JAPAN TAPPI JOURNAL
1
January 2019
Vol. 73, No. 1

CONTENTS

The Special Issue of the 61st—2018 JAPAN TAPPI Annual Meeting at Omiya, Saitama

2019 January JAPAN TAPPI JOURNAL

Vol.73, No.1　Abstracts

High Pressure Washer for Canvas 「Blower Suction type Super Cleaner」

Chihiro Murayama
Technical Sales Department / AIKAWA IRON WORKS CO.,LTD.

We have so far had more than 100 installations for the canvas cleaning devices, since in the beginning a scan jet shower device, and in 2003 delivered the high pressure cleaning device “combi cleaner” for the first time in Japan, then in 2007 delivered the first domestic-made super cleaner.

The conventional high pressure washing equipment has the eco - wash function that is performed during machine operation, and in the high pressure washing category there has historically been an upper limitation of two high pressure nozzles (orifice diameter 0.2 mm) not giving the negative influences to the paper quality.

It has however recently become possible to increase to between 5 and 12 nozzles using high pressure nozzle diameter of 0.2 mm, by changing the cleaning head shape and applying an ideal nozzle formation.

We will then introduce the features and case studies of the latest Blower suction type Super Cleaner.

Development and high efficiency of vertical separater，washer，and fiber recovery “ Vertical Z ”

Takefumi Ide, Masayasu Kamijo, Saki Ueda
TAIZEN CO.,LTD.

Taizen recieved a Japan TAPPI Sasaki prize in1999 for our product “Taizen Pulp Washer”， and we recieved this year's Sasaki prize for “TaizenVerticalZ”, it was our second Sasaki prize.

We have been developing washers from horizontal type to vertical type, and it has resulted in the greatest step up. Especially for fiber recovery from low consistency and large quantity of white water or waste water. We introduced“TaizenVerticalZ”in this paper in2011, but this time we will introduce new features for “TaizenVerticalZ”.

We appreciate the support from“TaizenVerticalZ” users, and appreciate the opportunity to introduce this paper to the paper manufacturing industry again.

MaxiTrasher System and Continuous Detrash System
-Suggestion of the latest contaminants removal method for lower quality waste paper-

Keiji Yasuda
Aikawa Iron Works

The paper mills in Japan using waste paper as main raw material have been required urgent counter-action against the lower quality waste paper grade since China enforced the law in 2017 prohibiting the unsorted waste paper imports. The countries in South-East Asia also need to prepare the same action since the unsorted waste paper refused by China have been sent distributed to South-East Asia nowadays.

In this paper the MaxiTrasher system that was released recently and the Continuous Detrash system that was developed from the MaxiTrasher technologies are introduced. The both systems would be an effective solution against the lower quality waste paper.

Pulping and Detrashing technology for the solution of contaminants treatment

Masamori Tanaka
Voith IHI Paper Technology Co., Ltd.

The role of Pulper is not only to defiberize the raw material but also to separate raw material into fibers and contaminants. Nowadays the property of raw material is changing and the role of pulper for contaminants separation is getting more important. High-Con Pulper has no slushing function and so most of contaminants are rejected without cutting into small pieces. It has good effect for outlet quality, but Low-Con Pulper can use much smaller perforation diameter of screen plate and it enables better quality than High-Con pulper outlet.

To treat wet-strength raw material, High-Con pulper needs longer pulping zone even normal raw material does not, and it requires more installation space. In Low-Con pulper, defibered material goes through the screen plate quickly and flakes remains in the vat. This means that capacity and installed power are mainly used for non-defibered material and the size of machine can be more minimized than High-Con pulper.

The latest detrashing system consists of Junkomat, IntensaMaXX and ScreenDrum. They are operated by automatic sequence and it is possible to adjust their operating

condition based on the contaminants property. Less dilution water is required in the system and so their sizes and motors can be minimized because the volume to handle is less than diluted one.

Now and for future, the ratio of contaminants in raw material seems to be unstable. For future pulper and detrashing system, more flexible function will be required based on their features.

New counter mesurement against the Fabric defect combined with Dryer Section Deposits Prevention and high recovery ,high pressure cleaner

Tomohiko Nagatsuka
Application Development Section
MAINTECH CO.,LTD Fuji Technology Development Center

As the recycle pulp is increased, the amount and adhesive deposit is also increased in the system. Particularly, the adhesive deposits lead to serious problems in paper-making machine which cause sheet breaks or defects in a finished paper. Paper-making machine adopts Maintech Dry-part surface prevision(DSP)technology and the high pressure cleaner to this problem on the Fabric, but this combination which the cleaner removes Maintech DSP coating on the fabric turned out to be unsatisfactory. On top of that Besides remaining water of some cleaners sometimes leads to water mark and spot on the paper.
So Maintech and IBS together have developed “Fabrikeeper” that is the combined technology of DSP and IBS cleaner “Fabricare” .
This report introduces the concept of “Fabrikeeper”and examples applied in the paper machines.

Selection and development of trapping tools for effective best management

Tomohiro Ohba
Earth Environmental Service Co., Ltd

Using the insect trapping tools is a basic measure for pest management. The use of the trapping tool has the purpose of killing insects and investigating (monitoring). For effective pest management, it is necessary to understand the features of various models, and to select an appropriate model according to the use purpose and place of installation of the insect trapping tool. In this report, I explain the features of each model together with our product development.

Adhesive type insect trap is a trapping tool that captures insects with adhesive paper. This model is suitable for investigation (monitoring) of insects. There are also large size models that can trap many insects. Our adhesive type insect trap ESCO 641 is equipped with a generator of induced sound waves, it can also use odor-attached adhesive papers (641 Kobae sheets) and real time monitoring equipment (EMS-Q). ESCO 641 is a model that enhances trapping performance and investigation function. Suction type insect trap is a trapping tool that that captures insects by suction with the fan. This model can trap many insects. Our suction type insect trap ESCO AIR 640 can strongly capture insects with a wind speed of 13 m / s.

We developed a new insect trap ESCO LED 641 using LED as the attracting light source. This model not only saves power by using LED but also enhances the trapping performance by edge effect, flicker function, induced sound wave and strong adhesive sheet. It has 1.2 to 3.5 times capture performance than conventional products, and it is excellent also in capture speed and capture performance in bright places.

How the paper industry in Japan has technologically responded to the paradigm shifts of the Japanese society

Part5： Key-technology, Information Revolution and the Summary of the Series

Kiyoaki Iida

Since 1960, the industries manufacturing goods in Japan made better use of the solid state technology that was newly developed, improved productivity and upgraded product quality, and led the world in manufacturing sectors. The progress of the solid state technology, however, stagnated in the 1990s. The technology spread to other countries which, then, chased Japan. Exactly at that time, the information technology that would be a key technology of the next generation was invented, in which Japan was behind by a couple of steps.

The industrial society that started from around 1800 kept increasing its GDP by almost the same rate per year, exponentially in other words. The information society beginning from 2000, on the other hand, has reduced the energy consumption per unit production exponentially every year. That will be a hope of being a sustainable society.

The content of this series is summarized in the last part.

Surface Modifications of Cellulose Nanocrystals and Their Applications

Jun Araki
Institute of Textile Science and Technology, Academic Assembly,
Shinshu University and Institute for Fiber Engineering (IFES), Shinshu University

Cellulose/chitin nanowhiskers (NWs) obtained by acid hydrolysis of native cellulose and chitin have been investigated as rod-like charged colloidal systems. Due to their high mechanical properties, they are also promising as reinforcing fillers of nanocomposites. The author presents a brief overview about preparation of various types of cellulose/chitin NWs by different acid treatments, control of their dispersibility by introduction of surface charge groups or steric hindrance by surface-grafted polymers, and resultant changes in viscosity behaviors and liquid crystal formation. More recent topics, i.e. hybridization with metal nanoparticles and production of novel dry fine CNW powders are also presented.

JAPAN TAPPI JOURNAL
2
February 2019
Vol. 73, No. 2

CONTENTS

CNF/Research and Development

Topics & Information

2019 February JAPAN TAPPI JOURNAL

Vol.73, No.2　Abstracts

Development of highly functionalized transparent sheet from phosphorylated cellulose nanofiber

Hayato Fushimi
CNF R&D Center, Innovation Promotion Division, Oji Holdings Corporation

Cellulose nanofiber (CNF) is highly crystallized microfibril in which molecular chains of cellulose regularly arranged. It has excellent properties such as high strength and Young's modulus, low thermal expansion, high surface area. From these features, it has been proposed to process CNF into sheet form and use it for various applications such as flexible electronic devices. However, there have been no examples of establishing CNF sheet production to the scale larger than laboratory equipment so far, and thus there are many problems in manufacturing. We applied CNF manufacturing technology by phosphorylation and CNF sheet manufacturing technology, and introduced the facility of CNF sheet production in the second half of fiscal 2017. AUROVEIL™, CNF sheet which is continuously produced in this facility has features, namely, high strength and modulus, flexibility and low thermal expansion, in addition to the transparency comparable to the optical film. We can also produce AUROVEIL 3D™, the sheet having a feature that it can be freely formed without cracking during molding process, and AUROVEIL WP™ overcoming the shortage of water resistance. We will further accelerate the application development of these CNF sheets.

Efforts for the practical use of cellulose nanofibers（CNF）
- Application development of various CNF -

Masayuki Kawasaki
Nippon Paper Industries Co.,LTD

As a "comprehensive biomass company", we are striving not only to expand existing business such as paper products and chemical products utilizing wood biomass but also to develop new business area. Amid efforts of new businesses, we are focusing on developing manufacture and use of cellulose nanofiber (CNF) as a new cellulosic material. Since the participation in the project of New Energy and Industrial Technology Development Organization (NEDO) in 2007, we have been engaged in the development of CNF and have been developing practical use of various types of CNF. In 2017, we have prepared various CNF production systems by installing production

facilities at the Ishinomaki mill(TEMPO oxidized CNF) and Gotsu mill (Carboxymethylated CNF) as a commercial mass production facility and demonstration plant of CNF reinforced resin at the Fuji mill. In this report, characteristics of CNF produced at each production facilities installed last year and the situation of application development are reported.

Commercialization and application development of nanoforest

Yoshio Itoh

Development, Chuetsu Pulp & Paper Co.,Ltd.

Chuetsu Pulp & Paper Co., Ltd. is producing cellulose nano fiber(CNF) named as "nanoforest", which is produced with Aqueous Counter Collision(ACC) method. The product name "nanoforest" is mixture of the word "nano", means very small size, and "forest", means natural forest. CNF is becoming popular as nano-material derives from nature and has several special features such as light weight, high strength, high elasticity, and low linear thermal expansion. A lot of companies related with CNF from material manufacturers to application users are now participating industrial CNF organization "Nano cellulose forum" and are collaborating for future application development.

Chuetsu Pulp & Paper Co., Ltd. have started commercial production of nanoforest at our 1st commercial plant located in Sendai mill, Kagoshima Pref. on June 2017 to answer market request.

This paper will report about production technique of nanoforest, it's features, and application development situation.

Development of Chemically Modified CNF Reinforced Plastics

Daisuke Kuroki

CNF Business Promotion Department, SEIKO PMC Corporation

Cellulose nanofiber(CNF) is a renewable material obtained from inedible biomass, such as wood and herbaceous plants, and has superior features such as light weight, high strength, high elasticity, low thermal expansion, high specific surface area, and so on. Therefore, extensive studies on CNF have been in progress in Japan and the other countries. While CNF holds superior potentials mentioned above, it is difficult to obtain homogeneous composites of CNF and hydrophobic resins due to CNF's hydrophilic and water absorbing characters. Chemical modifications on the surface is indispensable for CNF to be widely used in many industrial applications. We have been developing some chemically modified CNFs based on our paper-making chemical technologies. Once treated with amphiphilic reagents having both cellulose-reactive group and hydrophobic group, the hydrophobicized CNF surface shows improved dispersibility in polyolefin matrix. The obtained composites reveal various improvements in tensile strength, flexural strength, elastic modulus, and linear thermal expansion, to name a few.

In this article, we describe the main features of our chemically-modified CNF reinforced plastics, "STARCEL□", and its applications to thermoplastic composites, foamed resins, and rubber moldings.

Development of Efficient Production Systems for Forest Tree seedlings

Naoki Negishi , Katsuhiko Nakahama, Nobuyuki Urata, and Toshiaki Tanabe

Research Laboratory, Nippon Paper Industries Co.,Ltd

Nippon paper Industries Co., Ltd. announce the commencement of an initiative to develop a large scion plantation in a bid to facilitate the quick propagation and full-scale production of cutting seedlings taken from specified mother trees of Japanese cedar to assist reforestation of the Company-owned forest in Kyushu. The Kyushu region is known for its abundant forest resources and Japanese cedars are widely chosen. The Company has taken 824 cutting seedlings from specified mother trees of Japanese cedar, which were propagated using an exclusive technology, and planted them on land in Hitoyoshi City, kumamoto Prefecture, which is owned by the Company's Yatsushiro Mill (Yatsushiro City, Kumamoto Prefecture). The scion plantation will be extended gradually, aiming to develop a space for 14,000 cutting seedlings by 2019. Test Plantation is due to start from next year with a view to producing and shipping approximately 280,000 cutting seedlings per annum from 2023 and onwards.

The Development of Wind Power Business in the Location Adjacent to the Akita Mill

Takashi Sasama

Nippon Paper Industries Co., Ltd.

Amid the high expectation for renewable energy as measures against global warming, its introduction has been rapidly advanced from a global perspective, including a power-generating facility newly built in 2015 of which ratio of renewable energy facilities exceeds 50%. Along with introduction of Feed-in Tariff (FIT) system, ratio of renewable energy accounting for composition of power sources has increased from 10%(2011) to 15%(2016) in Japan. When viewing its breakdown, introduction of renewable energy has been led by wind power overseas, whereas it has been advanced mainly led by solar power domestically as shown by the fact that approximately 90% of renewable energy introduced after start of the FIT system was solar power. In addition, electricity generation cost by wind power and solar power has decreased below 10 yen overseas, whereas in Japan purchase price for electricity generated by wind power and solar power based on FIT system is at a level less than 20 yen. Between Japan and overseas, there are some differences we could find.

The wind power generation facility has commenced business operations as of this January in the location adjacent to the Company's Akita Mill. It is a first wind power generation facility for Nippon Paper Industries Co., Ltd.

We introduce the latest wind turbines and facilities manufactured by General Electric at one of the most suitable locations for wind power generation in Japan and the power generation output is 7,485 kW (three units in total).

CFD technology for slot coating

-Consideration the penetration of liquid into porous paper-

Yousuke Ozeki, Masaru Yasuhara

MPM CAE Center Co.,Ltd.

Coating is a significant basic technology in the field of chemical engineering and in Japan, VOF(Volume Of Fluid) method has been frequently applied to the coating industry to analyze free surface of the coating bead. This analysis method can reproduce various coating defects such as air entrainment, ribbing, rivulet, chatter, non-uniformity of layer thickness near the coating edge, and so on. Furthermore, the operability window of coating, quantitative correlation

between coating conditions and state of coating defects, shows well similar phenomena to the actual coating. Thus the coating analysis method can provide the investigation of the cause of coating defects and the estimation of coating defects under coating conditions without experience, and recently is available to design the optimum coating condition mainly in the electronic materials industry.

On the other hand, in the field of paper making industry, the fluid structure interaction analysis method is applied to the analysis of blade coating, while the penetration of coating material to base paper does not be taken into account. However, on the analysis for printing process, penetration model has already reproduced the behavior when liquid penetrates to porous paper, and the next target is application of this model to the blade coating.

In this study, we advanced the consideration on the penetration of liquid into porous paper material in slot coating process.

The History of Paperboard

Part 1: Paper Recycling Before 1800

Kiyoaki Iida

The paper industry developed the method of producing paperboard from waste paper in the late 1800s and doubled the market size of paper. Its history is followed in this series.

Before the Industrial Revolution, paper was manufactured with huge amount of labor and was very expensive. After used as document, waste paper was further used in different ways in different regions of the world.

Japan had a record in 886 saying that letters were recycled to sheets of paper on which sutra was written. It was very common since Heian period that reclaimed (waste) paper was recycled to sheets of paper which were used again for writing. Kyoto and Edo were famous with that recycling business. Recycled papers were called Usuzumi-gami (gray-colored sheet), Shikisi (colored sheet), and Syukus (old sheet). Asakusa-gami (toilet paper) was also manufactured in Edo, Asakusa being one of its district.

