environmental Communication and Industries

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Environmental Communication is an exchange of environmental information among different actors, i.e. citizens, industry, public authorities and NGOs, to establish between them a partnership for the realisation of a sustainable society. For companies, it is a challenge to promote the communication of environmental information, the provision of which is not legally required but discretionary. In conducting economic activities, industries are consuming natural resources that are the common asset of all global citizens. In other words, citizens entrust the use of natural resources to industries in return for the fruits of their activities in the form of products or services. This means that citizens have a right to know and companies are accountable for providing information about the interrelations between companies' economic activities and the environment. In order for industries to properly take this responsibility in contributing to citizens' right to know, it is essential for them to grasp stakeholders' needs on corporate environmental information by promoting environmental communication. A study by the Ministry of Environment entitled 'Research on Industries' Environmentally Benign Activities' shows that companies have become increasingly aware of the importance of environmental communication in recent years. In future, for companies to promote environmental communication in an even more efficient and effective way, there are several points that need to be borne in mind. These are to: 1) define the stakeholders and aim of information provision, and choose the content and tools accordingly, 2) ensure comparability, credibility, objectivity and transparency of information, 3) add some originality to information provided as well as include negative information and 4) draw a future vision of the social role or responsibility that the company wishes to take and of the relationships that it wishes to develop with society.

The Yokohama Enviroment Protection Agreement and The Ideas

TamotsuAndo Enviromental Management Division Enviromental Protection Bureau of City of Yokohama

Yokohama City had started the construction of reclamation of Negishi Bay in 1959.In the reclamation area, large factories of electric power plant, gas industry, petroleum refinery, petrochemical industry, electrical industry, machine industry, and ship construction etc, were expected to be build. However, expansion of air pollution by the factories was anxious.

However, under the laws, Yokohama City did not have any rights to control or lead pollution stationary at that time. Then the city has agreed to have the contract "Pollution Control Agreement" with the companies based on science data and public opinions. The pollution control agreement has been contracted with Electric Power Development Co., Ltd. Isogo thermal power station first 1974, it has been applied to supplement pollution related laws and made good result, so it still has been

Contracted with many self-governing bodies since then.

As the situation surrounding Yokohama has been changed greatly from the agreement established, we are going to propose this agreement as "Environmental Protection Agreement" with considering the relationship among people ecosystem and global environment as well as supplement the laws relating to environmental pollution.

Corporate Environmental Communication-From the viewpoint of Non Governmental Organizations-

Tsunoda Kimie
Member of Steering Committee, Valdez Society

Sharing information is the prerequisite of the environmental communication. Qualitative aspects of general disclosure, for example, relevance, reliability, understandability, comparability, verifiability and clarify, are also fulfilled with the environmental disclosure. The sender of information should be grasped the " 6W1H" points.

According to the survey against companies certificated ISO14001 in Japan in 1999, they didn't always positively environmental disclosure and communication in spite of researchers' hypothesis. Companies certificated ISO14001 should be positively promoted the environmental disclosure and communication.

Corporate environmental reports (CERs), the base belong some corporate discloser's media, are published more and more in Japan. For readers, it is difficult to compare various CERs even them in similar industries, so I'd like to expect to develop common item or indices for much comparability in CERs by industries or industrial associations.

Chemical Risk Communication is took notice of recently in Japan with the enforcement PRTR Low. Chemical Risk Communication is the interactive process between corporate and stakeholders to promote understanding and construct credibility. Stakeholders wish not only safety but also peace of mind against chemical risk. Companies should be promoted communication to bring stakeholders' peace of mind.

Practice of Environment Communication

Sachio Otoshi
Asahi Glass Co. Ltd.

It will be important to the practice of environmental communication with community for industries after the making public of the emission of harmful chemical substances form facilities. We call it risk communication. Industries must explain the risk of these emissions and improve the understanding of the community. This paper explains about what are hazard and risk, and the process of risk communication.

The Future View for Establishing the Recycling-Based Society

Morishita Ken
Eco-Management Institute

In the 21st century, there is increasing pressure to move away from the current socio~economic system, which is based on mass production, mass consumption, and mass disposal and to establish an environmentally sound, sustainable society. In order for this to take place, the voluntary and positive efforts of businesses that play a significant role in socio~economic activities are crucial.

For businesses, management benefits can be achieved, through operating business of higher quality such as a reduction in the consumption of resources and energy, less disposal of wastes, or by providing environmentally conscious products and services.

In recent years, it has become increasingly aware that businesses have social obligation to disclose their own environmental information. The importance of publishing and disclosing environmental reporting, which summarizes the state of environmental management, environmental performance, environmental accounting information, and also promoting environmental communication with stakeholders, e.g. consumers, investors, customers, local public, has been increased.

RPF: Its present state and future

Katsushiro Seki
Seki Shoten Co. Ltd.

