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The Special Issue of the 64th—2021 JAPAN TAPPI Annual Meeting

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BTG high performance creping blade with Yankee coating visualization system

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Sanitary tissue market has changed since COVID-19 pandemic in Japan. It has not been easy to go to public space and people are staying in home. Demand of toilet roll for public facilities has declined. On the other hand, demand of Household paper is increasing and toilet roll become longer because of reducing environmental impact. Even though product specification has changed for home use, Improving productivity and stabilizing quality are the most important challenge for Sanitary tissue manufacturer.

Coating layer condition on the Yankee surface is one of the most important factor of crepe quality and productivity. Almost all operators depend on experiences and intuitions of yankee master, because there was no way to measure and check it. Steel blade tends to change crepe quality and bulkiness because of low wear resistance. Then frequent blade change prevents rising productivity.

BTG developed and optimized Vigilance(Yankee coating visualization system) and Duroblade(High performance creping blade) for Japanese Sanitary tissue manufacturer. Vigilance is not just a vibration monitoring system, but it can analyze and classify a cause of vibration. Finally, it visualizes the coating layer condition and make the machine stable. Duroblade is not only high wear resistance creping blade, but also making high quality crepe & stable bulkiness products, Reducing edge build up & paper dust, Making Stable bulkiness products and coating layer condition.

Specification and Solution of Vigilance and Duroblade are reported in this article.

Energy savings by newly developed conical refiner for stock preparation

Masaharu Menjo
Valmet K. K.

In this paper, a newly developed conical refiner is briefly described. The electricity consumed by refining is considered as about 20 % of all electricity for one paper machine. Therefore, effective ideas to reduce energy consumption by refining would be attractive. In Japan, double disc refiners are mainly used as a refiner for stock preparation. To reduce energy consumed by double disc refiners, refiner plates with function of energy savings are widely adopted. The refiner plates with smaller diameter of refining zone enables to reduce no-load power of refiners. In terms of no-load power, conical refiners are superior from double disc refiners, because rotating refiner plates have smaller diameters which can lead to lower no-load power. Valmet has been selling conical refiners (product name : OptiFiner RF) to all over the world since 1983. While refining pulp, some of pulp remain in grooves of refiner plates all the way up to the outlet of refiners and these pulp result in unrefined pulp. This phenomenon happens to double disc refiners as well as conventional conical refiners and it is clear that the refining efficiency for these 2 refiners is not high. To improve the refining efficiency, Valmet has developed a new type of conical refiner with brand-new refining mechanism and the first product was commercialized in 2010. The new conical refiner (product name : OptiFiner Pro) is excellent regarding energy savings and has been sold more than 100 refiners worldwide. In Japan, 4 refiners were sold so far. In this paper, the new conical refiner with new refining mechanism and the first reference in Japan are briefly explained.

Analysis of phase transfer of thermal chemicals in linerless thermal labels

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Thermal paper is made by applying a coating layer containing a colorless leuco dye and a color developer dispersed in fine particles on a paper base material, and when heat is partially applied to the coated surface, it becomes a leuco dye at that location. The color developer melts and comes into contact with each other, causing a chemical reaction to develop color. In addition, a sensitizer or an ultraviolet absorber that accelerates color development is used according to the specifications.

Normally, the thermal label is attached to the release paper after applying an adhesive to the back surface of the thermal paper, but the linerless thermal label is directly attached by providing a release layer on the thermal surface side of the adhesive-processed top paper for the thermal label. Since they are combined, there are merits such as no need for release paper, reduction of waste, and the length of the label roll can be increased with the same diameter.

During the development of this linerless thermal label, when an acrylic emulsion-based adhesive, which is also used in ordinary thermal labels, was used, a case of desensitization (decrease in print density) occurred. Since there were no cases of occurrence with ordinary thermal labels, the direction of improvement could not be determined. Therefore, it was decided to analyze whether or not the thermal chemical components had changed before and after desensitization.

Thickness Reduction Control System on RB, Using Immersion UT Inspection Technology

Yoshihiro Kondo
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Hokuetsu Corp. has been engaged in the“ Minimum Impact” that reduces the burdens on the environment through the company growth. With biomass energy and the latest technology available, we will take on the challenge of achieving zero CO2 emissions by 2050.In June 2021,we took the ISO45001 certification that manages the occupational safety and health, with our company being the first to do so in the paper industry. We target to achieve SDGs by fulfilling safe and reliable work environment. To fulfill the target we set, running the large-scale Recovery Boiler (RB) safely and securely at the central key plant, Niigata Mill, is essential. In this paper, we will introduce the mill standards in managing and maintaining the soundness of boiler tubes on RB.

Introduction of Toscotec S.p.A

Masahiro Yamaguchi
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VOITH Group in December 2019, with the aim of strength the competitive position of both Companies and increase the products and services of VOITH portfolio, in line with the growing demand of paper and tissue products of high quality. TOSCOTEC, thanks to its experience in tissue, is the VOITH global platform for the new tissue plants and machines rebuilding. The TOSCOTEC wide range of machines portfolio, the high level of technical solutions and the support that can be provided to the Customers for the consumption and quality optimization is an additional value for the Customer that is not looking only to a simple Supplier, but to a Partner for its new business investment.

Key points for creating and operating a pest management strategy

Tomohiro Ohba
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For effective pest control, it is important to thoroughly consider the problems of your own factory and create an original management strategy for each factory. Since the purpose of pest control is to prevent insect contamination in products, management strategies need to be developed based on insect contamination scenarios and risk assessments. Risk-based strategies help explain the need for costs to management and enable effective cost allocation.