Europe, on the other hand, did not manufacture recycled paper. Waste paper was converted to paste board which was used mainly as book front covers. Its demand might be balanced with the supply of waste paper. In China, it is reported that recycled paper was used in the 1600s, though it seemed not to be so common. Waste paper might be used for making many kinds of paper products.

Then, the Industrial Revolution changed social systems, and the USA, a newcomer in paper manufacturing, developed paperboard market and changed the way of using waste paper.

JAPAN TAPPI JOURNAL
3
March 2019
Vol. 73, No. 3

CONTENTS

Process Control and Automation/IoT

Topics & Information

Research Report (Original Paper)

2019 March JAPAN TAPPI JOURNAL

Vol.73, No.3　Abstracts

Advanced IT to support production
—Advanced data Analysis, Applying IoT—

Yoshiaki Nakagawa
Nippon Steel & Sumitomometal Corporation

We adopted the online system that runs 24 hours 365 days in 1968 ahead of other industries in Japan. The system made production high efficiency. Since then, we have been adopted supply chain management systems and production management systems at our company depending on the advancement of the computer. We have worked on improving the efficiency of manufacturing and sales.

In the 2010s, because ability of the computer also dramatically increases, computer can process a large amount of data, and gather large amounts of data from mobile units at low cost, which was difficult in the past. So, Machine-Learning called one of the big data analysis, and third generation artificial intelligence entered the practical stage.

In this paper, we introduce examples of application of these advanced IT in our company.

Remote Monitoring and Diagnosis Technology of Kawasaki Heavy Industries, "Techno Net"

Naoki Noguchi , So Kurosaka
Kawasaki Heavy Industries, Ltd.

Kawasaki Heavy Industries provides a variety of products including trains, motorcycles, ships, aircraft parts, helicopters, industrial robots, hydraulic equipment and power plant. As one of these products, we have gas turbine co-generation power plant that is equipped with various control instrumentation systems. In this paper, we will introduce the remote control and monitoring technology that we take an active interest in. We call this system "Techno Net".

Online anomaly prediction detection system by AI which became practical stage and its example

Daisaku Kimura , Motomi Kohata
Azbil Corporation,Advanced Automation Company

Over the past few years, the idea of revolutionizing various activities in the world by using state-of-the-art ICT such as IoT, BigData, AI is becoming a big trend. This trend also spreads to various industries, and the value creation in each area of QCDES (quality, cost, distribution, environment, safety) has started.

We introduce the outline of " online anomaly prediction detection system " which is becoming the beginning of utilization of AI in industry.

Proposal to Make Full Use of Web Inspection System by IoT Technology

Hirotaka Ogino
Inspection Systems Business Div. OMRON Corporation

Manufacturers are seeking high-value-added monozukuri, high quality, and stable production. They are also demanded of effort for global competition and new technology evolution.

The new technology evolution as IoT, robotics, AI, etc. started in current environment for manufacturers. We can see these movements in Industrie 4.0 in Germany or Industrial Internet Consortium in the USA.

Manufacturers involved in big changes to handle diversified requirements by small-volume production, to pursue the sophistication of monozukuri by factory management evolution using huge amount data, to have stability global production framework by multipolarized production bases, to have automated production caused by a shortage of skilled person or rising labor costs.

Therefore utilization of latest technology is more important to correspond to monozukuri evolution and to meet market needs changes. In this report, we will introduce Omron i-Automation concept and application in sheet inspection system.

Operation optimization of pulp manufacturing

Akira Endo
Solution Business Division, Yokogawa Solution Bervice Corporation

With the development of IIoT (Industrial IoT) technology in recent years, Yokogawa Solution Service Corporation began to develop services that utilize this technology for plant operations at paper mills and provide advanced operation support. In order to

prevent obsolete model of model predictive control due to aged deterioration which was difficult in the past, utilizing the co-creation space based on the Internet and utilizing the method of tuning the model from plant data in a short time, quality stability by optimum control and we realized "optimal operation support service" that can maintain cost reduction effect.

In this paper, we describe its modeling technology, tuning method using IIoT, and the result share contract to maintain its cycle. In the future, we will promote the overall optimization of the paper mill including optimization of other processes, and further consider adapting to other industries, so it will be popularized as a case at the manufacturing plant through the use of IIoT we are aiming to go.

Case Study of Latest Type Near Infrared Color Defect Detector

Kihachiro Bannno
Daio Engineering Corporation

The defect detection device of Marubishi Paper Tech Co., Ltd. was updated to Omron's latest type Near Infrared Color Defect Detector.

Since the conventional defect inspection device was a combined reflection and transmission method, it was necessary to adjust the balance between the amount of reflected light and the amount of transmitted light for each product type.

Therefore, by adopting the color reflection / NIR transmission independent system, there is no interference of light, adjustment of light quantity becomes easy, and highly accurate inspection can be performed stably.

This makes it possible to detect minute foreign substances, etc., and is useful for improving the quality of products.

Energy saving by introducing energy management system (EMS)

Takehiro Ogawa
Shin Tokai Paper Co., Ltd.

Pulp and paper is the industry which consumes significant amount of energy, ranks with iron and steel, chemical, cement and oil refining. Shimada mill of Shin Tokai Paper Co., Ltd. purchases electrical power beside self-generation to satisfy the large electrical demand in production.

Therefore, energy efficiency improvement has been one important agenda aims reducing environmental burden and production cost reduction. Based on this background, in a project of biomass boiler construction, we have introduced Energy Management System (hereafter EMS) of Azbil Corporation for existing utility plant (boilers and turbines).

Multi-variables, model-predictive control SORTiA-MPC of the EMS executes optimization control for the utility plant, and operation with maximized power generation has been accomplished while input energy is same and operation constraints such as steam and power demands are satisfied. This report introduces the EMS which realized the energy efficiency improvement and operation cost reduction.

Real-Time performance monitoring
―Need for Powerfull Analytics Tool Enables Smart Operations and Cyber Security―

Sadao Ueno, Itaru Nakamori
Honeywell Japan LTD Honeywell Process Solutions

Modern process control systems are designed and instrumented with the goal to control the process, but do not necessarily give all the information required to efficiently and effectively run the process, equipment and business from a performance and reliability standpoint. With an accurate measurement of process performance continuously compared with a proven benchmark, personnel can better operate their plants and ensure production has been fully optimized. Industrial facilities also need timely notifications to take the right proactive actions, which minimize degradation, poor performance and secondary damage to equipment to ensure lower costs, increased throughput and higher profits.

"Industrial" cyber-attacks against industrial facilities such as electricity, gas, pulp and paper, oil, chemical products as well are on the rise. Recently, as the Industrial Internet of Things (IIoT) has been focused on control system's cyber security countermeasures and strengthening of the defensive power have also been taken as urgent problems.

This paper explains the necessity of the powerful analytics tool for industrial operations and industrial" cyber security of the control systems.

Advancing the intelligent factory with AI and IoT

Hiromitsu Oikawa
Head of AI&IoT Offering planning Department, Fujitsu Co., Ltd.

The environment surrounding the manufacturing industry, including Industry 4.0, is constantly evolving. In order to realize further improvement and efficiency, new technology such as AI and IoT has been drawing attention.However, how to utilize AI and IoT is an issue at the manufacturing site. This time, I will introduce the latest case studies on smart manufacturing.

IoX solution to evolve manufacturing
—Introduction of Safety monitoring for factory workers and Predictive & preventive maintenance solutions—

Ai Yuasa
IoX Solution Business Promotion Department, NS Solutions Corporation

In this paper I introduce the IoX solution which is the concept of NS Solutions. The IoX solution aims to provide solutions to both Internet of Things (IoT) and Internet of Humans (IoH).
In the IoH solution, Safety monitoring system for factory workers, and the IoH solution, predictive & preventive maintenance solutions. Both systems are cases our customers use it as a production system.

The History of Paperboard
Part 2: The Birth of Paperboard

Kiyoaki Iida

After the industrial revolution, countries such as the UK and the USA increased their productivity at a high rate per year which was 3-4 times as much as that in the precedent era, extended rail way networks and expanded mobile area of goods, and accomplished the social paradigm shift. In the 20th century, the USA created the society of mass production and consumption, for which marketing and .distribution of goods were essential. The paper industry helped to develop carton boxes and wrapping paper for the former and corrugated containers for the latter.

As the market of carton boxes grew in the 1800s, the paperboard made of straw pulp and sheeted with cylinder machines was developed and continued to be produced in the 1900s. Newly invented carton converters, fancy image printing by lithography and modernized railway networks further enlarged the market. The volume of publications by printing also grew year by year and old printed paper was reclaimed as a new source of recycling. Then, in about 1920, the urban paper mills appeared and became popular, making paperboard with multi-vat cylinder machines, using reclaimed old printed paper.

Corrugated containers began to be used in replacement to wooden boxes around 1900. The early liner was made of straw and jute pulp, called jute liner. Then, mills in the US south took over the market by inventing kraft liner, which was less weighty and was made of kraft pulp from pine that was abundant in the south, sheeted with Fourdriner machines with some modifications. Corrugated containers are accepted in

the world, though Japan and Europe make their liner with waste paper as its main resource.

In the next issue, the history of paperboard production in Japan will be reviewed.

Factors affecting the yield of phenolic monomers in an oxygen-soda anthraquinone cooking

Kengo Magara, Satoshi Kubo

Forestry and Forest Products Research Institute of
the Forestry Research and Management Organization

The process of lignin oxidation by oxygen gas or other oxidative catalysts to produce phenolic monomers, such as vanillin, has become important in the development of new methods for producing polymers from renewable resources. It was found that oxygen-soda anthraquinone (AQ) cooking produces a phenolic monomer yield of over 17%, including vanillin, under higher liquid/solid ratios. Higher liquid/solid ratios always achieved a higher yield than under lower ratios. This was thought to be due to the condensation reaction which progresses under low liquid/solid ratios, as there was a higher concentration of eluted lignin in the black liquor compared to high liquid/solid ratios. However, there was no evidence to verify this assumption from the average molecular weight measurements of the black liquor. On the other hand, there was a positive correlation between the phenolic monomer yield and NaOH consumption during cooking. Therefore, NaOH consumption is considered to be important for increasing the phenolic monomer yield in oxygen-soda AQ cooking.

JAPAN TAPPI JOURNAL
4
April 2019
Vol. 73, No. 4

CONTENTS

Welcoming New Emploees

2019 April JAPAN TAPPI JOURNAL

Vol.73, No.4　Abstracts

Development of black liquor viscosity control chemical

Kaori Fujitsuki
KATAYAMA CHEMICAL,INC.
Akira Yamakawa
KATAYAMA NALCO INC.

In the craft pulp manufacturing process, 7-10t the black liquor is generated for making 1t of pulp. Generally, the black liquor is concentrated about 75 % under the hot vacuum in concentrating process and burned in recovery boiler for combustion energy with inorganic pulping chemicals. Higher concentrated black liquor is improved recovery efficiency for energy. However, over 75% concentrated of the black liquor makes trouble for handling

In this report describe the results of our research about the chemical reducing the viscosity (fluidity) of the black concentrated liquor. The viscosity of the 80% concentrated black liquor which is treated by this chemical could be handle like 75%. New formulation chemical has founder to control viscosity of black liquor.

Retention Control Key Tool in Improving Papermaking Efficiency

Timo Rantala, Lasse Kauppinen and Jukka Nokelainen
Valmet Automation Inc.
Kenichi Ishihara
Valmet K.K.

Paper and board makers face a host of demands: how to make a stable, uniform product at the desired quality level at minimum costs. To make this happen means increasing efficiency, agility and flexibility in production. This is a real challenge while using mixed low cost raw materials, including recycled fibers that contain unknown amounts of disturbance materials. The ultimate target is minimized downtime, off spec production and sheet breaks at the highest possible machine speed. One cornerstone of high production efficiency is a stable wet end.

First pass retention – more precisely, the stability of white water consistency – is a sensitive indicator of wet end stability. White water consistency variation bears a direct relation to variation in end product quality (basis weight, moisture, ash) and to the number of sheet breaks. Furthermore, the level of white water consistency is

connected to formation, machine cleanliness, retention chemical needs, etc. Stable retention and correct use of wet end chemicals can be achieved with automatic controls based on reliable wet end measurements. This article presents practical issues for achieving stable retention and gaining multiple benefits.

New Proposal for Improvement of Fixability of Internal Agent by "AXISZ System"

Yohei Miyoshi, Koichi Tadaki, Kazutaka Kasuga, and Miho Kato
Technical Div. Technical Dept., SOMAR Corporation

In 2017 JAPAN TAPPI Annual Meeting, We introduced a new type retention aid which we developed using “Reactive Polymer Technology”. Now, this retention aid comes to be used in some kinds of paper mills. Recently, performance of wet-end agents has started to decrease because quality of waste paper pulp has deteriorated. Therefore, dosage of sizing agent and paper strength agent tend to increase. We have developed high performance retention aid “REALIZER R Series” and high performance coagulant “REALIZER A Series” which enable these internal agents to attach to pulp fiber by introducing special monomer and “Reactive Polymer Technology”. “Reactive Polymer” can lower machine stain and paper defect by increasing fixability of internal paper strength agents and sizing agents. Many paper mills reduce dosage of retention aid because of agent cost. However, dosing some amount of reactive polymer can enhance the retention of these internal agents, so that total agent cost becomes lower. Increasing dosage of traditional retention aid can improve one-pass retention and ash retention but dosage of internal agents do not decrease in many cases. This suggests that these existing retention aids can not improve fixability of sizing agents and paper strength agents.

In this paper, we report that “REALIZER R Series” and “REALIZER A Series” which has special monomer and “Reactive polymer technology” are different from traditional retention aid and that these new agents show good performance in some paper machine and board machine even if papermaking condition is tough. For example, Cationic retention aid “REALIZER R230” which has new special monomers improves retention of sizing agents in coated paper machine and high-quality paper machine. Furthermore, we have developed new type coagulant “REALIZER A3700” which has two kinds of special monomers. It has been disappeared that these special monomers can enhance the retention of sizing agents and paper strength agents in board machine. “REALIZER R240” which is developed with “Reactive Polymer Technology” can bind to pulp fiber if retention aid is partially broken by the shear of inside system. This retention aid is capable of increasing the one-pass retention and ash retention and improving the formation of paper if relatively large amount of retention aid is dosed.

Separation of wood constituents by soda-AQ cooking for chemicals

Shiho Tsuji
Nippon Paper Industries Co., Ltd

Nippon paper Industries takes part in the NEDO project “Technology development of Manufacturing Process for Non-edible Plant-derived Chemicals/ Development of an Integrated Process for Manufacturing Chemicals from Woody Biomass”. In that, we are developing a technology for separating major wood constituents based on the sulfur-free soda-AQ cooking. Although we investigated the autohydrolysis, a method for extracting hemicellulose prior to cooking, it made lignin higher molecular weight and unsuitable for chemical use. Therefore, we chose a process simply separating wood into black liquor and pulp by the cooking. In case of the hardwood, xylan, the chief component of hemicellulose, can be separated from lignin that preliminarily prepared from black liquor.

The project plans to construct the integrated process at kg-scale and evaluate economic efficiency during last two years (2018-2019). We have developed a kg-scale system for separating wood component. As for lignin, we introduced “portable lignoboost skid” (Valmet), a bench-scale lignin manufacturing equipment. Therefore we started to provide pulp and lignin samples at kg-scale to chemicals companies.

Why it is important to measure charge in the paper making process
—a presentation of state of the art for laboratory and online charge measurement—

Daniel Ohndorf
emtec electronic sales department
Hiroyuki Miyaoka
Sanyo Trading Co., Ltd.

In the pulp suspension of the paper making process there are fibers, fillers, fines and anionic trash particles. Anionic trash describes a wide range of anionic dissolved polymeric and colloidal substances. Ex. Dissolved Electrolytes, Suspended fibers, suspended fiber fines ant etc...

Most colloidal or filler particles and fiber surfaces are covered with a negative or positive charge cloud on the surface. Negative and positive charged particles attract each other. Particles with the same charge repel each other.