RPF(Refuse Paper & Plastic Fuel) is a fuel made of waste paper and plastics, and is attracting interest by its ecological character. Waste paper and waste plastics are reclaimed from big factories with great care on their sources. They are disintegrated separately to about 40 mm in size. Then, with a certain blending ratio, they are formed into pellets (8 mm in diameter and 10 mm in length). Its heat value is 6000-8000 kcal. These pellets are used as a solid fuel for boilers. The present monthly production is 10,000 tons, and capacity expansion projects are in sight. The demand is expected to be about 600,000 tons a year in 2005. The paper gives an outline on its production system.

Statistical Survey on Industrial Wastes and its Utilization in Pulp and Paper Mills in Japan

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Environmental Technology, JAPAN TAPPI
Industrial Wastes Committee, Japan Paper Association
Environmental Protection Committee, Japan Paper Association

Japan Paper Association surveys statistics on industrial wastes disposed from pulp and paper mills every year by sending a questionnaire to each mills. The result in the 2000 survey is as follows.

1.The coverage is 88.4 %, based on the paper production volume. It is the highest figure in these several years.

2.The total industrial waste generated, that is the sum of industrial waste reused and industrial waste finally disposed, increased 6 % in B.D. weight compared to that in the 1999 survey. It is due to paper production increase of 10 % in 2000.

3.The waste reused rate is 81%. The waste finally disposed reduced 11% in B.D. weight compared to that in the 1999 survey.

4.When compared to the 1989 survey, following improvements are remarked.

(1) The unit industrial waste generation is 22 % less than that in 1989.
(2) The water content of the industrial waste generated is reduced to 30% from 50% in 1989.
(3) The unit waste finally disposed is 80% less than that in 1989.
5. The guideline by Japan Paper Association for waste reduction is that the waste finally disposed in 2010 should be reduced to 450 thousand tons (as it is) from 2537 thousand tons in 1990. It is 612 thousand tons in 2000.

Solution for Dryer-part Deposit Originated Spot Prevention Spot Generation Mechanism and Prevention Program

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Maintech Co, Ltd.,Sales Engineering Div.

The spot problem originated from deposition of pitch, stickies and latex in the dryer section is becoming a critical problem under the condition of high DIP furnish, closed system and alkalization. These spots lead to production problems and quality problems such as increase of broke and joint work. To date, not a few pitch control program have been tried, high-pressure fabric(canvas) cleaning showers and double doctoring have been developed. However none of them have met with industry wide acceptance.
Maintech has developed a spot prevention program, a total solution that passivates all surfaces in the dryer section where the deposition could grow up to cause spots. The program starts with M/C survey and interview to M/C tender to investigate spot generation process, then present a proposal which installs right equipment in right positions, uses right chemical products in right application methods. The resulting surface passivation prevents depositions on cylinder, fabric and calender rolls and reduce the number of spots in the paper drastically.
Mills can take considerable advantage from this program. Elimination of deposits in the dryer section reduces not only the number of joints in the finished rolls but also broke tonnage and down time for M/C cleaning.
This paper reviews an investigation method of spot generation from dryer deposition. Case history illustrating gained benefits in a linerboard M/C is presented.

A Study of Print Mottle-Effect of Under Coated Layer on Double Coated Paper－

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Latex Research Center,Nippon A&L INC

The relationship between print mottle of double coated paper and characteristic of under coated layer were studied.
In this study on laboratory works, the influences of fiber coverage, surface roughness and water absorption rate of under coated layer on print mottle were considered with introducing the concept of critical fiber coverage（CFC）.
Print mottle of double coated paper was influenced by fiber coverage and water absorption rate of under coated layer.
This behavior is explained by the differences of water absorption rate between coated and uncoated part of base paper, whereas water absorption rate of under coated layer itself was influential over CFC.

"SHOWER ROLL"A Felt Cleaning Device

Toshio Kameyama
Aoki Machinery Co., Ltd, System Engineering Department

We have mainly installed and modified paper machines and other peripheral devices since our company was established. Then, we have developed a breakthrough felt cleaning device.
That is called "SHOWER ROLL" based on long experience and accumulated know-how. Lately,
Importance has been placed on the recycle of papermaking materials. Under such circumstances
most paper manufacturers are struggling against the problem of cleaning equipment resulting
from applying poor quality of waste paper. Moreover, the application of cleaning chemicals,
detergents, and the like accordingly causes increase in cost to make a commitment to effluent treatment problem.
Now, we will present our new type of felt cleaning method coming from a novel idea, which is
totally different from conventional methods and explain the features well.

Valmet-Raisio Color Mat System For On-Line Measurement of Coating Color Properties in Coater Supply System

Yosuke Takesita
Nippon U.S. Machinery Co., Ltd

The quality controlling for the coating color used to be carried out so far by picking up color samples periodically from the line and bringing them to a laboratory for analysis.