In the wet-end part of the paper making process, a variety of process chemicals and additives are added.

Additive: Stay in the final product to optimize or to improve the product properties, ex. Sizing agents

Process Chemicals: Control and optimize the paper making process, improvement of

waste water and waste air treatment. Do not stay in the final product, ex. Fixing agent

The charge of pulp fibers is anionic while also the charge of trash particles is usually negative, i.e. anionic. Process chemicals, which are used to influence the quality of the finished product, and additives are mainly positively charged (cationic).

The knowledge of the charge of the chemicals, the anionic trash and the fibers enables a correct and effective dosage of charged chemical additives. Now it is obvious that these amounts of charges, especially the charge of the anionic trash – but also the fiber charge itself – have to be measured in some way in order to take necessary action with regards to chemical dosing.

We introduce two very useful and state-of-the art laboratory tools for this purpose: The CAS touch! – Charge Analyzing System as well as the FPA touch! – Fiber Zeta Potential Analyzer.

With help of these devices, it is possible to get information about the amount of anionic trash in the pulp suspension as well as about the zeta potential of fibers (fiber surface charge).

Solution for existing wastewater treatment

Akira Imaizumi
EPC Department,VEOLIA JENETS K.K.

UNOX system which is wastewater treatment using oxygen gas the system has many references for Pulp and paper mills. （More than 150 units in Japan and Southeast Asia area).Sometimes existing facilities are requested that the capacity of the wastewater treatment be increased by changing the upstream process after the introduction of the UNOX system. Therefore we will introduce examples of capacity adding by combining with existing water treatment facilities. In addition, although the oxygen generator(PSA/VPSA) is added to the UNOX system, and then sometimes the PSA/VPSA also may have cases where the making capacity declines compared to the time when the capacity was first installed PSA/VPSA that have been in operation for more than 20～30 years since its introduction, therefore we will also introduce examples of energy saving effects by updating them to the latest version of VPSA. Plus, we will also introduce examples which making capacity recovery was expected by replacing a part of adsorbents. Our company's predecessor Showa Kankyo System (Showa Engineering) have become the Veolia Group, we can introduce technologies possessed by Veolia, in addition to our own wastewater treatment technology. Finally, we will introduce the bio carrier that Veolia possesses. The carrier can be easily utilized for improvement the capacity of existing wastewater treatment facility.

High Brightness Mechanical Pulp from Eucalyptus Planted Trees

Takanori Miyanishi
JAPAN TAPPI

The mechanical pulp yield is about 85 to 95% of the original wood, compared with around 45 to 55% for chemical pulp. Hardwood mechanical pulp has the desirable properties of low cost, high opacity and good printing quality due to its high bulk, high smoothness, resiliency, and good ink absorption. Hardwood mechanical pulp tends to have shorter fibers, higher light-scattering coefficient and lower strength value. Eucalyptus plantation tree is a common tropical hardwood species and is used for the production of lower yield chemical pulps such as kraft pulps. It is believed however that Eucalyptus mechanical pulp is not suitable for the production of graphical paper grades because of its low initial brightness and limited bleachability. Alkaline peroxide mechanical pulping (APMP) and thermomechanical pulping (APTMP) use caustic soda, hydrogen peroxide, and stabilizers to soften and brighten wood chips prior to refining in a disc refiner. The chip pretreatment facility employs a screw feeder device to apply mechanical compression on wood chips and squeezes out the detrimental substances for bleaching. It also partially destroys wood structures allowing for easier fiber separation and reduces refining energy. In our study, APMP and APTMP were applied to Eucalyptus-globulus planted trees by pilot plant tests and significant benefits were obtained to improve bleachability. Brightness of Eucalyptus APMP reached 87% ISO brightness that surpassed 80% ISO brightness of aspen APMP.

Report on the Results of the Fiscal 2018 Follow-up Survey on" JPA's Commited Action Plan for a Low carbon Society" and Related Information on Measures against Global Warming in the Japanese Paper Industry

Yasuharu Sakina
Japan Paper Association

The Japan Paper Association (JPA) established its "Voluntary Action Plan on Environment" in 1997, in response to The Japan Business Federation's call to the Japanese business community to organize "The Voluntary Action Plan on Environment". Since then, JPA has carried out a follow-up survey and published the results every year.
As the Voluntary Action Plan finished in fiscal 2012, JPA newly started "the Action Plans towards a Low Carbon Society" and has been actively addressing global warming prevention in order to achieve the following targets set in the plan:

- Compared to BAU scenario(based on specific CO_2 emission rate of 2005),

reduce fossil energy-derived CO_2 emissions by 1.39 million tons by fiscal 2020 .

- In view of securing forest resources and increasing forest carbon sink, expand forest plantation areas owned or managed by the paper industry at home and abroad to 700 thousand hectares by fiscal 2020.

According to the results of the fiscal 2018 follow-up survey (actual results for fiscal 2017), fossil-energy derived CO_2 emissions in fiscal 2017 was 17.85 million tons, a 28.4% reduction compared to the fiscal 2005(24.95 million tons).This is attributed to each manufacturer's active efforts including energy saving and energy conversion from fossil energy to non-fossil energy such as biomass energy.

In addition to the results of the follow-up survey, this report introduces the current energy situation in the Japanese paper industry, outline of the next phase of JPA's Action Plan for Low-Carbon Society spanning the ten-year period from fiscal 2021 through 2030 and the latest information of countermeasures against global warming.

The History of Paperboard

Part 3: Paperboard Production in Japan

Kiyoaki Iida

With the start of the Meiji ear, the social systems of western countries were imported in to Japan, and industries supporting the systems were born. The paper industry was one of them and tried to produce printing paper for letter press printing and paperboard for paper cartons that would help the distribution of goods.

As the market of carton grew to about 4000 tons in 1886, using imported paperboard, a Fourdrinr machine which was of the modern specifications of that time was imported and installed to supply paperboard domestically, using rice straw pulp. As the market was promising and rice straw was abundant in Japan, entrepreneurs in local districts got in to the business. Starting from Tokyo, Osaka and Shizuoka, the business spread to Okayama, Niigata, Hokuriku, Gunma, Saga and so on, as a typical local industry, and became a boom in the 1930s. Domestic machine builders, which were already capable enough, delivered numbers of cylinder machines. The shift of pulp from straw to waste paper is supposed to have begun after 1930.

Corrugated containers started to be served in the 1930s, though it could not be a major player before the World War II.

The statistics for paperboard production were available since 1914, and its share in the total paper and paperboard production remained about 30-40%, and is now about 40%.

Analysis of Gloss Constancy in Light Source Size Change

Shinichi Inoue
Process Development Laboratory, Mitsubishi Paper Mills Limited
Masanori Maki
Graduate School of Advanced Integration Science, Chiba University
Shoji Yamamoto
Tokyo Metropolitan College of Industrial Technology
Norimichi Tsumura
Graduate School of Advanced Integration Science, Chiba University

Appearance is observed as the results of association among various physical factors. For example, the color appearance is well known. We have an ability to estimate the primary color of object through an adaptation, even if only the light source color is changed. It is called as color constancy which is remarkable ability of human eyes. Likewise, here, we define gloss constancy as a human ability to estimate the original gloss of an object even if the light source is changed. In this paper, we verified the influence in gloss and material constancy under the artificial environment by changing the size of light source. We performed two type observations in subjective evaluation, one is the gloss appearance which is mainly observed by the distribution of specular reflection, and the other is the material appearance which is mainly observed by all distribution of specular and diffuse reflection influenced roughness as whole appearance of object. We prepared two kinds of printed paper object which has different roughness, and four kinds of light image generated by LCD projector. A paired comparative experiment was performed under different light source with real printed paper object. The present result about difference in gloss appearance suggested that sharpness of the gloss appearance is affected by the size of light source. Apparently, perception of gloss is decreased as the size of light sources increase. The other evaluation was performed by observing the difference of material appearance. It is suggested that constancy of gloss appearance only appears when we observe material property such as roughness and contrast as whole appearance of object. We find the effect of material constancy. However, we hardly find the effect of gloss constancy. Gloss appearance evaluation is affected in the size of the illumination. In the pulp & paper industry, it is suggested that the lighting condition is important to evaluate the paper gloss appearance subjectively.

JAPAN TAPPI JOURNAL
5
May 2019
Vol. 73, No. 5

CONTENTS

Household Paper

Topics & Information

Research Report (Original Paper)

Pulp and Paper Mills in Japan (78)

2019 May JAPAN TAPPI JOURNAL

Vol.73, No.5 Abstracts

KAWANOE/Valmet tissue machine lineup and the latest technology

Masamichi Sugi
Design Dept,KAWANOE ZOKI Co.,Ltd.

Kawanoe BestFormer, a household tissue machine for tissue, toilet paper and towels, started to install in Japan as well as Asia since 1974. Now the machines have been installed more than 200 units. There are wide varieties of product lineups such as BF-1000 of the machine speed at 1000m/min, BF-1200TW that can produce both at dry and wet crape and so on. This time we would like to introduce BestFormer lineups along with the latest energy saving technology that can meet the customer's needs, production volumes and use applications. Also, we offer DCT CrescentFormer under the license agreement with Valmet and ViscoNip, the latest press technology, will also be introduced.

How to Improve Tissue Making
-Effect and solution of cellulose fiber on coating the shell-

Ryo Inamatsu
Application Development Section, Maintech Co., Ltd. Fuji Technology Development Center

Improving production and sheet quality have been one of the top priorities for tissue manufacturers. As press felt deposits due to recycled paper causes sheet web moisture profile uneven and dropped fiber, coating on Yankee dryer tends to be unstable and over hardening, which also leads to sheet spot and chattering mark on the dryer surface. Many kinds of Creping control agents especially polymer based coating agents and release agents have been used to solve the problems, however they have not succeeded in forming stable coating the shell under the recycled furnish condition.

Maintech has developed innovative creping control agents which protect coating the shell from the uneven moisture of the sheet web and over hardening.
This report describes the concept and mechanism of new creping control agents and its field testing cases in which new creping control agents has been able to improve productivity and sheet quality.

Advanced technical approach to Tissue machine
-Visualization of coating chemical on Yankee-

Takuya Maekawa
Spectris Japan Co. LTD., BTG Div.

BTG is a technical company who has been innovating and providing a High-Performance Creping blade (Duroblade) to tissue mills in the world, which can improve tissue paper quality and productivity by implementing less blade change and better softness than the conventional steel creping blade. Under BTG policy of "Yankee Safety", BTG have innovated a unique CBC holder system also which can reduce risk of Yankee damage and the frequency of Yankee re-grinding period.
Coating chemical on Yankee is the most important factor making impact on tissue quality and protecting Yankee surface, but there is no way established to measure and check this coating chemical condition on Yankee directly yet. If the coating chemical would be hard or soft, thick or thin, this determination is made through operator's experiences and intuitions which is difficult to be equitized.

The latest BTG system innovated -Vigilance- can monitor the coating chemical on

Yankee by checking a specific vibration on Yankee blade holder. Vigilance is not just a vibration monitoring system but a system that can analyze a cause of the source for vibration analyzing a filtered vibration band. Applying Vigilance on tissue machine makes coating chemical condition in visualized and lead to optimize tissue machine operation.

Latest Technology of Creping Control Agent

Masashi Sano
Specialty Chemical Divi. Riken Green Co., Ltd.

Tissue and towel (T&T) paper mills in Japan are required to be more competitive because low-priced paper imported to Japan is increasing and cost of raw materials and fuel are going up. Steel Yankee dryer is installed in many T&T paper machines in overseas to improve production efficiency because heat conductivity of steel is better than that of cast iron. Shoe-press is installed in many T&T paper machines as well and this new technology is started to introduce in Japan. Shoe-press enables to bring less water into Yankee dryer, therefore edge deposit of Yankee surface, which is a common issue of the dryer, occurs more often than before. The edge deposit might cause chatter mark, damage of dryer surface, sheet break or quality loss of paper, and it becomes one of issues of T&T machine with shoe-press. Conventional release and coating products could not fully control the edge deposit, therefore Solenis, who is the leading company of chemical products for paper mills in the world and their products have been distributing in Japan by Rikengreen exclusively, developed new products to solve this problem. The edge deposit issue of Yankee dryer could be improved by using new release and coating products of Solenis, and the interval of doctor blade exchange could be extended and stable high quality paper production could be achieved.

CleanLine – The Complete Fabric Cleaning

Yukio Gyonouchi
Voith IHI Paper Technology

Maintaining fabric performance is essential in order to achieve targets of productivity, paper quality, cost and safety on the paper machine. However, fabrics in the forming, press and dryer behave like filters to trap and hold contamination. Traditional methods of cleaning fabrics often cause negative side effects such as having to use corrosive and hazardous chemicals, barrier coatings attaching to fabrics and sheet property variations caused by high pressure showers. Also, today's furnish introduces increasing amounts of contaminants while outdated efforts to clean fabrics simply shift the contamination to the next sections, affecting the runnability of the paper machine.

New traversing cleaning systems have been developed in cooperation between paper mills, fabric designers and high pressure water technologists. These solutions are now running successfully on some of the most demanding applications. In forming, the concentration of water jets can greatly reduce the number of wet end breaks, reduce waves in the sheet and minimize spray and mist. Improved cleaning systems for press fabrics can reduce moisture variation and lower the amount and frequency of the use of cleaning chemicals while improving machine runnability. A unique cleaning head can be matched to the surface and structure of dryer fabrics to remove more contamination.

These developments in cleaning technology, using a complete concept throughout the paper machine, bring benefits in servicing, availability of the equipment and the performance of paper machine fabrics.

Axial movement compatible type mechanical seal for Refiner

Takahiro Hayashi
Engineering Dept. John Crane Japan, Inc.

Application of the mechanical seal has been progressing for sealing system of rotating equipment in the pulp and paper industry. The applications of the mechanical seal were limited to such as pumps and screens for black liquor and coating collar services. In recent years, it is progressed for agitators which has large axial runout and vibration.

However it is remained the gland packings for refiner, because of large shaft movement.

In order to reduce energy consumption and maintenance costs and to provide safety and stability for the daily operation, John Crane would like to introduce the mechanical seal that has capability of large axial shaft movement for refiners.

High temperature erosive wear resistance of overlay welding metal in various boiler furnace wall

Ayumu Sakaguchi ,Yoichi Shiraishi
Welding Alloys Japan LTD. Engineering Department
Kazumichi Shimizu
Muroran Institute of Technology

In the circulating fluidized bed boiler, erosion wear is remarkable as compared with other boilers due to silica sand which is a combustion medium in the furnace. Therefore, in the past, at our company, high temperature blasting test was adopted to evaluate high temperature corrosion abrasion resistance of various overlay welding metals as a countermeasure against erosive wear in CFB boiler under high temperature environment.

In this study, high-temperature blasting tests were conducted on new overlay welding metals of Ni and Fe based, which are not widely adopted in domestic applications other than boiler applications, and high temperature erosive resistance wear characteristics were investigated.

As a result of this test, it was suggested that the overlay welding metals tested this time compared with Inconel 625 has a wear rate of 18 to 27% lower, which is possibly excellent in erosive resistance under high temperature environment.

In the future, in order to simulate a boiler actual machine, in addition to high temperature erosion, we are looking for ways to evaluate the resistance to the environment such as chlorination and sulfurization and think that it is necessary to select the optimum welding metals according to the operating environment of each boiler.

Oil Analysis – what it reveals and what it offers
-Managing Equipment through Diagnosis of the lubrication oil-

Kentaro Ootsuka
JAPAN ANALYST CO.,LTD
Eiji Suzuki
JSD Ltd

Many industries, including paper manufacturing, have machinery equipment which use lubrication oil in order to protect the equipment from wear. The lubrication oil, however, can also wear and cause malfunction in the machinery. Lubrication oil acts like blood in the human body system, circulating within the machinery equipment and maintaining it while collecting information that shows the condition of the machinery. Management of the equipment can be hugely enhanced by oil analysis which includes monitoring viscosity, oxidation, water level, and particle number and weight. This analysis allows operators to take necessary measures to protect the equipment, such as fitting it with a high-quality oil filter. In many companies it is the norm to use equipment until it requires partial or whole replacement, but oil analysis can give a clear picture of what is happening to the machinery, and help companies take measures to ensure clean oil, which can prolong the life of their machinery equipment. This will lead to better productivity and overall long-term economic benefit to the company.

The History of Paperboard
Part 4: The Current Use of Waste Paper in Paperboard Production and the Summary of the Series

Kiyoaki Iida

In Japan, by the data of 2017, 67 % of recovered paper was used for paperboard production, and paperboard used recovered paper at the utilization rate of 93.8 %. Even kraft liner, needless to say of jute liner and corrugated medium, is produced with OCC as its main furnish. Wrapping paper, on the other hand, used recovered paper at the rate of less than 10%.

In Europe, by the data of 2015, 68% of recovered paper was used to produce paperboard and its utilization rate of recovered paper was 74%. Its case materials, equivalent to paperboard for corrugated container in Japan, used recovered paper at the rate of 71%. Its trend is similar to that in Japan, though the utilization rate is less than that of Japan.

USA is different from the above two. By the data of 2015, only 45 % of its recovered paper was used for paperboard production, and 40 % was exported to China. The utilization rate in paperboard production was estimated to be 27%, which is quite small compared to Japan and Europe. USA makes most of kraft liner with virgin kraft pulp.

Finally, this series is summarized.

Reports on Ozone Bleaching in Vietnam's Pulp and Paper Industry

Takanori Miyanishi
JAPAN TAPPI

One of the smaller Asian countries that has done well in recent years is Vietnam. Indeed, the country's paper and paperboard consumption are showing relatively stable increases of over 15% per annum. Since Vietnam is quite dependent on imports at the moment, it will have to invest in to ensure that it has the quality and quantity of domestic paper production required to stop the market from being taken over by overseas producers as its markets develop.

Among the other challenges currently facing Vietnam's pulp and paper industry, the treatment of colored effluent discharged from pulp mills and the shift from conventional bleaching to Elementary Chlorine Free (ECF) bleaching are drawing attention. Ozone has a powerful oxidation potential to react with any type of lignin compounds and can thoroughly replace chlorine gas in bleaching pulps to high brightness. Effluent is non-toxic, colorless and does not cause any environment problems. Approximately 50% of new ozone bleaching equipment installed during the year of 2000-2013 in the world is successfully operated by Japanese paper companies.

Upon the request of Vietnam Pulp and Paper Association (VPPA), I was invited to give a lecture at Hanoi in Vietnam and share my experiences in ozone bleaching with scientists and engineers of pulp and paper companies, university students and lecturers. The technical seminar was fruitful, and many questions were raised from the audience. The following day, we visited An Hoa Pulp and Paper Factory. It is a new paper mill committed to producing and supplying high quality pulp and paper products including calcium carbonate coated paper, printing and writing paper, and photocopy paper.

Evaluation of Cellulose Nanofibers by Using Sedimentation Method

Akio Kumagai , Takashi Endo
Research Institute for Sustainable Chemistry, Department of Materials and Chemistry,
National Institute of Advanced Industrial Science and Technology
Maki Adachi
RENIAS CO., LTD. Development Design Group

The practicality of sedimentation method for evaluating the diameter and morphology of cellulose nanofibers (CNFs) in CNF dispersions was studied using CNFs with different degrees of fibrillation prepared by the mechanical fibrillation of softwood bleached kraft pulp. Evaluations of the CNF dispersions were performed using a stability analyzer and centrifuge particle size analyzer based on the gravitational sedimentation method and differential centrifugal sedimentation (DCS) method, respectively. The sedimentation behavior of CNFs provided by the stability analyzer reflected the fiber morphologies, and good correlation was found between the Stokes' diameter obtained by the DCS method and the fiber diameters estimated from field-emission scanning electron microscopy observations. These results show the possibility of using analysis based on the sedimentation method for evaluating the diameter and morphology of cellulose fibers in CNF dispersions, including the cellulose fibers obtained by fibrillation.

JAPAN TAPPI JOURNAL
6
June 2019
Vol. 73, No. 6

CONTENTS

Energy Saving I /Biomass

Topics & Information

Research Report (Original Paper)

2019 June JAPAN TAPPI JOURNAL

Vol.73, No.6 Abstracts

Introduction of Fujinomiya Micro hydro power plant

Kenichi Ikeda
Fuji Mill, Oji Materia Co.,Ltd.

Fujinomiya office, belonging to Fuji mill, Oji Materia, is located in 8km northern area from Fuji mill. After two paper machines stopped operation at Fujinomiya office in 2014, industrial water which had used to make paper production was left over and discharged into the river, therefore, we had to consider how to use this left water effectively in another way. As a result of consideration, we introduced Micro hydro power plant manufactured by ANDRITZ K.K, a leading supplier for hydraulic power generation, and have been able to obtain electric power since 2017.
In this paper, we will explain our experience of introduction of this plant.

H State-of-the-art Integration of Energy Balance by Andritz
-A Futuristic Pulp Mill with Improving of Recovery Process and Bio Product-

Masato Tsuchitana
Andritz K.K.

The kraft pulp mill is consisting of various fiberline processes, recovery processes and various sub-systems as well as auxiliary equipment.

By upgrading and integrating the mill process and through optimization, it will be possible to create more green energy and more efficiently from the biomass. The modern kraft pulp mill is also producing bio-products that are also integrating the mill process. Andritz has the sate of art for the integrating the mill process to produce more green energy and bio products that contributes to the reduction of greenhouse gases and pulp economy.

Maximum use of home generation of electricity with Model Predictive Control (MPC)

Toshiaki Tsutsumi
Mishima Mill, Daio paper.co.ltd

In order to reduce the energy cost, we introduced a MPC (Model Predictive Control) as a multivariable model predictive control system for the automatically avoiding operation constraints and the maximizing power generation output. As a result, we got more than 3,000kW output compared with last year.

In the private power utility, there are various restrictions under the operation due to the seasonal factor and the demand change of manufacturing process and the operators are always required to adjust the output balance. However, it is difficult to keep fine-tuning constantly while the operator doing other several taske, so there is inherent loss of operation opportunity that "it cannot be operated even if it is physically possible to increase".

In our case, we developed the control system which maximize the output of the facility constantly and keep the each parameter within the upper and lower limit range, such as steam, condensate, fuel, power etc. We succeeded in increasing the amount of power generation by systemizing the operational know-how and reducing the loss of operational opportunities.

Boiler Cleaning System for Municipal Solid Waste Incineration Plant

Yasuo Suzuki , Yohei Takeyama,Keiju Morishita,Yusuke Yamamoto and Tatsuyuki Noda
Environmental Solutions Sector, JFE Engineering Corporation

To remove dusts on the boiler heating surface is effective to improve the efficiency of power generation in municipal solid waste incineration plants. But it is difficult to remove dusts on the radiation and convection chamber of the boiler during operation, so that the flue gas temperature at outlet of radiation chamber becomes high and high. To solve these problems, We tried two types new boiler cleaning systems and have good effects.

Activities for energy saving in N2 boiler at Kishu mill

Yuki Minato
Paper Business Division Kishu Mill,Hokuetsu Corporation

We Kishu mill has three boilers, biomass boiler (N2 boiler) and recovery boiler (No.6 boiler) for daily operation and heavy oil boiler (N1 boiler) for preliminary. The steam generated from the boiler is used in whole mill through turbine (N1 turbine). In regard to power, we also use purchased power due to lack of power generation.

The biomass boiler (N2 boiler) started operation in July 2008, and has been in operation for 10 years. As we have implemented some energy saving activities, we will introduce some of examples that a great effect has obtained.

Application for Biomass Power Plant Fuel Storage Silo with Material Handling System and for The Better Environment

Tetsushi Kadowaki
Industrial Machinery Dept. No.2, Itochu Machine-Technos Corporation

Utilization of renewable energy, which is included in the main measures in the Fifth Energy Basic Plan announced by the Agency for Natural Resources and Energy on July 3, 2018.

In order for many paper manufacturers to support their contribution to the regional economy through "entry into new businesses and development" as set forth in their business plans, we can propose to build an overall fuel storage, transportation and supply system that covers large-capacity storage silos for biomass power generation fuels (wood chips, wood pellets, PKS, etc.) and design of a transportation system that integrates necessary functions within a limited site and completion of large silo construction using a proprietary spiral welding method in a shortest fabrication period make it possible to greatly reduce the cost of plant construction.

In addition, this paper introduces the economic effect of the feed water preheating system by waste heat recovery from boilers, which makes it possible to realize energy saving by high-efficiency operation of fossil fuels, which is also one of the main measures.

We expect that by building a system with utilizing those original technologies and extensive knowledge, we can contribute to the sustainability of the globally expanding pulp and paper industry through the revitalization of local economies.

Improvement of paper strength by enzyme cellurase

Kota Yoshimura, Masanobu Hatano
Sales Dept., Specialty Chemical Div. RIKENGREEN CO., LTD.

Enzyme has been used in various process of paper making. For example, xylanase is used in pulp bleaching, amylase is used for viscosity modification of size press starch, laccase is used to remove lignin for bio-bleaching, and cellulase is used in refining and drainage of paper making.

Hercobond 8922 is a cellulase which accelerates fibrillation of pulp fiber, improve paper

strength. Consequently, we succeeded in saving of energy cost by reduction of DDR load and in improving of pulp quality as well. This article explains the results of improvement of paper strength at laboratory test and case histories at mill trial.

Introduction of Orege effluent treatment system,
How this new technology realizes improvement of sludge dryness.

Mizuho Saito
Industrial Department No.3, Itochu Machine-Technos Corporation

OREGE SA company basing in Paris / France , who is an engineering & manufacturer of wastewater and sludge treatment equipment. This company spent for 8 years for R&D , and started sales activity for worldwide market from 2015.Their product「SLG」has unique patented technology which enable to reform sludge in waste water mechanically and that improve the efficiency of dewatering in latter process. Thanks to the improved efficiency , the volume of sludge is reduced. Also thanks to that efficiency , consumption of polymer can be reduced too.
ITOCHU-MACHINE-TECHNOS CORP introduce about outline of Orege and their equipment hereby especially for Pulp&Paper companies, who mostly have concerns about cost of polymer.

Effect of Sheet Forming Method on Wet Tensile Strength of *Usu-mino-gami* (Japanese Kozo Paper)

Masamitsu Inaba
Graduate School of Fine Arts, Tokyo University of the Arts
Satoshi Hasegawa
Hasegawa Washi Kobo
Masaki Handa
Handa Kyuseido Co., Ltd
Toshiharu Enomae
Graduate School of Life and Environmental Sciences, University of Tsukuba
Akihiko Takashima
Historiographical Institute, The University of Tokyo
Zhiyou Han
Graduate School of Fine Arts, Tokyo University of the Arts
Shiori Someya
Graduate School of Life and Environmental Sciences, University of Tsukuba

Mino-gami (Japanese *kozo* paper) has been utilized in various ways to conserve cultural properties for many years. Especially, *usu* (thin)*-mino-gami* is frequently used as the first back lining paper of hanging scrolls in order to support the main paper with a painting or a work of calligraphy on it. Improvement of the *usu-mino-gami* quality will more contribute to preservation. In the first stage of our research, the purpose is to clarify the manufacturing conditions of high-quality *usu-mino-gami* produced with different sheet forming techniques. As a lining paper, usability and feedback from users were considered in this study. The results showed that the sheet formation measured based on light transmission homogeneity was ranked as papermaking experts Furuta, Hasegawa and a papermaking beginner in descending order of quality. This sheet formation result agreed well with the wet tensile strength of *usu-mino-gami* both sensorially evaluated and measured by a tensile tester with the *Finch* device. The wet tensile strength decreased as the concentration of alkali solution for moistening paper samples increased. Paper prepared from fibers after net washing and from a top portion of *kozo* branches had a relatively low wet tensile strength. About the relationship between the order of sheet forming and wet tensile strength, the sheet formation and wet tensile strength of paper improved in the sheet forming order presumably because long fibers were filtered and formed into sheets in early sheet forming and remaining short fibers and parenchyma cells composed the paper in late sheet forming.

JAPAN TAPPI JOURNAL
7
July 2019
Vol. 73, No. 7

CONTENTS

Energy Saving Ⅱ

Topics & Information

Introduction of Research Laboratories (129)

Technical Report (Original Paper)

Pulp and Paper Mills in Japan (79)

2019 July JAPAN TAPPI JOURNAL

Vol.73, No.7 Abstracts

Energy Savings with the Installation of the No.5 Turbine Generator in Gotsu Mill

Sadayuki Hata
Gotsu Mill, Nippon Paper Industries Co., LTD.

The turbine generators (No.2 & No.3) in Gotsu Mill have had lots of issues due to their deterioration after 60 years since their construction, especially relating to their mechanical governers and hydraulic systems. However, it is impossible for us to replace these existing mechanical governers with electrical governers due to manufacturer limitations. Therefore, it was necessary to install a new turbine generator (No.5) in order to continue steady operation.

Nippon Paper Industries regards Gotsu Mill as a main mill of the chemical product business, and a plan to increase the production of dissolving pulp was made. Taking into account a steam and power balance of the whole mill, an optimal evaporator and turbine generator (No.5) were chosen and installed. The installation of the No.5 turbine generator enabled us to utilize the steam previously lost in our mill, therefore achieving significant energy savings, cost reductions and a more stable operation.

Activities for Energy Saving in Nichinan Mill

Masami Uchida
Nichinan Mill, Oji Paper Co.,Ltd

At Nichinan mill, we set the targeted reduction of energy saving as “1.5% of the total energy in the mill” and we are working as one to achieve this target.

However the amount of capital investment is on a downwards trend in recent years. And it is becoming to be difficult to find and implement the new idea.

In these circumstances we continue to reduce energy consumption by deepening past energy saving case and referring to the idea from the other Oji paper mills.

In this paper, we introduce the examples of our energy saving effort which we had implemented.

AIR LEAK VIEWER® MK-750 - Visualizing gas leaking location

Masahiro Oda
Technology Development Department, JFE Advantech Co., Ltd.
Yasuo Kushida
Measuring & Diagnosis Division, JFE Advantech Co., Ltd.

In order to visualize gas-leak location as well as to detect gas-leak on gas pipes installed within a wide area of factories, we have developed a new portable and light-weight instrument, the “AIR LEAK VIEWER® MK-750”. The“MK-750” brings the beam-forming technology using an ultrasonic microphone array to the conventional ultrasonic leak detection method. The ultrasonic microphones are positioned in array arrangement which creates time delay (phase delay) between the microphones in the arrival of ultrasonic waves from its source, and the time delay (phase delay) of the microphone to that being the closest to the ultrasonic source becomes larger as the distant of the microphone becomes farther away from that microphone. This time delay (phase delay) between the ultrasonic microphones is determined from the distance of the microphones and the ultrasonic wave orientation. The maximum amplitude obtained from overlapping the received waveforms at each ultrasonic microphone is given by correcting the time delay (phase delay) corresponding to the ultrasonic wave source orientation (that is, the gas-leak location).

The gas-leak orientation is shown as a live image on the LCD of “MK-750, and, one can

promptly identify a gas-leak and its position on the “MK-750”LCD screen.

We carried out field tests on actual factories and gas-leaks on pipes containing compressed air, nitrogen gas, etc. were easily and efficiently detected up to 15m apart from the gas-leak source by using the“MK-750”. In addition, the“MK-750” can identify a gas-leak even in a very noisy area, since it makes use of ultrasound while detecting.

The“MK-750” can detect ultrasound and determine its orientation based on the beam-forming technology. Thus, the“MK-750”allows for ultrasound source detection in a wide area. For instance, corona discharges are known to emit ultrasound when they occur and by using a similar technology to “MK-750”, corona discharges can be not only detected but visualized. A portable instrument called “CORONA DISCHARGE VIEWER MK-760” has been released lately in order to perform electrical facilities diagnosis.

Development of Special Environment LED Lighting using AC Drive Technology

Hiroyuki Tanaka
Do Light Co., Ltd.

Due to the suppression of global warming and enforcement of the Minamata Convention, the switching of lighting equipment from existing light sources to LED light sources has become an urgent matter for the entire industry.