However, in the much improved and high speed production sites of these days, the above method would inevitably bring us about a large amount of loss in the color production, since the method would consume much time, after any detection of undesirable things and before any counter-measure to be taken to stop it would be taken. This has become the more peculiar, the hirer the machine speed has got, and "on-line color analysis" has become a must with that much increased coater speed.

On the other hand, the continuous color make-down system has made its debut, out of the tendency to minimize the color consumption and to best optimize the production efficiency, and it calls for "on-line color analysis" as an indispensable part of it.

"COLOR-MAT" is a highly reliable an on-line color analysis system which on-line takes measurements of temperature, solid content, air content, and rheology factors, and is even equipped with a self-cleaning system. It can be connected to whichever existing DCS systems in mills, and has been introduced to a larger number of paper mills in Europe.

The best position along on the coater line at which "COLOR-MAT" should be line-connected, should be as much closer to a coater head as possible, to optimize the coater operation and consequent paper quality.

Ozone treatments of bleached kraft pulp and wastepaper Ⅱ.
Simultaneous use of ultraviolet lights and hydrogen peroxide during ozone treatment of bleached kraft pulp

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Media R&D, Fuji Xerox / Supply Business Company
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In a previous report, it was found that the brightness and the sheet strength tended to be improved when the chlorine compound component included in the pulp decreased during the ozone treatment of the chlorine-type bleached pulp. At this time, ultraviolet lights and hydrogen peroxide were simultaneously used during the ozone treatment of the bleached kraft pulp as an application of the advanced oxidation process. The effect of the treatment by each combination of ozone/ultraviolet lights, ozone/hydrogen peroxide, and ozone/ultraviolet lights/hydrogen peroxide on the various physical properties of the pulp fiber and the changes in the chlorine compound in the pulp were examined. In this experiment, three kinds of light sources with different wavelengths and outputs were used as sources of the ultraviolet lights, and changes in the reaction condition such as the amount of addition of hydrogen peroxide and the presence of the stabilizer, etc., were evaluated. The total halogens (TX) and the ethanol extractable organic halogens (EOX), which were the index of the chlorine compound, freeness, water retention value, limiting viscosity number, tensile strength, and light scattering coefficient, etc., of the sample were measured after the treatment.

Both the total halogens (TX) and ethanol extractable organic halogens (EOX) decreased compared to the value by the ozone treatment alone when the pulp was treated by the ozone/ultraviolet lights combination. On the other hand, the brightness and tensile strength were significantly improved when the pulp was treated with the ozone/hydrogen peroxide combination. For the combination of ozone/ultraviolet lights/hydrogen peroxide, the tensile strength was remarkably improved. Moreover, it was found that the improvement in the sheet strength by the ozone treatment was attributed to an increase in the bonding strength between the fibers as a result of the tensile strength and the zero-span tensile strength measurement of the handsheet after the treatment.

Keywords: Ozone treatment, Advanced oxidation process, Chlorine-bleached pulp, Total halogen, Extractable organic halogen, Uitraviolet light irradiation, Hydrogen peroxide, Tensile strength, Brightness

Surface Chemistry of Deinking Process:Correlation between Surface Free Energy of Ink and Deinking Agent on Office Waste Deinking

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The surface properties of four types of inks (toner ink, inkjet ink, offset newsprint ink and heat-offset ink) and their effects on office waste deinking were investigated with regard to the surface tension of deinking agents. The surface free energy of those inks was determined from the measured contact angles and surface tensions of probe liquids using the Lifshitz-van der Waals/acid ?base approach. All of the tested inks were characterized as having low-energy surfaces and the major contribution was derived from the Lifshitz-van der Waals component. Among them the toner ink had the lowest surface energy whereas the inkjet ink had the highest energy. The contact angles of deinking agents on the ink decreased as the surface tension of deinking agents decreased. On the other hand, the deinking experiments indicated that detachment efficiency of the inks from the newspaper and copy paper became highest when the surface tension of deinking agent was similar to the Lifshitz-van der Waals surface energy component of the inks. Furthermore, the hairy toner/clean toner ratio, which was calculated by visual microscopic observation, showed that the deinking agents, which gave better toner ink detachment, facilitated toner ink break down. It was concluded that the surface energy is an important parameter in office waste deinking.

Keywords: contact angle, deinking agent, office waste, surface energy, surface tension

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November 2002 Abstracts

Cationic rosin size for weakly acidic and neutral papermaking
Muneo Sakamoto and Che On Au Nissan-Eka Chemicals Co., Ltd.