LED lighting is excellent from the perspective of energy savings / eco product, and it seems that erroneous information that it is a light source which does not get hot unlike conventional lighting and its merit are widely understood. Since heat-sensitive materials are often used as parts for LED lighting, heat dissipation design, which was not deemed important in existing lighting sources, has become a problem that affects the product life, and in particular, high temperature and dust impact. In applications where there there are special circumstances such as vibration, the product life can be severely impacted and disappoint users' expectations. Our products do not require ballasts. Independent type modules adopting AC drive chips and LED lighting for special environments of less than 70 ℃ are developed by a heat sink with a helix structure unparalleled anywhere. In addition, in this paper I would like to touch on the latest measures against heat, casing design, material improvement and development of new material LED chips to meet expectations for high temperature environment users above 70 ° C.

Introduction of high-efficiency and power-saving closed condensate recovery system in Paper industry

Takehiro Uwafuji , Sohei Akinaga
Miura Co.,Ltd.

MIURA as a leading manufacturer of small once-through boilers has adopted “Plant infrastructure total solution” as a slogan and is promoting various eco-friendly proposal activities through water treatment devices for industrial water and compressors using in-plant process steam, and so on. This paper explains high-efficiency and power-saving closed condensate recovery system in Paper industry.

Niigata Mill Energy Saving Case

Masahito Washidu
Hokuetsu Corporation Co.,Ltd.

In recent years, countries have been required to take measures against global environmental problems such as global warming, and Japan aimed to reduce CO_2 emissions in FY 2030 by 26% from FY 2013 in the draft of the Paris Convention's promise [1)] . In order to contribute to the draft of the promise of the Paris Agreement, we have also started a project to save energy. In this paper, we report two cases, "Enhancement of primary screen efficiency of No.8 paper machine" and "Water conservation by adding secondary water filter of No.9 paper machine" at the Niigata Mill.

Approach to reducing steam consumption in dryer section

QIAN LIN , Shogo Ujiie
Kurita Water Industries Ltd.

In the papermaking process, various integrated efforts are demanded to reduce the energy consumption. To dry the wet paper to a targeted moisture value in the dryer section requires a large amount of energy. The energy efficiency will be worse enough to affect the whole production process in the winter season, since at the lower temperature extra steam energy is required, which deteriorates the steam consumption rate. As a result, mitigating the steam consumption rate is crucial to reduce the energy consumption and to improve the productivity.

In this paper, an originally developed technology, Finesteam, is introduced to improve the heat transfer efficiency. The core of this technology is to increase the water repellent ability in the inner surface of the dryer, so the liquid film layer of steam condensed water can be avoided, which effectively reduces the heat conduction resistance. This technology is expected to optimize the heat transfer process. Results in this paper confirmed that the reduction of the steam consumption rate is about 3~10% on average.

Another advantage of this technology is that it can be applied cheaply and easily to the existing systems without changing the present operation conditions, making it a great option to reduce the energy consumption. It will not affect the boiler water quality. In addition, an automatic control system has also been developed independently for the chemical feeding. Visualization is also possible with our most recent water processing monitor system, S.sensing® WEB.

The effectiveness of technology has been successfully applied in single-cylinder Yankee dryers and multi-cylinder dryers, leading to more than fifty cases of adoption in Japan and worldwide.

New Type Turbo Blower Saves Energy
-Air foil bearing Variable speed Single stage Turbo blower TurboMAX-

Tsuyoshi Masuda
ShinMaywa Industries, Ltd.

In this paper I would like to introduce the advantages and technologies of TurboMAX turbo blower. TurboMAX turbo blower consists of superior technologies like air-foil bearing, permanent magnet synchronous motor, high efficiency impeller, high speed control technique and so on. As for the overall structure, blower, motor, inverter, touch panel controller and blow off valve are installed in one enclosure. This is a new style turbo blower called “air foil bearing-variable speed-single stage turbo blower”. Compare to the conventional blowers, TurboMAX turbo blower has many advantages in “Saving energy”“Low noise and vibration”“Saving maintenance cost”“Space-saving and lightweight”. Especially, compare to the conventional root blowers, TurboMAX turbo blower can reduce power consumption by 20% on average.

As global warming is serious issue around the world now, reducing the power consumption is required to all industries regardless of its type and scale. Especially for paper industry which uses and disposes a large amount of water, reducing the cost for waste water treatment is a big challenge. In the process of waste water treatment, aeration blower's power consumption makes up the large proportion, and aeration blower usually runs for 24 hours every day. So, high efficiency aeration blower can contribute to the cost reduction of waste water treatment significantly.

In the latter half of this paper, I introduce an actual case of replacing 2 root blowers with 1 turbo blower (MAX100) at municipal sewage-treatment plant for the field trial. As the result, we could confirm 25% energy saving, 16dB noise reduction, 25μm vibration reduction, and 6℃ blower room’s temperature reduction.

ShinMaywa Industries, Ltd. launched TurboMAX turbo blower since 2012 in Japan, and some blowers have been delivered to paper factories. As for paper factory, we have delivered blowers to 8 paper factories so far and 12 blowers are in operation now. Especially, one of these blowers are used for flotator which is used in the deinking process during manufacturing recycled paper from used paper, and we confirmed TurboMAX turbo blower

can reduce power consumption in non-aeration use too. I expect TurboMAX turbo blower can reduce the power consumption in many other uses too. I hope TurboMAX turbo blower contributes to the energy saving in many fields and it leads to the reduction of environmental burden of the globe.

Honeywell's multivariable predictive control for pulp process optimization and life cycle management of MPC

Kunihiko Seto
Honeywell Japan Ltd. Advanced Solutions

Multivariable predictive control (MPC) application has been started for pulp mill in Japan. Honeywell's multivariable predictive controller "Profit Controller" is widely accepted in process industry by its unique and advanced functions such as robustness and scalability for optimization. Lifecycle management is also important to utilize MPC and sustain its benefit for long time. Key points of lifecycle management and recommended support structures are described.

The effect of the countercurrent washing process for KP brown pulp stock line

Yoshitatsu Mori
Consulting Dept.2, Solution business Division, Yokogawa Solution Service Corporation

The washing process of KP (Kraft pulp) brown pulp stocks, following to KP cooking continuous digester, is consist of a series of washing equipment. This multi stage washing process is not only to wash the brown pulp stocks effectively but also to recover KP cooking chemicals (expensive sodium compounds) and some wood lignin components that dissolved in the filtrated dilute black liquors. And the filtrated and extracted black liquors are send to the following KP causticizing process, and the chemicals are recovered finally.

In this KP washing process, "Countercurrent flow washing" strategy has been utilized in general, and expected to the washing process to achieve better washing states for the pulp stocks not to remain much chemicals in it. And, furthermore, they are required to be washed effectively with lesser amount of fresh water usage, and, at once expected to decrease the energy loads of the following black liquor evaporation process.

In this paper, a washing calculation model for this KP multi stage washing process that can simulate and estimate the chemical material balance was proposed. Next, utilizing the simulated results by this model and another "Cross flow washing strategy", that used simple fresh washing water flow lines were compared. As the result, the effect of the "Countercurrent flow washing" was confirmed from the superiorities of the simulated results of the recovered chemical amounts in each washing filtrate line, lost chemical amounts to be carried away attached to the brown pulp stocks and the variance of the recovered chemical consistencies etc.

JAPAN TAPPI JOURNAL
8
August 2019
Vol. 73, No. 8

CONTENTS

Pulp

Research Report (Original Paper)

2019 August JAPAN TAPPI JOURNAL
Vol.73, No.8 Abstracts

Global woodchips supply/demand

Natsuki Omori
Woodchip & Biomass department, Sumitomo Corporation

Recent supply/demand balance of woodchips has changed dramatically due to the rapid pulp production increase in China. On the demand side, China became the biggest woodchip importer surpassing Japan for the first time ever. Globally, the trade volume of woodchips was 27 million BDT (Born Dry Ton) in Asia and approximately 30 million BDT including European market. It was the largest volume in history. On the supply side, three major supply countries, Vietnam, Australia and Chile had a record export volume respectively; however, those countries have some negative issues for stable supply. Thus, it is expected the supply/demand balance in the near future will be in a tight situation. In this report, we will study the future market prospects by analyzing the demand/supply situation respectively.

Growth of industrial forest plantation business and its challenges
-Efforts on the productivity of industrial plantations in Brazil-

Hiroyuki Obuchi
Japan Overseas Plantation Productivity Center (JOPP)

In the future, the priority issues for management of industrial forest plantations will be making strategies to the increase of world population and the global warming.World demand for wood will definitely increase year by year due to population growth. However, competition with the demand for agricultural land will make it difficult to secure new lands for tree planting. For improve forest productivity, it will be necessary not only to increase growth but also to develop of tree species that overcome global warming.

The goal of industrial tree planting is to get for the maximum yield in limited lands.Sustainability in industrial forest plantations are to improve cost competitiveness in order to provide society with wood needed for the future.For that purpose, it is important to grasp accurate information.

Forest measurement technologies continue to progress year by year. Satellite data are also able to use to watch illegal loggings, forest fires, wind damages, flood damages, pests and diseases. From now on, we can take information of plantation sites and forestry machines by IoT(Internet of Things).

This time, I was given the opportunity to explain the launch of The Brazilian Tree Industry(ibá), the creation of genetically modified eucalyptus in Brazil, and the technologies in CENIBRA's tree planting business.I would like to evaluate that they are steadily moving in the direction captures the requests of the times.

Outline of Pulp Manufacturing Technology in Japan

Makoto Iwasaki
MIP Consultant Office

In this paper I described about pulp manufacturing technologies which related to KP, MP and DIP after World War Two. These pulping technologies were mainly influenced by raw materials, environmental issue such as AOX in bleaching effluent and market needs.

Introduction of the DIP system

Takanori Goto
Project Sales Dept., Voith IHI Paper Technology Co., Ltd.

A DIP production process consists of many kinds of machines. It means that there are possibilities to be able to reduce the cost of raw material, energy, and chemical by the technology of each component. In this paper, we will introduce DIP system technologies related to each component and system.

Modernization of bleaching plants at Cenibra in Brazil

Hiroshi Yamashita
Valmet K.K. Pulp & Energy Service business line

In order to modernize the existing bleaching plants at Cenibra in Brazil, a new No.3 bleaching plant was installed with the latest bleaching technologies and state of the art washing machines; Twin Roll Press Evolution (TRPE) to replace the existing old No.1 bleaching plant. With this installation the power consumption, total steam consumption, and water consumption were reduced approximately by 49-50% , and effluent load were reduced approximately by 38%. In addition, the consumptions of chlorine dioxide, peroxide, caustic, and sulfuric acid were reduced by about 11%, 15%, 12%, and 45% respectively. It means that a lot of benefits can be obtained by adopting the latest bleaching technologies and TRPE instead of the old bleaching plant. Today it is progressing to modernize the existing No.2 bleaching plant with latest technologies and TRPE, which scheduled to start up in December 2019, and expected to obtain same results as those achieved in the new No.3 bleaching plant.

Operating Experience of Bleaching Optimization Control System

Kosuke Ikeda
Iwakuni Mill, Nippon Paper Industries Co., Ltd.

Kraft Pulp Mill needs to install Auto Process Control system, which can achieve bleaching chemical cost reduction with operating and quality stabilization as well as workload reduction for each operator. Iwakuni Mill has two Kraft Pulp Mills, one is 5KP with hardwood chips, and the other is 3KP with switching operation between hardwood and softwood chips. 5KP plant, which 1,550t/D production is applied, controls brightness and Kappa number of final furnish by 4-stage bleaching system (A-D_0-E/P-D_1) and had an issue of excessive bleaching chemical consumption not to breach brightness quality standard.

Last year operating optimization and chemical cost reduction in 5KP were achieved after installation of Valmet APC Bleaching Optimizer (VBO). This report shows our experience through the process leading to stabilized operation since VBO installed.

Automatic control of the pulp bleaching process
- the history of its evolution and the future

Yoshitatsu Mori
Yokogawa Solution Service Corporation

It is well known that the PID control is very effective function. However, PID has a weakness against process's long dead time such as pulp bleach process have. Therefore, it has been used sample

PI control and Smith's predictor etc. to avoid those problems. I summarized the development of the history of the control technology to improve the controllability against the pulp bleach process problems, for example, cascade control, pulp bleach advanced control by DCS(Distributed Control System), feed forward control system using multiple regression model by utilizing process computer with database system connected to the DCS and recently MPC(Model Predictive Control) systems. Furthermore, unavoidable sensor troubles in pulp bleaching process and the soft-sensor in the MPC are described. Finally, touching on the technologies of Industrial-IoT, machine learning and AI etc. using big data, we'd like to consider how these new technologies will be utilized in the pulp bleaching processes in the future.

Chemical approach to solving pitch problems in the pulping process

Ryosuke Doi
Nissin Kagaku Kenkyusho Co., Ltd.

In the paper industry, engineers who aim for stable operation and quality improvement in manufacturing, have been faced with the increasing number of pitch troubles due to sticky substances in recent years. These problems are caused by the increased utilization ratio of waste paper and plantation trees, furthermore, closed water system.

Conventional pitch control methods in the pulping process generally use microtalc, surfactants, anions and cationic polymers. They are highly effective and at low cost, however, a new countermeasure method is required because the conventional methods are not enough to meet the demands for further improvement in quality and productivity in many cases nowadays.

This article describes our approach to pitch control in the pulping process.

Efficient pulp washing on KP brown stock washing process

Yukinori Enomoto , Masakazu Fumihara
KATAYAMA CHEMICAL, Inc.　PULP&PAPER RESEARCH
KATAYAMA NALCO, Inc.　PULP SERVICE THIRD DISTRICT SALES GROUP

The purpose of brown stock washing is to separate spent cooking chemicals and dissolved organic wood solids from unbleached fibers. Recently, some pulp mills are trying to improve pulp yield, but this operation usually tends to make pulp with high blow line kappa number. Also, we need more bleaching agents or oxygen delignification efficiency than conventional operation to meet required fiber brightness. If we use water alone for this process, we cannot remove hydrophobic materials, like dissolved lignins and extractives, from unbleached fibers completely. Our pulp wash aid has dual effect; one is to improve drainage and the other is to remove wash hydrophobic materials efficiently. Using our pulp wash aid, we can reduce the amount used of wash liquor and bleaching agents, and also achieve improvement of oxygen delignification, etc. This article describes the theory of our pulp wash aid, and introduces some case studies from actual mills in overseas.

The Basic Operation Management of Black Liquor Concentration System

Kohei Nakamura
Sumiju Plant Engineering Co., Ltd.

Sumitomo Evaporator is a plate type falling film evaporator. The biggest feature of it is excellent solution for scale trouble. For its feature, Sumitomo Evaporator has been applied to Black Liquor Concentration since 1974 in Japan. In This Paper, We introduce Sumitomo evaporator and its other features. Then, we will show how to check the state of multiple effect evaporators from the point of view of temperature conditions.

Problems with refractories for rotary kilns and their factors

Hitoshi Toda
MINO CERAMIC CO.,LTD.

In this paper, we report on the wear of refractories in rotary kilns and their factors by showing two examples. The wear of refractories in the rotary kiln includes corrosion, spalling and abrasion caused by various factors. In case of a rotary kiln, mechanical spalling due to mechanical stress can be a serious problem. By identifying the causes of wear of refractories and conducting proper measures, it is possible to prevent refractories from being prematurely worn and to increase the operation rate of the kiln.

International Recycling of Waste Papers

Michikazu Kojima
Senior Economist, Economic Research Institute for ASEAN and East Asia

The utilization of recovered paper has been increased significantly in these thirty years. China has been a major importer of waste paper. Around half of internationally traded waste paper have been imported by China in recent year In 2017, China announced the tighter control of import of recyclable waste would be introduced from the end of 2017. Regarding paper, China has prohibited importing other waste papers, including mixture of various waste papers, which is not classified in other trade code. The reasons behind the trade restriction is pollution from paper recycling and mixture of non-recyclable waste.

EU and US increased the export of waste papers to India in 2018, while Japan did not. The reason why Japan did not increase the export of waste papers to India might be transportation cost. From east coast of US and EU, India is closer than China. But from Japan, the transportation cost to India is significantly high, compared with China.
This paper reviews the recent trade flow of waste papers in recent years, and Chinese regulation on waste paper import.

Introduction of the latest solution for productivity improvement in Kraft pulp process

Hideo Yamamoto ,Satoshi Wada, Mitsuru Komatsu and Masayuki Murano
Kurita Water Industries Ltd.

In recent years, demand for paper has been sluggish, each paper company is making efforts to improve productivity and reduce costs to improve profitability. Even in the kraft pulp making process, it is necessary to use inhomogeneous raw materials, operation with chemicals and energy conservation, and various problems accompanying it are becoming obvious.

Regarding the pitch component in the raw material, it was possible to reduce the solvent extraction amount and dirt number by removing fatty acid and resin acid of the pulp by the newly developed pitch control agent. Regarding to the pitch component derived from the antifoaming agent, it was possible to significantly reduce the dirt number by developing an antifoaming agent with excellent dispersibility. Regarding the whiteness of the pulp, it could be improved with a pulp cleaning agent which removes lignin and prevents reattachment. As for the calcium oxalate scale, we optimized the scale inhibitor to enhance the performance under high pH and drastically extended the continuous operation period in the actual machine.

We would like to contribute to the paper making industry by solving our customers' problems and improving productivity and ensuring stable operation through our chemical treatment technologies including these examples.

Numerical Simulation for Compressive Strength of Corrugated Fiberboard Box

Takao Kobayashi
Packaging Innovation Center, Oji Holdings Corporation

Many prototypes and experiments are repeated in order to decide the specification of the optimum corrugated fiberboard box, so if it is possible to predict the compressive strength of the box in advance, the development period can be shortened. Therefore, a method of predicting compressive strength of corrugated fiberboard boxes using nonlinear finite element analysis was studied. Considering geometric nonlinearity and material nonlinearity, phenomena leading to the maximum of the load through bifurcation buckling, initial yielding and material failure were reproduced. As the material properties, the order of the buckling mode and the box compressive strength matched the experimental results by inputting the data of the stress-strain curve obtained by the edgewise crush test of the corrugated fiberboard and the rotational rigidity around the crease line axis. As factors influencing the box compressive strength, it is conceivable that the edgewise crush resistance of the corrugated fiberboard, the bending rigidity of the box corner part, the buckling mode, and the shape of the box. It was proved that estimation of the box compressive strength by numerical simulation is effective as a means to realize optimum design of the box specification and shortening the turnaround time of new product development.

JAPAN TAPPI JOURNAL
9
September 2019
Vol. 73, No. 9

CONTENTS

Papermaking Technology I

2019 September JAPAN TAPPI JOURNAL
Vol.73, No.9 Abstracts

New development of waste paper handling technologies
- Introduction of latest stock preparation equipment -

Jiro Urata
AIKAWA Iron Works Co.,Ltd.

In 2017, there was a trade conflict between the United States and China, in addition to a change in China's wastepaper procurement policy. This had a major impact on Japanese wastepaper procurement in 2018, and surpluses and shortages occurred in a short time. As a result, in the paper mills in Japan, the price of waste paper has risen, sometimes forcing the use of some grades of waste paper that are not regularly used, and affecting product quality and operations.

China announced a policy to target zero solid waste imports by 2020. It will limit the import of unsorted waste paper from Japan. There will be a shortage of high quality waste paper, an excess of unsorted waste paper, and frequent use of low grade waste paper. If inexpensive waste paper can be used to maintain product quality, the production cost can be reduced.

Solutions for handling low grade waste paper measures are important for the stock preparation system. The latest waste paper processing technology will be introduced along with successful examples in domestic and overseas mills.

Intelligent Refining to Contribute Minimized Operating Costs,
Optimal Quality and Increased Stability – Solutions and Results

Keiichi Fujiki
Paper Technology, Valmet Japan
Juha-Pekka Huhtanen,
MFC Team, Valmet Finland

The refining stage in stock preparation plays an important role in developing the properties of stock for paper and board production. In the refiner, appropriate fiber treatment greatly affects the runnability of the paper machine and quality of the end products. Based on years of experience of several types of refiners, customer cases and pilot machinery testing, Valmet has developed the refining process where the stock treatment efficiency has been raised to a new level.

The key target of the solution development is to save operating costs and increase profit while keeping the end-product quality at the target level for the customers. There are three cornerstones for achieving these targets: refining, high capacity OptiFiner Pro, itself e.g. how fibers are treated and at which amount of refining energy. The second cornerstone is automation and how stock properties can be measured automatically without human interference and how to utilize models to predict the quality of the stock after the machine chest. The third cornerstone covers Industrial Internet applications, which provide possibility to a meaningful dialogue with data. The dialogue with online data further improves the ability to have stability in the process, and remarkably shortens the reaction times to solve problems. There is also possibility to have a connection to a performance center, with a whole team of experts to speed-up troubleshooting and give support for process optimization.

Pilot facilities for stock preparation processes provides the complete testing environment for mechanical pulping, recycled fiber, stock preparation and pulp drying. This enables an individual testing of customer’s own processes as well as provides a comprehensive basis for

the product development.

Many commercial installations show that refining solutions improve end-product properties and increase energy efficiency. The electricity savings potential is considerable. In one case, only one new refiner replaced two traditional refiners and still delivered 40% electrical energy savings.

This paper will present a more detailed description of the refining solutions, automation platforms and Industrial Internet applications. It will also present mill experiences and results under production conditions.

Operating Experience of vertical washer and fiver recovery "Vertical Z"

Hideto Miyata
Oita Mill, Oji Materia Co.Ltd.

In Oita mill, there are three paper machines, #1 ,#3 and #5, which produce various types of products such as paperboard, gypsum liner board, white paperboard, color board, and core board paper.
White water put out from these three machines was treated directly at AST (activated sludge treatment) in our mill, therefore, SS (suspended solids) concentration in waste water was higher than other mills in our company. It was one of the factors which made total production yield lower in Oita mill.

In this report, we will introduce the case that we installed vertical washer (Vertical Z TAIZEN Co., Ltd) which recovered fiber from white water and we have confirmed improvement of total production yield.

Technological Trends of Internal Sizing Agents

Kazuya Miyamoto
Chiba Laboratory, Paper Chemical Business Division, SEIKO PMC CORPORATION

This paper presents a review of technological trends and developments of internal sizing agent. In recent years, papermaking conditions have changed by greater use of recycled pulp and closed water system in paper mill and the performance of internal sizing agent has been declined. Under these circumstances, formulations have been proposed that emphasize the use of surface sizing agents rather than internal sizing agents, but have not been much advanced and the internal sizing agent still have an important role in paper making.

The Operating Experience of the Canvas Cleaner Equipped with a Roots Blower for Vacuum at PM N2 in Yatsushiro Mill

Kazuho Igarashi
Yatsushiro Mill, Nippon Paper Industries Co., Ltd.

Yatsushiro Mill, Nippon Paper Industries Co., Ltd is located in Yatsushiro city having rich nature, "Kuma River" which is one of the Japan's three biggest fast flowing river, also "Kyushu mountain range" and "Yatsushiro Sea". Yatsushiro Mill is the integrated mill, mainly produces newsprint, printing paper, information paper. Yatsushiro Mill has four paper machines and produces 500,000 tons annually.

In order to reduce paper loss due to pitch, PM N2 installed the latest canvas cleaner in 2016, and it is the first printing paper machine in Japan to have this cleaner.

This report describes the outline of PM N2 and the operating experience of this cleaner.

JAPAN TAPPI JOURNAL
10
October 2019
Vol. 73, No. 10

CONTENTS

Papermaking Technology Ⅱ

2019 October JAPAN TAPPI JOURNAL
Vol.73, No.10 Abstracts

Water quality management and Stable operation for papermaking wet end by Kurita S.sensing® Technology.

Yasuhiro Kagawa, Hiroki Katsura , Keiji Suruga and Takashi Saigusa
Pulp and Paper Industries Department, Kurita Water Industries Ltd.

Recent environment around paper industry has been changing, especially in regard to increasing paper recycle rate. It causes in fluctuation of furnish quality, that influence on machine running stability and paper product quality. In such a complicated situation, we focus on “water”used a lot in paper-making process to improve productivity. We report our new technology, “S.sensing® system” to achieve it by stabilizing water quality. S.sensing® system has three functions：monitoring, analysis and control.First, we monitor water qualities and accumulate machine running & paper quality information from customer. Second, we analyze the correlation among them. Third, we control water quality and achieve improvement on machine running stability and paper product quality.

In this report, we introduce the case study that defect on paper reduced by analysis correlation between water quality & defect causes then controlling water, and we linked the upstream side and the wastewater treatment process by our newly developed “S.sensing® system”.

Smart Control Module for Wet-End Process

Ryozo Shimizu
Project Sales Department, Voith IHI Paper Technology Co., Ltd.

The concept of "Papermaking 4.0", launched by Voith Paper in 2015 in Asia including Japan, is the fourth high-tech strategy "Industrie 4.0", a high-tech strategy promoted by the German government. Based on the industrial revolution. Construct a system combining modules composed of highly digitalized smart devices, collect and analyze huge big data such as machine equipment, papermaking process and product quality via high-speed network, and perform advanced predictive control This is a new total solution for paper machine equipment that provides predictive maintenance and artificial intelligence based on condition monitoring results, and operation support services that make full use of machine learning functions. A new company, Voith Digital Solutions, launched in April 2016, brings together resources within the Voith group to the development of new digitization products and application software and services that make full use of IoT technology, creating a digitization business model It was established for the purpose of further expansion. Product development and data security using a cloud system by expanding to the area providing secure and reliable IT infrastructure facilities and services that are the foundation of the three product areas of smart control, smart maintenance and smart service In addition, services such as cyber security measures and penetration tests to diagnose system vulnerabilities can also be provided.

As the world's leading paper machine supplier, Voith integrates the latest dynamic advanced information technology with the know-how accumulated in the papermaking process through the design and development of numerous papermaking machines provided over the past 150 years Bring the next level of change to the paper industry. We will introduce the smart control module of wet-end process, which has obtained good results in the past several years after verification on the actual machine, including future possibilities. In the conventional method of measuring the strength of the paper, the sheet sampled from the surface layer of the winding after frame change is subjected to destructive inspection in the test room off-line.

Therefore, a time lag of approximately one hour occurs before reflecting the measurement result in operation and obtaining the result. In order to guarantee the quality target value of the shipping products reliably, it is addressed by setting the setting value in the operation to a high value, but excessive waste or waste is generated in medicine and raw material

combination. This is a factor that lowers production efficiency, as products manufactured from the time a problem occurs beyond the allowable range of the quality target value to the time it is dealt with are scrapped. The virtual sensor is a technology that can predict and quantify various quality control values online by analyzing and modeling (static and dynamic) process data, machine data and test data. Since real-time quality control can be performed, excessive operating cost reduction and productivity improvement can be expected. On-line control in combination with the smart control module can also provide safety assurance and performance improvement through stable operation. Extremely high accuracy, as highly correlated data is found from all process data, machine data, and test data and reflected in the model instead of using only correlated process data based on theory or experience A model is built. Basically, all quality control values can be modeled as virtual sensors.

Latest technology trend in Wet-End process automation
-Advanced analytics improve mill performance and reliability-

Jari Almi and Samuli Lehtonen
Valmet Automation Oy. Finland
Kenichi Ishihara
Valmet K.K. Automation Business Line

The Industrial Internet has enabled the unlocking of the value of vast data resources in a modern pulp and paper mill. Combining process and business data from different mill systems, applying advanced analyti③cs and utilizing industry knowhow allows advanced companies to launch new data driven analytical applications. The applications can just visualize the big data, but also incorporate artificial intelligence to predict future outcomes and increase overall level of intelligence. New applications enable assisted decision making by mill operators and create more intelligent setpoints to the automation system. Analytical applications and remote connections can be also used by suppliers process and machine experts in their remote support centers. The future of data analytics will involve common solutions by suppliers in a so-called “digital ecosystem”. Concrete steps in building this ecosystem are being taken by combining the resources and solutions of an automation supplier with a supplier of enterprise resource planning and manufacturing execution systems.

Clean Paper Machine Operation by Proper Slime Control and Retention Aid System

Yu Kimura
Technical Div., Technical Dept., SOMAR Corporation

In recent years, the usage of wastepaper pulp and recycled water has increased in paper machines in order to reduce environmental burden. This increase has brought a lot of troubles in paper making process and paper quality itself. These troubles are caused by microorganisms, residual paper making aids, pigments and stickies which originate from wastepaper. Therefore, we have developed "CURECIDE System (slime control agent)" for microbial deposits and "AXISZ System (retention aid / coagulant)" for the deposits which come from papermaking aids and stickies.

"CURECIDE System" is composed of a variety of slime control agents. These agents are mixed with sodium hypochlorite when they are dosed. This system can generate both general inorganic and organic biocides. The organic biocide is very excellent in not only long-time effectiveness as bactericide but also anti-fungal effect. Fungi grow fast with starches, but starches which derive from wastepaper pulp are increasing. This trend helps increment of microbial deposits. "CURECIDE" and sodium hypochlorite are transported to the machine side in two separated pipes and are mixing just before added to paper machine. In this way, there is no decrease in the sterilizing effect. Our on-machine trial shows that the number of microorganisms reduces greatly. Consequently, the paper defects decline as well.

"REALIZER FX77", retention aid which is one of the compositions of "AXISZ System" is very effective for the deposits from stickies and papermaking aids."REALIZER FX77" is a high-performance retention aid which is incorporated with "Reactive Polymer Technology". "Reactive Polymer Technology" is able to bind both stickies and residual paper making aids to pulp fibers even if the retention aid polymer is broken by machine shear. To add "REALIZER FX77" improves the retention of internal sizing aids. Hence, the number of paper defects which are caused by the residual sizing aids can be greatly reduced.

Alkaline Newsprint with High Brightness and High Opacity for Color Printing

Takanori Miyanish
JAPAN TAPPI

Several mill trials on a twin wire gap former suggested that neutral PCC (Precipitated Calcium Carbonate) filled newsprint has high brightness and opacity, and is technically feasible. Sheet formation was good, physical properties were acceptable, and print quality such as ink transfer and print through was excellent. However, more linting propensity was observed. To solve this problem, Prüfbau printing tests and EPMA (Electron Probe Micro Analysis) were employed for the evaluation of linting tendency and paper sheet structure. PCC fillers retained by mechanical filtration were observed near the paper surface as agglomerates. Laboratory studies found that using a retention aid improved two-sidedness of paper and distribution of PCC fillers by colloidal forces, and reduced linting propensity.

Based upon these results, the next mill trial was performed. For effective use of retention aid, zeta potential of the paper machine headbox was monitored continuously by an on-line instrument and was controlled into the proper range. Stock inlet pH was stable at 7.5-8 due to the buffering effect of PCC, and no darkening of mechanical pulp was observed. No paper breaks or foaming troubles occurred. The first pass retention was increased and two-sidedness and linting of the newsprint were decreased to satisfactory levels. The neutral papermaking technology of newsprint was successfully applied to develop value added high brightness and high opacity wood containing printing grade and generated ample profit to paper mills.

Wet End Chemicals and the applications in Japan, China, USA and SEA

Ryuji Itose
Harima Chemicals Inc.　Paper Chemicals Company,
Sales department, Southeast Asia Block Sales Section

Harima Chemicals Group supplies wet end chemicals such as paper dry strength resins (DSR) and rosin dispersed sizes in Japan, China, US and Southeast Asia (SEA) corresponding to the requests of paper quality for customers and the compliance of regulations for environment.

In this report, the trend of wet end chemicals in the area and the countries is described based on the paper production with economic trend. The performance of wet end chemicals is massively affected by the conditions of raw materials and machine setting such as recycled fibers and pulp types and wire types, etc. In order to get the best performance of wet end chemicals, it is necessary to comprehend the wet end condition. Then, we can get the better runnability and productivity with optimizing the application of wet end chemicals and machine setting. We recommend our DSR (Harmide®) for better runnability and total cost reduction against the application of starches for papermaking. Also, we introduce our rosin dispersed size (Harsize® and NeuRoz®) with Co-mingle system® for better sizing and cost reduction.

Picth Troubleshooting of Paper Making by Comprehensive Chemical Approach at Paper Stock Preparation / Wet End

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

Recently, the quality of the wastepaper is lower than before, because the good wastepaper circulation volume shrinkage by influence of progress of information digitalization, and the other hand, improvement of paper quality and weight saving are desired from paper and board user, therefore deposit trouble is one of a serious problem for papermaking engineers.