High levels of calcium carbonate in waste furnishes and increased contaminants in the closed backwater systems have set new demands on rosin sizing in neutral pH. Eka Chemicals have developed new sizing systems to meet these challenges :
・Rosin ester (Bewoid Extra)
・Use PAC (Ekafloc) instead of alum
・Rosin aluminium pre-mix (Bewomix System)
・Cationic rosin size (Composize)
Cationic rosin size, consisting of rosin particles stabilised by cationic polyelectrolytes via protective colloid action, represent the best approach to rosin sizing at neutral conditions. Due to its self-retention property, cationic rosin size can give superior sizing efficiency, reduction in alum usage, and improved machine runnability.

Keywords; Sizing at neutral pH, Cationic rosin size, Rosin ester, Rosin aluminium pre-mix, PAC

Blow through Steam Reductuons with the ‘Flonage’ System
Shigeo Miyata
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Spirax Sarco (Japan)Ltd.

The ‘Flonage’ System is the system which brings a dryer perfect condition, by controlling blow rate with a separator and steam flow meter installed on the downstream of the dryer.
The ‘Flonage’ system enables heating pressure (temperature), revolving speed and steam blow rate to be standardized in figures. Also, this system is highly effective in optimizing energy consumption rate by minimizing steam blow rate to downstream.
Advantages of the ‘Flonage’ system are as follows.
1. Easy standardization by optimizing blow rate in figures for a best manufacturing condition.
2. Stable production by blowing quantitatively, no matter how pressure fluctuation on the downstream is.
3. Minimizes energy consumption unit by the decreasing unnecessary steam blow.
4. Improves boiling in the condensate tank.

Development of High Corrosion-resist Surfaces for Metering Roll
Norio Fujita and Yasuhiro Mochida
Nomura Plating Co., LTD

We reported corrosive phenomenon of metering roll from an electrochemical standpoint last year. Its result showed a few combinations of top-coat and under-coat may show higher corrosion resistance than conventional coating. So actual corrosion resistance was verified by corrosion test in dynamic condition with test plant size machine. As a result, Cr coating on Ni-W alloy coating showed superior corrosion resistance.

Advantages of the Flexishaft for Progressing Cavity Pump in Paper and Pulp
Toru Iwata
Iwaki Co., Ltd. Promotion Department.

For the color coating process in Pulp & paper industry, lots of pumps are installed. Among these pumps, Progress-Cavity pump is mostly prevailed.

"Mono Pump" company of United Kingdom have succeeded to develop new kinds of joint, called flexishaft less joint, which is very far from conventional idea of joint.

The flexishaft has no wearing parts as a new construction of oil-less. That created the advantage of Progress-Cavity pump and makes it easy handling.

We now would like to explain the effects of the flexishaft for Progress-Cavity pump.

Trend in Mechanical Seal Technology in Pulp and Paper Plant Failure and Countermeasure Examples of Mechanical Seal

Hidekazu Takahashi
EAGLE INDUSTRY Co., Ltd. Seal Engineering Dept.

In a pulp and paper plant, a large number of water pumps and various different pumps for pulp or chemicals are utilized in the production processes from economical point of view (energy saving, resource saving and maintenance saving) and environment preservation point of view. Mechanical Seals are also utilized for other rotating equipment including agitators, screens and refineries. This text describes failure and countermeasure examples of Mechanical Seal for pulp and paper industry.

Latest Activity of Algas Microfilter－The Reference Report from Japanese Market－

Yasuo Harikae
Itochu Sanki Corporation

In compliance with social requirements on environmental protection, pollution control for water at a pulp and paper mill is becoming more and more important. Also, water consumption need to be decreased in light of material resource saving as well as production cost saving.

Under the circumstance, not less than 500 Algas Micro-Filters (AMF) are running all over the world and we have installed 14 AMF in Japan since 1998. AMF can contribute to re-use fibers, clear water and additives from white water, effluent water etc. and to reduce cost of water treatment as well as water discharge.

This report is to explain the basic construction and features of AMF and the successful references of AMF installation in Japan.

E.C.H. Will Model "GFS" Global Folio-size Sheeter

Mamoru Fukumoto
K. K. Irisu

Since 135years E.C.H.Will Hamburg is one of the leading manufacturers of converting machinery for the paper industry.The company has gained worldwide acknowledgement when introducing cut size sheeters for copy paper. These machines are used worldwide by all well-known paper makers and also in the meantime by smaller paper converting companies.

With regard to folio size sheeter E.C.H.Will was and is reknown for special solutions instead. Based on and with the knowhow of hundreds of cut size sheeters and some hundred folio size sheeters having been delivered, the concept of the Will "global folio size sheeter" type GFS has been developed.

The great technical experience in cutting and transporting paper as well as introducing innovative ideas, new materials and, last but not least, the influence of various customers' requests, which are known to E.C.H.Will from numerous special projects, were the base for development of the GFS folio sheeter.