The pitch measures in the pulping process are extremely important as one of the means to solve the pitch problem fundamentally. But it is impossible to solve the pitch trouble only by the pulping process, so the pitch measures at the wet end are also necessary.
This report introduces the pitch control method at the wet end.

The latest technology for the solutions of Approach Flow

Masamori Tanaka
Voith IHI Paper Technology Co., Ltd.

Approach Flow means the system to prepare the suitable fiber and water condition just before the Headbox. The suitable condition is that uniform paper is produced without paper breakage and/or quality problems during operation. For the continuous and stable production, Approach Flow should get rid of problems mainly like pulsation, uneven fiber consistency and mixed and dissolved air bubbles. Additionally, saving energy and less space of installation for machines are also required for better system.

CoMix is the system for fast and even mixing. Hydromix is for stock dilution with short retention time. The size of CoMix and Hydromix is much smaller than conventional design. Dearation tank system has less energy consumption than dearation pump system. Pulsation can be decreased by Multifoil rotor and special casing screen.

With these machines, the latest Approach Flow System achieves much compacter system with less energy consumption and stable uniform stock quality.

Quality Improvement in Yonago-Mill N-1M/C Approach System

Tsutomu　Shimoji
OJI PAPER Co.,Ltd Yonago-Mill

Oji Paper Yonago-Mill N-1 Paper Machine (N-1M/C) has started commercial operation with producing the base paper for A3 grade (Light weight coated grade) since October 1998. In 2000 the wood-free paper production has been launched then, the production of the base paper for A2 grade (Fine coated grade) has been as follows started in 2005 when the remodeling of the off-coater part was completed.

A tremendous measure has been taken on N-1M/C to achieve much higher machine efficiency and improve the quality though, we are introducing the useful work for the quality improvement through the approach system in this article.

Development of Technologies for Integrated Production from Woody Biomass of Cellulosic Ethanol

Atsushi Furujyo, Shingo Sekizawa, Naoya Azumi, Akira Tsukamoto and Shoichi Ikemizu
Oji Holdings Corporation, Innovation Promotion Division, Bioresource Development Center
Kohei Ide, Miyuki Kanezawa, Akira Fukuda, and Takeshi Uemura
JXTG Nippon Oil & Energy Corporation, Central Technical Research Laboratory

Bioethanol produced from biomass is expected to become a sustainable energy source in the future since bioethanol has advantages over fossil fuels. Namely, bioethanol is a natural and renewable form of energy that does not increase atmospheric carbon dioxide levels, because burning biomass releases carbon dioxide that is largely balanced by the carbon dioxide absorbed in its own growth. In Brazil and the United States, bioethanol produced from sugarcane, corn and other crops is already being used as automobile fuel by blending with gasoline. Increase in bioethanol production may, however, lead to increase in food prices due to the competition with food production.

In our country with the background of self-sufficiency ratio in the primary supply, "Sophisticated method of energy supply structure" has been established in 2009 to limit the volume of green-house gas emission and use of the biofuel is required. At the present, bioethanol which made from sugarcane is imported from Brazil. But considering in competition with a food is mentioned by a law, development cellulosic bioethanol is required from the prospective of energy security.

From 2015 to 2017, JXTG Nippon Oil & Energy(JXTG) and Oji holdings(Oji HD) studied "Demonstration and Development Project of Production System for Cellulosic bioethanol" for the purpose of development and demonstration. This project was supported from New Energy and Industrial Technology Development Organization(NEDO) and gathered the elemental technology obtained in the previous project, and in experiment, the most suitable combination was selected. Furthermore, we operate pilot-scale plant and confirmed the productivity of the cellulosic bioethanol.

DryOnyx H Release Coating of Valmet Corporation Expands Its High-Performance of Non-Stick Properties
- On-site Coating Services on Dryer Cylinders at Japanese Paper Mills -

Noriyuki Yasuo, Kimiaki Iwane
Nagoya Plant, Tocalo Co.,Ltd
Daisuke Inoue
Overseas Business Division, Tocalo Co.,Ltd

In 2015, Tocalo Co.,Ltd. started on-site coating applications of DryOnyx H, a release coating for dryer cylinders of paper machines licensed from Valmet Corporation, Finland, for Japanese paper manufacturers after closing a license agreement with the company in 2014 August. Valmet's DryOnyx H represents a package of unique technologies for coating formation that is highly recognized and used by paper manufacturers around the globe and is a successor, with improved features, to DryOnyx Z. The number of cylinders coated with DryOnyx H tops 300 as of 2014 August. Its functional coating surface has proved excellent releasing and non-stick properties for doctored dryer cylinders, contributing to drastic productivity improvements in papermaking processes.

One of the biggest advantages of DryOnyx H is its short time requirement realized by the on-site application, which eliminates the needs for removing large cylinders from the line and transportation to the coating facility as required in conventional release coatings. Low temperature cured paints and polytetrafluoroethylene (PTFE) fluoropolymer sheets are known as conventional on-site solutions for dryer cylinders, however, only few examples of actual use are found due to quality and short service life from their low durability to doctor blades. DryOnyx H is on-site coating technology designed to provide solutions for these challenges and now meets customers' expectations for shorter process time and longer service life.

During 2 year period from September 2015 to the end of 2017, nine cylinders have been applied with DryOnyx H, and more than six projects are underway in 2018. In this paper, the basic characteristics and coating processes of DryOnyx H along with its performance are reported.

Standardized Paper and Pulp Testing for Process Optimization and Control
—L&W New Generation Autoline and Online Pulp Measurement System—

Mitsuhiro Yamazaki
Pulp & Paper Group, Industrial Automation Division, ABB K.K.

In all types of mature business, constant improvements are required for a company to stay competitive. Today it is more important than ever. Search for cost reductions and improved efficiency is always on the agenda. In the pulp and paper industry, the first goal is to produce a product within given specification at the lowest possible cost - quality testing and monitoring of the process is one way getting there.

In this speech, at first about L&W Autoline, I would like to share our experience and knowledge which has been obtained from installation base of almost 500 systems all over the world. And, I continue to introduce the design concept and capability of L&W Freeness Online, L&W Fiber Online, and our new solution, L&W Freeness & Fiber Online which can combine the online measurements of freeness and fiber properties.

Reliable automated paper testing system and online pulp measurement system helps to monitor and control properties and qualities, and to create the best possible continuous and uniform process throughout from pulp furnish and to paper product.

Trace ion analysis by Ion Chromatography

Toshitatsu Takei, Iori Tomoda, Eriko Tawara and Mitsutaka Kondo
Material Analysis Center, Innovation Promotion Division, Oji Holdings Corporation

Ion chromatography (IC) was first published by H. Small et al. in 1975. IC is the method in which ions are selectively separated. It has been adopted to standard test methods such as "JIS K0127 ion chromatography common rule" and “Standard Methods for the Examination of Water” and applied in various fields such as the environmental, the chemical industry, the pharmaceutical industry. The IC consists of a pump that delivers the eluent, an injector that introduces the sample, a column that separates the target analyzer species, and a detector that detects the separated analytical species. In this study, we investigated the 2mm column instead of the current 4mm column and 100ml instead of the current 25ml loop to develop the micro-analytical method. Results show the sensitivity was 20 times higher than that of the current method.

The peak of the carbonic acid ion (CO_3^{2-}) could, however, be detected in between the peaks of nitric acid ion (NO_3^-) and sulfate ions (SO_4^{2-}) because of the high sensitivity of analysis, resulting in the lower analytical accuracy due to the changes in the retention times, sensitivities, reproducibility, the peak shapes, etc. Although we investigated the device for removal of the carbonate ion, it was not so effective as to lower the carbonate concentration for the high sensitive analysis. Therefore, we examined the different types of the columns, the gradient conditions of the eluent, and the column temperature. We applied the analytical method developed and optimized for the trace anion quantitation to paper samples. Results demonstrated that the method we developed was highly sensitive and also quantitative for the paper samples.

Mathematical Model of Paper Surface Topography by Perlin Noise Derived from Optical Reflection Characteristics

Shinichi Inoue
Process Development Laboratory, Mitsubishi Paper Mills Limited
Masanori Maki , Norimichi Tsumura
Graduate School of Advanced Integration Science, Chiba University

Both of gloss and gloss unevenness are important quality for printing paper. In addition, it is assumed that these optical reflection characteristics are caused by paper surface topography. Therefore, it is important to build the mathematical model of paper surface topography to evaluate gloss and gloss unevenness. However it is difficult to measure paper surface topography. Furthermore, it is difficult to make the mathematical model because it is irregular.

In this paper, we propose a new method of mathematical modeling of paper surface topography based on the Perlin noise. To estimate paper surface topography, we assume

that surface topography is expressed as the Perlin noise. The Perlin noise is a computer graphics drawing technique in recent years. It can generate irregular phenomena of natural world such as clouds, flames and water surface. These images are generated with a sense of natural by adjusting parameters. It is assumed that these optical reflection characteristics are caused by paper surface topography. The parameters which decide about the Perlin noise model is derived from the measured statistical optical reflection properties of paper. The statistical property of the surface normal distribution, that is BRDF (Bidirectional Reflectance Distribution Function), is acquired by the collimator optical system. The spatial frequency property of the unevenness is acquired by the telecentric optical system. We estimate the surface topography with this method and verify the validity of the proposed model.

The optical reflection characteristics of the surface topography generated by the proposed Perlin noise model were close to the actual optical reflection characteristic of paper. Moreover, it was confirmed that it can explain the gloss phenomena well.

JAPAN TAPPI JOURNAL
11
November 2019
Vol. 73, No. 11

CONTENTS

Pulp and Paper Research Conference/Paperboard・Cardboard

What is required of bioplastics now!

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

Considering their widespread usage in various fields, such as food packaging, clothes, shelter, communication, transportation, construction, health care, and the leisure industries, plastics are very important materials. Currently used plastics are mostly produced from petrochemical products. However, there is a growing demand for eco-friendly plastics, namely “Biomass Plastics”, which are produced from renewable resources, and “Biodegradable Plastics”, which degrade in the environment, to establish a more sustainable society and to solve global environmental and waste management problems. In this paper, I will introduce the processing of strong and porous fibers, mechanical properties, molecular and highly ordered structure, enzymatic and environmental degradation of microbial polyesters synthesized from sugar and plant oils. Recently, our group succeeded to synthesize new thermoplastics from polysaccharides such as curdlan, paramylon, pullulan, *etc.* by esterification and found interesting thermal, mechanical, and optical properties.

Highly transparent films, injection molding, and melt-spun fibers were prepared from ester derivatives and their physical properties and structures were investigated. Furthermore, unnatural-type polysaccharide, α-1,3-glucan, can be achieved by *in vitro* enzymatic polymerization with glucosyltransferase from sucrose *via* one-pot water-based reaction. Biomass Plastics and biodegradable plastics are thus intensively studied, and their current uses as well as future prospects are discussed in this paper.

Breeding and clone development for *Eucalyptus* plantation forest in northern Brazil

Kazunori Hayashi, Eiji Iwata and Naoki Negishi
Research Laboratory, Nippon Paper Industries Co., Ltd.

Nippon Paper Industries Co., Ltd. (NPI) manages *Eucalyptus* plantation forests in Brazil, Chile, Australia and South Africa as part of its sustainable resources procurement policy “Tree Farm Initiative”. Among them, Amapa Florestal e Celulose S.A. (AMCEL) located in Amapa state in northern Brazil owns the largest plantable area, planting *Eucalyptus* species in plantations and producing wood chips to export to overseas.

AMCEL enjoys flat, large and consolidated plantable areas, a favorable position of the chip mill and port relatively close to plantations, and a strategic location adjacent to the northern hemisphere for easier access to major markets. Since NPI joined AMCEL’s management in 2006, we have focused on development of elite commercial clones through, in particular, introduction of species and families well adaptive to AMCEL environment, establishment of near-infrared technique for wood property analysis, and modification of the conventional clone development process. As a result of continuous improvement in our principal breeding targets including tree volume, basic density and kraft pulp yield, we recently developed a new superior commercial clone which largely exceeds our current commercial ones.

In this presentation, we would like to discuss the latest situation and future direction of our breeding and clone development program for AMCEL plantation forest.

Characterization and Application Development of Phosphorylated Cellulose Nanofibers

Rina Tanaka
Oji Holdings Corporation

Phosphorylated Cellulose nanofibers (P-CNFs) with uniform width of 3–4 nm can be obtained via phosphate esterification of wood pulp, followed by simple mechanical disintegration process. The preparation method was simple and time-saving. Wood pulp was

soaked in an aqueous solution of urea and ammonium dihydrogen phosphate, and was dried and cured in hot air for a few minutes. During the reaction, anionic dibasic phosphate groups were introduced on the surface of cellulose nanofibers. X-ray diffraction measurement indicated that crystallinity index and crystal size of phosphorylated pulp almost didn't change after phosphate esterification. Due to osmotic pressure of water and electrostatic repulsion by phosphate groups, the P-CNFs can easily be nanodispersed in water with less energy consumption. P-CNFs can be used in dispersion, sheet and powder form. The aqueous P-CNF dispersion was highly transparent and had much higher viscosity than conventional thickeners. The transparent P-CNF sheet had low coefficient of linear thermal expansion, excellent mechanical properties such as high Young's modulus and high tensile strength, foldability and organic solvent resistance. Furthermore, we investigated the hydrophobized CNF and its powder whether to disperse in various organic solvents. P-CNFs can be applied to a variety of fields such as thickener, filler materials, display materials and flexible substrates.

Operating Experience of PM2 After Modification

Shigetsugu Sato
Kanazu Mill,Rengo.Co.,Ltd

6 paper mills in Rengo group had produced container board, however, we consolidated it into 5 paper mills to increase earning capacity by Rengo's reconstitution strategy of paper board production system. Although PM2 at Kanazu mill had produced only corrugating medium since 1969, it was modified to produce both liner board and corrugating medium with this policy.

PM2 started commercial run in October 1st 2017 and have continuously optimized its operation and reached 1,000 tons daily production, which represent an increase of 30% from the before modification, in June 2018.

This report describes general information for this project and operating experiences of PM2.

Development of Surface Strengthening Agent for Paperboard Having High Penetrability

Taku Ainoya
Research & Development H.Q., Paper Chemicals , Arakawa Chemical Industries, Ltd.

Recently, corrugated cardboard tends to become thin (reducing weight) due to environmental problems such as carbon dioxide reduction and resource saving. Since thin paper reduces the strength of the paper, it is well know that a method of compensating the strength by applying a paper strengthening agent. Generally, inexpensive starch is applied to the surface, and with starch it is difficult to reach the compressive strength of the intended paper. There is also concern that coating unevenness may occur by using a high viscosity starch solution. Furthermore, if corrugated cardboard coated with a large amount of starch is used, problems are pointed out such as poor adhesion when corrugated cardboard is assembled. On the other hand, Polyacrylamide (PAM) is used instead of starch. There is a problem that PAM is more expensive than starch. Paper surface strengthening agent developed in the past failed to achieve the target cost performance because it was not able to penetrate the paper sufficiently.

In order to solve these problems, we have newly developed the "high penetrating surface paper strengthening agent of PAM type". The feature of high penetrating type agent is: (1) it has excellent penetrability in the Z-axis direction of the paperboard; (2) it interacts with the ion component in the paper to make it pseudo-high molecular weight. Compared with the conventional surface paper strengthening agent, it has a higher compressive strength, improves the strength of corrugated cardboard products, and has the advantage of less adverse influence on adhesion property during molding of corrugated cardboard.

Rosin Sizing System with Reduced Alum Dosage for Linerboard

Kenichiro Yokota, Takuya Kawamura, Takuya Yamashiro and Takahiro Tanaka
Paper Chemicals Development, R&D Center, R&D Company, Harima Chemicals,Inc.

On the papermaking system of linerboard, it has become more difficult to achieve an effect of internal additives due to increase of waste paper which contains high calcium carbonate, highly-closed water system and increase of machine speed. Also, reduction of chemical cost has been strongly demanded, and thus more and more cost-effective chemicals is in need.

Alum is one of the most cost-effective fixing agent as well as it has the effect of deposit control and fixing internal additives. Although it is very important of anionic sizing system, excessive usage of alum could cause problems such as scale issue of calcium sulfate and increase of conductivity which bring negative impact on the other additives. For these reason, it is necessary to reduce alum to optimize wet-end chemical system, but this is obviously disadvantage for anionic rosin sizing agents.