Introduction of Calculation Soft for Pressure Dropping in the Transportation Piping of Liquid Pulp Sigeru Saito

Engineering Group , KITZ Corporation

Generally speaking, the pressure dropping degree of pulp liquid depends upon the nominal size of piping and concentration, speed and freeness of the liquid.

On the equipment designing, the calculation of pressure dropping is one of the most important things in selections of pump and nominal size of piping and control valves, however, as indicated in the Figure 1, it seems very difficult to calculate manually in each case.

Upon the requests from our customers and under the above situation, we have developed the unique calculation soft with our own invention, in order to realize an easy calculation by the personal computer.

It has already been introduced for some particular customers, but we, hereby, would like to make it open for all customers. We are very pleased, if this soft could be useful for you.

Fibers, Fillers and Fines Recovery from the Process Water Coming from Paper Machines and Stok Preparation- O.M.C."GAMMAFILTER"-

Takefumi Ide
Taizen Co., LTD.

The GAMMAFILTER assures, compared with the traditional filters, a very large filterring surface (6 times larger), thank to the particular shape of the wires.
The suspended materials settle in the inner side of the drum, which constantly and slowly turns around its axis, forming a layer, whose thickness grows gradually as the drum dips into the water.That operation improves the filtering action, too. If necessary, some chemicals can beadded in the feeding to optimize the coagulation or the flocculation.Thanks to a level difference of 30cm max from the inner and the outer part of the drum,which can be adjusted by a mechanical overflow, the water naturally flows by gravitytowards two symmetrical lateral purges.

The suspended solids contained in the water settle on the wires and create a layer whichstays on them.

High Rate Nitrogen Removal Process by Moving Bed Biofilm Reactor"PABIO DENI"

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The necessity for nitrogen removal is increasing from the viewpoint of eutrophication control in recent years. Although a Modified activated sludge process was prevalent in the nitrogen removal process, since there are some faults such as long Hydraulic retention time (HRT), the various efficient process of replacing with this process have come to be developed and put in practical use. We put in practical use nitrogen removal process, PABIO DENI, which is the fluidized bed using the carrier elements made from polyethylene as a moving carrier elements. This process has the characteristics that the treatment in the HRT of 1/2 to 1/3 of the modified activated sludge process is possible, the high nitrogen removal efficiency is acquired at 10°C, and it can be adapted for the various forms of existing reactors, etc.

A demonstration tests confirmed efficient and high treatment capability such as a high removal ratio as 98 % or above with volumetric loading 0.9 kg-NH4-N /m3･d for nitrification and with 3.5 kg-NO3-N /m3･d for denitrification, the nitrogen in treated water becomes below 10 mg / L even if HRT is 5 hrs.

In this report, while an outline of the principle, the structure and the treatment method of the fluidized bed nitrogen removal process is introduced, a part of the demonstration test result is reported.

Keyworld: Nitrification,Denitrification,Moving Bed Biofilm Reactor, Carrier Elements

Current Progress in Plant Genome Research and Tree Biotechnology-Present and Future Prospects-

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Progress in molecular biology in the 1980s brings enable us to analyze various type of biological nature of plants at the molecular (DNA) level. Genetic engineering based on the molecular biological techniques provided exciting opportunity to produce transgenic plants and mutant lines with altered phenotypes and to better understanding the physiology, biochemistry of plants. Furthermore, much of knowledge how plant grow and develop has been gained from research in genome area such as complete genome sequence Arabidopsis thaliana that is being used worldwide as a model organism for basic and applied research in plant biology. Likewise, novel approaches such as express sequence tags, genome sequencing and enhancing traditional strategies for woody plant research. This paper provides a comprehensive overview of tree biotechnology and the areas currently being researched on biosynthesis of cell wall.

Report on 2002 TAPPPI Coating Conference-Recent Trend of Coating Technologies－

Akio Okagawa, Ph. D.
Noah Enterprise Limited

TAPPI 2002 Coating and Graphic Arts Conference and Trade Fair was held at Rosen Center in Orland, Florida on May 5 to 8, 2002. More than 600 people of paper industry and allied industry from all over the world attended the conference. This report summarizes the contents of the conference. Recent developments of non-impact coating such as curtain coating and spray coating are almost reality. It is the matter of time we will see an actual installation near future. Further new technologies presented at the conference is dry coating using electrostatic force and thermo-mechanical treatment. Number of new developments on coating pigment, especially engineered type kaolin and calcium carbonate, latex binders and various chemicals to improve coating operation were also presented.

Techniques for analyzing paper properties by applying image processing to light transmission image

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Abstract

The pattern matching technique is applied to light transmission images to analyze paper properties and its versatility is demonstrated. A prototype system developed for obtaining light transmission images consists of a CCD camera, diffuse illumination from the backside of a specimen and software. In pattern matching, one of the two images to be compared is divided into small rectangular blocks. The other image is searched for a block with a similar pattern to one of the blocks of the first image taken as a template block while the block frame is moved pixel for pixel. The similarity is judged based on the inner product of the two block images as a vector. Ten-fold interpolation with the high-resolution bi-cubic spline interpolation function is successfully applied to estimate the deformation distribution with ten-fold precision. In-plane distribution of tensile deformation is measured well even for paper with good formation. This technique is applied to in-plane distribution of restraint drying shrinkage of wetted copy paper. When a paper specimen is set and constrained vertically, every block around the center of the specimen totally shifted upward. It is because water moves downward by gravitational force, resulting in that the top part that dries and shrinks earlier draws the fiber network mostly from the flexible wet part immediately below. Thermography proves the water movement as a portion of low temperature due to absorption of evaporation heat remains to the last moment around the bottom part. On the contrary, when set horizontally, the specimen does not exhibit any total shift in the restraint direction, but shows shrinkage only in CD as well as observed with the specimen set vertically. For free drying of the copy paper, a flatbed image scanner was used to acquire images. The shrinkage tends to occur in a complicated manner, distorted by mixture of CD and MD shrinkages.

Biobleaching of Kenaf and Shirakaba Pulps by Wood-rot Fungi

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White rot fungi OM5-1 and KUF2 isolated from the experimental forest of Kochi University had high abilities to brighten the kenaf bark pulp and the shirakaba pulp, respectively. Bleachabilities of both fungi were compared with those of standard fungi, i.e. Phanerochaete chrysosporium and Pleurotus ostreatus. Brightness increase of kenaf bark pulp by OM5-1 was much larger than that estimated from kappa number decrease. The similar tendency was observed when the shirakaba kraft pulp was bleached by KUF2. Bleachability of kenaf core pulp by fungi was not similar to that of kenaf bark pulp, but to that of shirakaba pulp.

Cumulative activities of ligninolytic enzymes from each of above four fungi had linear relation to the pulp brightness increase obtained by each fungus treatment. But, during later periods of treatment only the kenaf bark pulp showed higher brightness out of this linear relationship.

For kenaf bark pulp and shirakaba pulp, OM5-1 and KUF2 showed the highest pulp viscosities, respectively.

Keywords: kenaf bark pulp, kenaf core pulp, biobleaching, white-rot fungi, ligninolytic enzyme activity

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December 2002 Abstracts

OptiLoad Calender-Multinip Calender-
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Sumitomo Heavy Industries Techno-Fort Co., Ltd.

The OptiLoad multinip calender has been in the forefront of the new surface treatment technology. Launched in 1996, the OptiLoad has become a synonym for the new generation multinip calender. The total number of all OptiLoad ordered is nearing forty, and the market, especially for on-line applications, has only just opened up. There are clear reasons behind this success. OptiLoad contains many innovative features, which have been specially developed to improve the efficiency and reliability of the new calender generation. Non-compromising design criteria and thorough pilot testing have contributed to predictable start up curves and the avoidance of surprises, for example polymer roll failure.

On-line technology has been the focal point of the OptiLoad development from the very beginning. On-line technology has proceeded from newsprint and SC paper to coated woodcontaining grades and finally also to coated woodfree grades. In fact, on-line technology has now been applied to all major printing and writing paper grades.

Systematic Approach Janus MK2
Eiji Ando
Engineering Dept. Voith IHI Paper technology co., Ltd.

The supercalender is the reigning device to produce high quality paper with a long tradition. Development of softcalender around 1980 represented a step forward, however, the softcalender likewise failed to meet all quality demands. In this respect the supercalender remained unchanged. In only five or six years, the Janus concept has in fact brought about a quantum leap in calender technology. This implementation has definitely derived from the new cover and material technology. This article introduce the new development via the systematic approach and how did it make up for the long stagnation in supercalender.

Modern Winder Improvement
Michio Takahashi
Jagenberg Co., Ltd., Voith Paper Group

According to the demands from the market, paper mills are forced to produce better quality rewound rolls day by day, for which winder technology must be improved. Further, not only roll quality side but also size of shipping roll is becoming larger and larger due to printing reason.

Under such a circumstance, Voith Paper Jagenberg GmbH improved single drum winder taking into consideration of the following important factors.

1) Rewound roll hardness control by center-winding. Individual rewound roll control ispossible.
2) Full automatic reel set changeIn order to reduce number of operator, full automatic reel set change is developed.
3) One man operation is possible.
4) During winding process, there is no influence on rewound roll quality by increasing rewound roll weight.

According to the improvements, Vari-Plus can run with the most suitable tension for the applied paper and winding most suitable rewind torque for desired hardness. Therefore, we can expect less paper breakages and obtain exact required harness of roll.

WINROLL Winder－ Winding concepts and WINROLL winder －
Hitoshi Takii
Sumitomo Heavy Industries Techno-Fort Co., Ltd.