On the other hand, neutral sizing agent such as AKD and ASA can maintain good sizing even under low alum condition because of low dependence on alum dosage. However, rosin sizing is considered to be much better in terms of paper runnability and paper quality because these sizing agents may cause slipping and deposit trouble.

To solve these problems, we developed "Co-mingle®", new sizing system, and “Harsize CES series” which can maximize efficiency on this system. This technology is based on our experience as a leading rosin sizing supplier. Co-mingle® can perform even low alum condition on paper board production in contrast to conventional system. In this report, we give a detail of Co-mingle® and Harsize CES series. And we would like to introduce our new total wet-end chemical system for low alum condition.

Development and characteristic of latest forming fabric for board machine

Suguru Watanabe
Technical Dept. PMC・EF In-House Company　Nippon Filcon Co.,Ltd

A Forming Fabric is necessary and integral for modern papermaking machines, performing three main functions: 1) draining pulp slurry; 2) forming the sheet; and 3) transporting the sheet to the press section. Adequate sheet formation is one of the greatest concerns of papermakers, because it affects most of the sheet qualities. Recently, high quality and high productivity have both become top requirements of papermakers. Paper machines have evolved, increasing in size and speed. To meet the current demands of papermakers and the latest machines, forming fabrics have evolved as well.
The global boom of internet shopping (and shipping) has increased paperboard demand as packing and wrapping demand have increased. One consequence of the increased demand is that furnish quality can be inconsistent, thus affecting board machine operation.

Paperboard makers seek “trouble-free” wire to improve operation and production efficiency due to today’s market demands and increased machine speeds. To meet the latest demand of the board making industry FILCON engineers have developed a new wire structure for paperboard machines called “N-CRAFT”. N-CRAFT is a new warp-self-binding design that has the same excellent internal-wear resistance as the SAKURA and FUJI series.

The most significant N-CRAFT improvement comes from redesigning the wire’s machine-side structure, and using different diameters yarns for the upper and lower layers of the wire. With N-CRAFT’s advanced structural design we expect the following benefits: 1) Improvement of operability (high dewaterability, reduction of fiber accumulation around the machine, improvement of wire life); 2) Reduction of drive load (wire elongation improvement under high tension, reduction of bottom weft yarn friction); 3) Improvement of paper quality (improved formation and reduction of wire marks)
In this report, we introduce the features of N-CRAFT.

Development of mineral hybrid fiber from calcium carbonate and pulp using fluid-jet cavitation

Moe Fukuoka, Toru Nakatani and Shisei Goto
NPi Research Laboratory, Nippon Paper Industries Co., Ltd.

Studies on the synthesis and characterization of a hybrid fiber (HF) consisting of precipitated calcium carbonate (PCC) and cellulose fiber were conducted. The PCC-HF has been prepared by modifying the carbon dioxide (CO2) method for PCC synthesis under high-pressure fluid-jet cavitation in hardwood bleached kraft pulp (HBKP) slurry. Scanning electron microscopy (SEM) observations of the HF showed that almost all fiber surfaces were covered with nano-size PCC particles. By using this PCC-HF as raw materials, the handsheet containing more than 50 % PCC by weight with a high first-pass ash retention (greater than 80 %). Unlike ordinary paper such as printing paper, the sheet showed remarkable physical properties, such as high flexibility without crumbling despite extreme high ash content. The SEM images from a cross section of the sheet containing 74 % PCC revealed that a very little number of fibers embedded in PCC layer. This implied that the bonding mechanism of HF sheet was different from ordinary paper. In order to clarify the mechanism, the slurry of PCC-HF for handsheet making was separated into two fractions, long fibers and fines, by using the Dynamic Drainage Analyzer (DDA). It was found that the nano-size PCC was attached onto not only the surfaces of the long fibers but also those of fiber fines. Thus, the PCC-hybrid fiber fines contributed sheet properties and high ash retention.

JAPAN TAPPI JOURNAL 12
December 2019
Vol. 73, No. 12

CONTENTS

Environment

2019 December JAPAN TAPPI JOURNAL
Vol.73, No.12 Abstracts

Introduction of River Systems
-Some idea for rainwater drainage systems-

Hiroaki Oka
Environment Consultant (JEMAI)

If we carefully observe the rainwater drainage channels, waterways and the discharging rivers of the factory or business premises, we can recognize the three river functions of erosion, transportation, and deposition.

This paper reports the results of the river survey on the Ganges tributary in Nepal. Then, various behaviors of river will be presented; including floods surveyed in the past such as Kinu River and finally explain basic knowledge of the river systems.

Japan's highest Aeration Stirrer

Naonori Tsunehiro
Hanshin engineering Co., Ltd.

The AQUARATOR has greatly improved the energy efficiency of aeration by dividing the power source of the two major functions of aeration, “air supply function” and “stirring aeration function”, and making the latter a rational underwater machine. It can be used as an anaerobic / aerobic underwater stirrer.

In addition to the standard activated sludge method, it is easy to select treatment systems such as anaerobic / aerobic activated sludge method, intermittent aeration method, and batch type.

Depending on the situation and purpose, either one of the air supply function and the stirring aeration function, or both can be controlled at the same time, so that it can cope with large load fluctuations.

It describes the characteristics of the AQUARATOR, the problems of the existing diffuser, the update from the existing diffuser, the introduction of the AQUARATOR, and the comparison with the existing diffuser.

Deodorant‘DEOMAGIC’harmonize with the stench, arise fragrance.

Yutaka Tsujimoto
Shikibo Ltd.

‘DEOMAGIC’ is a new deodorant develop by Shikibo.Ltd. It showed good effect for the odor which difficultly be removed by ordinary deodorant. ‘DEOMAGIC’ was developed by use the mechanism of perfume. By harmonizing with bad odor, ‘DEOMAGIC’ can change the odor to good smell.

Efforts to reduce the use of PRTR substances by switching boiler treatment chemicals

Shinei Furuse, Shojiro Sakai and Yoshitaka Ito ,
Iwanuma Mill, Nippon Paper Industries Co., Ltd.
Yusuke Kondo
NAIGAI CHEMICAL PRODUCTS CO., LTD

As one of our Corporate Social Responsibility (CSR) activities, we efforts to reduce environmental load, and reduction of Pollutant Release and Transfer Register (PRTR) substances is regarded as an important issue.

Nippon Paper Industries Co., Ltd. Iwanuma Mill had used the PRTR substances

such as hydrazine and cyclohexylamine as boiler treatment chemicals in black liquor recovery boiler, but we switched to “Amine-carboxylate treatment” which is not regulated in PRTR.

As a result, the boiler has stably operated for five years, and inside the boiler drum and turbine blade have been improved preferable condition.
On the other hand, higher pressure plants still use the PRTR substances, and we think that switching of boiler treatment chemicals for these plants should be considered.

Points of Amended Soil Contamination Countermeasures Act

Makoto Nakashima
Disaster Risk Reduction and Environment SBU, Kokusai Kogyo Co., Ltd.

A low amending part of the Soil Contamination Countermeasures Act was fully enforced on April 1, 2019. In this amendment, in order to realize appropriate risk management of soil contamination, expansion of the land subject to “Soil Contamination Investigation”, establishment of regulations for the prefectural governor to request submission of the plan of “Action for Removal, etc”, and rationalization of regulations according to risk have been implemented.

In the expansion of the land subject to the Soil Contamination Investigation, the scale of the “Changes to the Form of Nature Land” that may be subject to investigation order has been strengthened from over 3000m^2 to over 900m^2 when “Changes to the Form of Nature of Land” are carried on the site of a plant or workplace where had used or are using “Specified Facilities” using “Designated Hazard Substances”.

In the establishment of regulations that prefectural governor require submission of “Report of Plan of the Action for Removal, etc.”, it has been newly required that the owner, manager or occupant of land submit “Report of Plan of the Action for Removal, etc”, “Construction Completion Report” and “Action Completion Report” of the Action for Removal, etc. to prefectural governor and receive confirmation.

Rationalization of regulations according to risk is carried out in various situations such as implementation of Soil Contamination Investigation, “Designation of Area which Requires Action, etc.”, Action of Removal, etc., “Carrying-Out of Contaminated Soil” to the outside of the Area which Requires Action, etc., and processing of removed contaminated soil.

It is noteworthy that the amended act has taken into consideration the use of naturally contaminated soil and contaminated reclamation soil of public water surface area.

Explanation of the latest legal revision concerning waste
-Waste management in the era of circular economy-

Hironao Sakamoto
ENVIPRO HOLDINGS Inc.

The following is explained as waste management in the circular economy.
①Trends in G20 climate change countermeasures and marine plastic waste countermeasures
② Problems related to resource recycling such as global resource consumption, plastic production, China and other waste plastic import regulations, marine microplastic problems
③ Environmental regeneration by promoting proper disposal of waste
④ The Fluorocarbon Emission Control Law has been revised to improve the recovery rate of chlorofluorocarbons at the time of disposal of equipment.
⑤ Fourth cycle basic plan (integrated efforts with the creation of a sustainable society, regional revitalization through the formation of a regional symbiotic sphere, thorough resource circulation throughout the life cycle)

Low-concentration PCB waste disposal in the DOWA group
-Trends in coatings and other contaminants-

Masayuki Suzuki
Keita Horioka
ECOSYSTEM-JAPAN Co.,Ltd.

PCB (polychlorinated biphenyl) toxicity has been widely recognized by society since the 1968 "Kanemi Oilosis Incident", and the "Manufacturing of PCBs in accordance with the Law Concerning the Examination of Chemical Substances and Production Regulations" enacted in 1974 In principle, imports were prohibited.

In 2001, the "Special Measures Law for Promotion of Proper Treatment of Polychlorinated Biphenyl Waste (PCB Special Measures Law)" was enacted, and high-concentration PCB waste was treated as a treatment facility of Intermediate Storage and Environmental Safety Corporation (JESCO). Chemical treatment is underway in Japan, and the treatment deadline will be reached step by step.

On the other hand, in the year following the enforcement of the PCB Special Measures Law (2002), PCBs were included in the insulation oil of electrical equipment that was originally said not to use PCB, exceeding the standard value of 0.5 mg / kg (0.5 ppm). The existence of what has been found.

In November 2009, the Ministry of the Environment positioned these as "micro PCB-contaminated waste electrical equipment, etc.", and so far, they have been detoxified by incineration or cleaning at private industrial waste treatment facilities.

In August 2012, PCB contaminants with a PCB concentration of 5,000 mg / kg (0.5%) or less (waste containing low-concentration PCB) were also added to the treatment objects, and these were collectively called "low-concentration PCB waste".

As of the end of June 2019, 34 companies were certified as detoxification treatment facilities by the Minister of the Environment, and 5 facilities were licensed by prefectural governors for detoxification treatment of low-concentration PCB waste.

This paper introduces the efforts to detoxify low-concentration PCB waste in the DOWA Ecosystem Group, which started in 2006, and the detoxification treatment of PCB contaminants such as PCB-containing coatings, which have recently been attracting attention.

Behind the Scenes of the SDG No.14
Proper Treatment of Waste Plastic and Resource Circulation

Masashi Hosoda
Network Management and Empowerment Team
ECO STAFF JAPAN Co.,Ltd.

Treatment of waste plastic and recycling problems have become a top-priority issue to be resolved not only in Japan, but also around the world. Ecostaff Japan, a company which operates a network of superior industrial waste treatment and recycling with recycling companies nationwide, has established linkage with industry, government and academia, including central government offices, amid its ties with waste treatment and recycling sites and waste-generating companies in regions across Japan. This lecture will outline future prospects while collecting information on the latest trends amid uncertainty over the flow and destinations of waste plastic in Japan emanating from resource import restrictions in China.

Accelerate BCP response by visualization and real-time disaster prevention information
-To prepare for natural disasters-

Astushi Nakagawa
Kokusai Kogyo Co.,Ltd.

In Japan, large-scale natural disasters such as the Great Hanshin-Awaji Earthquake and the Great East Japan Earthquake frequently occur and have a great influence on corporate activities.

There were many examples of impacts on business continuity of companies due to supply chain damage, large-scale blackouts, etc. resulting in production stoppage, shipment stoppage, and suspension of business. In addition, large-scale earthquake predictions such as earthquakes directly below the Tokyo metropolitan area and Tokai, Tonankai, and Nankai 3 linked earthquakes have increased social consciousness and increased corporate awareness of business continuity.

In the BCP established by companies, “maintenance of employee safety confirmation methods (introduction of services)” is the mainstream, followed by “distribution of suppliers / suppliers”, “distribution of production / distribution bases”, “alternative suppliers / purchases” “Securing customers, subcontractors and sales locations” is being focused on as a priority item. These are all matters that have had a significant impact on business continuity due to recent natural disasters. Therefore, quickly grasping the damage situation of this "supplier / supplier / production base / distribution base / alternative production base / subcontractor / sales location" is very important for quickly determining the impact on business continuity. It is important.

However, most companies still collect information related to business continuity, such as damage confirmation notifications to their facilities, affiliated companies, and business partners. For this reason, there is a growing need for greater efficiency through digitization and automation, which is expected to be introduced in the future.

In this article, we will introduce examples of BCP / BCM support tools that have become increasingly interested in recent earthquakes and heavy rain disasters.

Improvement of Wastewater Treatment Capability by Fluidized Bed Type Biological Method
-PVA Sponge Bio Carrier Y-CUBE®-

Seiichi Nomachi
Sales Dept. YUKIGAYA CHEMICAL INDUSTRY Co.,Ltd.

Recently, industrial circles including paper manufacturing have problems of wastewater treatment, such as an increase in water volume, fluctuation in water quality, aging of existing facilities, and response to strengthening regulations on wastewater. As solution for these problems, it is thought that the fluidized bed type biological method is one of effective means, but there is a big difference in the treatment performance of the facility depends on functionality of bio carrier.

The PVA sponge bio carrier "Y-CUBE®" has high functionality in terms of hydrophilicity, abrasion resistance and microbial adhesion, which is essential performance as bio carrier owing to characteristics of PVA and special open-cell structure. We have introduced “Y-CUBE®” to companies in various fields such as paper, food, cosmetics and electronic products. In this paper, we introduce the product features of "Y-CUBE®", examples of introduction in the paper mill and comparative evaluation results with representative polyurethane bio carrier as sponge type products.

"Y-CUBE®" not only has excellent wastewater treatment performance compared with polyurethane bio carrier, but also high response to fluctuation of wastewater quality. Recent paper manufacturing industry has been forced to produce small quantities of many kinds due to diversification of products. This trend will continue

in the future. Because this is directly linked to fluctuations in the quality of wastewater, it is an urgent task for paper mills to develop wastewater treatment facilities that are highly responsive to fluctuations. We are convinced that "Y-CUBE®" will be able to help as a solution to that problem.

Characterization of TEMPO-Oxidized and Refined Pulps (Part 2)

Yukinori Kobayashi
Pulp and Paper Innovation Center, Oji Holdings Corporation
Graduate School of Agricultural and Life Sciences, The University of Tokyo

Yasutomo Noishiki and Manabu Yamamoto
Pulp and Paper Innovation Center, Oji Holdings Corporation

Tsuguyuki Saito and Akira Isogai
Graduate School of Agricultural and Life Sciences, The University of Tokyo

Hardwood bleached kraft pulp was oxidized using a TEMPO/NaBr/NaClO system to prepare two TEMPO-oxidized pulps (TOPs) with similar amounts of aldehyde groups but different amounts of carboxy groups. The original pulp and TOPs were refined using a PFI mill at various revolution numbers, and the influence of refining conditions on the fundamental properties of TOP sheets was investigated. The tensile strength of TOP sheets was higher than that of the original pulp sheet prepared using the same PFI mill revolution numbers. Refining of TOPs significantly improved wet tensile strength of the TOP sheets, whereas the original pulp did not exhibit such effect by refining. A clear relationship existed between the wet strength and the amount of aldehyde groups in the pulps. These results can be explained by the formation of hemiacetal linkages between the hydroxy and aldehyde groups at the interfiber bonds in the sheets, which resulted in the increase in the wet strength of the TOP sheets. These results also indicated that refining is beneficial for improving wet tensile strength when TOPs are used for papermaking.