Increasing the size of rolls of rotogravure, LWC and newsprint, increasing the speed of printing press, and evolving of paper grades and paper making processes require to match the capacity of winder to the paper machine operated with high speed.

Based on these demands, minimizing manual operating and increasing operation productivity, Metso developed the completely new multi-station winder called "WINROLL". There are many automated functions such as "splicing at unwinding stand", "web threading", "core handling" and "tail fastening", which make one-man operation possible.

The WINROLL winder is able to produce 10 ton and 4 meter width rolls by new technologies.

Automatic Transfer System between Reel and Winder－Try for Automatic between Reel and Winder－

Makoto Inohara
Mitsubishi Heavy Industries, Ltd.

Generally, after being made by paper machines and taken up by reels, jumbo rolls are taken out and transferred by cranes, and then supplied to winders. In empty spools after paper is wound by the winder is removed. Thereafter, the empty spool is returned to the reel by cranes. For the meanwhile, since the operation above requires manpower when using cranes, to eliminate such crane operation, automatic transfer systems and labor saving between reels and winders have been sought-after.

In order to achieve this automatization, we delivered the "Automatic Transfer System between Reel and Winder" to Nippon Paper Industries Co., Ltd. Yatsushiro Mill N-2 machine and Daishowa Paper manufacturing Co., Ltd. Yoshinaga Mill No. 14 machine, which realized unmanned transferring of jumbo rolls and spools between reels and winders, resulting in reduction of the transferring time and improvement of safety factor as the crane operation can be eliminated.

In order to meet the needs for speeding-up of the paper machines, we introduce double-winder arrangement to our Automatic Transfer System between Reel and Winder for jumbo rolls. Simultaneously, we are aiming to totally automatize the transferring system of jumbo rolls between reels and winders.

- SLITTING-The European way-
- Latest Development In Slitting Technology And Dust Reduction -

DIENES WERKE GmbH & Co. KG
President：Rudolf Supe-Dienes
○Vice President(Marketing Asia)：Norbert Lanzerath

DIENES WERKE GmbH Co.& KG developed some new systems for web cutting.

We introduce their systems, for example, Dienes Digital Measuring System, "ASPS",Anti-dust-surface (ADS). Furthermore we introduce Dienes's cutting theory for best quality of cut edge and less paper dust.

Current Situation of Fully Automatic Random Roll Wrapping Machine

Takeshi Ogasawara
Finishing Machine Sales Engineerring, Kawanoe Zoki Co., Ltd.

The wrapping process, which is the final finishing process for rolls (products), must meet the needs of a larger wrapping volume and a larger variety of wrapping specifications than ever before. As production control in the entire plant becomes computerized, roll wrapping machines also receive wrapping data on-line, paving the way for automatic wrapping to process a large volume and a large variety of specifications. Now we have developed a roll wrapping machine that can process rolls produced by several paper machines, by increasing its wrapping capacity as well as enabling it to follow a large variety of wrapping specifications.

This machine consists of a bar code reader, inkjet printer, wrapping machine, and labeler. Operation data for each part can be set or changed easily through a touch panel. The operator training will be completed in a relatively short time.

This machine has demonstrated high reliability as equipment that plays an important role in the final finishing process for rolls.

Optima＜New Design Roll Wrapping System＞

Yasuhiko Shirokane
Engineering Dept. Maruishi Co.,Ltd

With the increased speed and width of paper machines, larger paper rolls are produced for even faster printing machines. Corresponding to these requests, each machinery manufacturer is trying to develop high-quality, full automatic and labor-saving winders for bigger paper rolls with good quality. Thus, for more stable and efficient production, the recent trend of the finishing line is one unified wrapping system optional with the diversity of wrapping forms for various paper rolls from several winders.

As a result, Maruishi-Saimatec newly-developed wrapping system, capacity over 150 rolls/hr. with only one operator, has become a realized dream to paper mills around the world. This super productivity is achieved on account of on-line synthetic FA control, a robot system, innovated index conveyors and so on.

We would like to introduce such new technologies jointly developed by Maruishi in alliance with Saimatec. In order to provide equipments that meet the various needs of paper mills around the world, our technologies and innovations will go on.

In this article, I'd like to explain in details the rationalization concept and optimum features of "Optima-Multi roll Wrapping System", particularly about the "Robot Lap System", which is highly evaluated around the world.

Logistic Information System for Pulp and Paper Industry

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Information Solution Business Division, Yokogawa Electric Corporation

The information processing business on the pulp and paper industry is dramatically changing for recent few years. This remarkable progress comes user request and vender proposal by using the latest IT technology with rapid development.

Thus, the purpose of logistic control system on the pulp and paper mill has changed from labor saving and partly-process optimization to all-process or all-mill optimization. Therefore, the engineer required more rich experiences and extensive knowledge such as computer, process, plural vender control, etc. than before.

In this article is presenting the most effectiveness logistic information system by using our recent delivery experience.

Operating Experience of Janus Calender to Yonago N-1 Coater Machine

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Yonago Mill, Oji Paper Co.,Ltd.

N－1 Coater at Yonago mill, Oji Paper, has been in operation since September 1997. The Coater has two coating stations of 7,290mm coating width, and the design coating speed is 1,600m/min, producing mainly 700tpd of woodfree coated paper.

Janus Calender from Voith Paper, Germany was installed following the coating section as an on-line supercalender for the first time in the world. The primary objective of having on-line supercalender at the coater was to reduce the initial investment and maintenance costs, to achieve higher personnel productivity, and to produce coated paper of better quality. This article introduces the latest operating experience of N-1 coater and Janus Calender.

A Report on 17th ISO/TC6 Meeting

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ISO/TC6 held a meeting on June 10-14 in Paris. Two Sub Committees and thirteen Working Groups also met during the week of the ISO/TC6 meetings. Seventy-five delegates representing seventeen countries attended the meeting of TC6.

A new work item for the measurement of fibre coarseness will be carried out within TC6/SC5/WG18, which was renamed "Fibre properties". TC6/SC2/WG29 "Thickness, density and specific volume" was reconstituted for the revision of ISO 534. WG30 "Tensile properties" and WG31 "Edge quality of cut-size office paper" were also established within TC6/SC2.

TC6/SC2/WG25 is in progress of formalizing the appointment of Messmer and Lorentzen & Wettre as Standardizing Laboratories for the calibration of print-surf dummy heads according the requirements in ISO 4094.

At the plenary meeting of ISO/TC6, it was announced that the next meeting would be held in Tokyo from November 3-8, 2003.

HBS pulping (4)- ECF Bleaching of HBS pulp and Thermo-stabilization of HBS Solvents-

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Todomatsu (Abies sachalinensis Mast.) chips as softwood gaveT-pulp with a Klason lignin (KL) content of 5.6% and a viscosity degree of 21.5 cP at a yield of 50.3% by HBS pulping with a mixture of 70% aqueous R-1,3- and 1,4-butanediol (as RHBS shown in Fig. 1) at 210°C for 3 h. Birch (Betula platpylla var. japonica Hara) chips were cooked with 80% RHBS at 180°C for 3 h to give B-pulp with a KL content of 5.0% and a viscosity degree of 43.4 cP at a yield of 54.3%. Chinese reed gave R-pulp with KL and ash contents of 2.5 and 6.3% in a yield of 48.7%, when cooked with 80% RHBS at 200°C for 2 h. B- and R- pulps were fully bleached by ECF sequence with OD, and T-pulp with ODEPP. Bleached B- and T-pulps had TI of 12.4 and 17.6 mN・m2/g, indicating that TI of HBS pulp was remarkably improved by ECF bleaching. Seventy and 80% aqueous HBS such as 1,3- and 1,4-butanediol, propylene glycol and 1,5-pentanediol were quantitatively recovered on heating at 190°C for 2 h, so they can be reused repeatedly as pulping solvents without distillation for purification and also with a little loss.

Keywords: HBS pulping, high boiling solvent, wood, reed, ECF bleaching,save-energy pulping process

Elastic Deformation Analysis for Case (Square Tube) of Corrugated Fiberboard Box Shape under Uniform Compression

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A formulation of elastic deformation was expressed for side plates in the case (width L/height h=1/2~2) of the corrugated fiberboard box shape (CFBS) supported by upper and lower edges under uniform compression loading. Then from this formulation, behaviors for stress and strain were discussed.

Normal stresses σx, σy and strains εx, εy in width and height directions for the plate are symmetric to center lines of the width and the height, and shear stress $\tau x y$ is anti-symmetric. And εx is mainly plus and εy is minus, and the maximum of εx is in upper and lower edges and the maximum of $\cdot \varepsilon y \cdot$ is at distance L/7 from the upper or the lower edge in side edges. The maximum value of εx is about 10% to the maximum value of $\cdot \varepsilon y$. The maximum of $\cdot \sigma x \cdot$ is constant to increases of L and h, and the maximum of $\cdot \sigma y \cdot$ increases a small with L increase and decreases a small with h increase. The maximum of $\cdot \tau x y \cdot$ decreases obviously with L increase and increases obviously with h increase. The maximum of εx first increases a small and next decreases obviously with L increase, and first increases obviously and next decreases obviously with h increase. The change of the maximum of $\cdot \varepsilon y \cdot$ is a small to changes of L and h.

Key Words：Computational Mechanics, Structure Analysis, Elastic Bending, Strength of Corrugated Fiberboard Box, Elastic Stress Analysis, Structure Strength, Numerical Analysis