For effective operation of pest management strategies, it is necessary for employees to understand and cooperate with pest management. Therefore, education and improvement activities are required. ESCO WEB learning and ESCOEVO are services that support education, information sharing, and communication, and are tools that support the operation of pest management strategies.

Management strategies should be regularly reviewed from the perspective of prevention of insect contamination on products. If the expected effect is not obtained, it is necessary to review the insect contamination scenario and risk assessment.

Safety monitoring solution for factory workers
"Anzen Mimamori kun" and introduction to smart factories

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In this paper I introduce safety monitoring system for factory workers provided by NS Solutions Corporation, use cases in each industry, and our concept of smart factory centered on safety management system.

Revolutions in the history of civilization induced by paper
Part 12: The birth of paperboard and fading trail

Kiyoaki Iida

In the 1800s, Japan was fairly literate and they enjoyed many kinds of publications, printed by wood block, of which topics ranged from history and pharmacy to entertainment. Paper was also used in many ways like paper clothes, fittings of a house, household goods and amour, and was in the age of its maturity. China was also in the matured stage of publishing, and used paper in many ways like in Japan. Their social innovativeness, however, was rather stagnant.

Europe, on the other hand, was changing itself by experiencing successive movements such as the Reformation, Enlightenment and the Industrial Revolution, to which paper and movable typo printing it had invented played a significant role、In the 19th century, their economy (GDP) started to increase at the rate triple to quadruple of the earlier age. Rail way was invented of which mileage was expanding at the rate more than 10 % a year, and people moved around and goods were transported more than ever.

The demand for paper was also growing which stimulated technical developments. Paper machine was invented, which was growing to larger and faster- running one (at the increasing rate of 3 % a year), and straw pulp became available. Finally, wood could be pulped in the 1850s. As paper became common, Europe that had used paper mostly for printing, started to apply it for many ways. One of them was packaging of goods for transport, which were wrapping paper and paper boxes.

Then, the 1900s began, and America that became rich built a society of mass-production and mass-consumption. For better marketing, they used wrapping paper and paper boxes printed by lithography that afforded free design of images. To transport goods efficiently, they invented corrugated boxes. Their system spread in the world and a new application of paper, paperboard, arose and its volume became as large as that of conventional paper.

The technological progresses after the Industrial Revolution invented new kinds of media for handling information based on digital technology and the volume of information on them is increasing exponentially, at far grater rate than that of paper. The consumption of paper as a carrier of information started to decline for the first time in its history, and its ratio in the whole information is drastically decreasing.

How to secure the maintenance and persistence of the new digital system is the subject of our present civilization.

An Essay on Methodology for Innovating "*JAPAN TAPPI JOURNAL*"
Part 18 (final issue) : A Short Thesis on Comparative Analysis of Journals for Relative Evaluation of the Japan TAPPI Journal

Fumihiko Onabe
Professor Emeritus,The University of Tokyo(Paper Science)

With a view to relative evaluation of the Japan TAPPI Journal from global perspectives, the characteristics of the Japan TAPPI Journal was compared with US's TAPPI Journal in a variety of ways. The significant difference is the medium for communication, i.e., paper-based Japan TAPPI Journal and digital-based TAPPI Journal.

The eighteenth article will conclude this series in terms of "comparison with overseas journals". The overall contents are described as below.

1. Introduction
2. Author's experiences of subscribing overseas journals
3. The organization of US's TAPPI
4. The organization of Japan TAPPI
5. The differences between US's TAPPI Journal and the Japan TAPPI Journal
6. The ways to extend the domain of the Japan TAPPI
7. Expectations for the future developments of the Japan TAPPI Journal
8. Epilogue

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CNF

2022 February JAPAN TAPPI JOURNAL
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Manufacturing and Application Development of Phosphorylated Cellulose Nanofibers

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In order to realize a sustainable society, multifaceted utilization of woody biomass is expected. Among them, cellulose nanofibers (CNFs) are attracting attention as a new nanomaterial derived from cellulose, one of the major components of trees. We have established a unique CNFs production method by introducing phosphate groups to the hydroxyl groups of some of the cellulose molecules in wood pulp and mechanically processing the resulting phosphorylated pulp. The obtained phosphorylated CNFs were completely nanosized (about 3 nm in width) with high yield, and its aqueous dispersion was highly transparent, highly viscous, and stable at pH 3-11. The aqueous dispersion of phosphorylated CNFs can be dehydrated and dried to form transparent CNFs sheets with densely intertwined CNFs. This sheet has high transparency, strength, and thermal dimensional stability, and at the same time, it has paper-like flexibility. In order to promote the practical use of this technology, we are currently operating a demonstration plant for the production of phosphorylated CNFs aqueous dispersions and phosphorylated CNF sheets. As the first stage of practical application, the aqueous dispersion of phosphorylated CNFs are used as a thickening agent for cosmetics and a leading agent for concrete pumping, and the sheet is used as a material for table tennis rackets. Furthermore, by modifying the functional group, the phosphorylated CNFs could be dispersed in organic solvents. The modified CNFs can be converted into powder, and its solvent dispersion has the sametransparency and viscosity as water dispersion. This has increased the applicability to solvent-based applications. We will continue to take advantage of the features of phosphorylated CNFs to develop further applications.

Characteristics and Applications of Xanthated Cellulose Nanofiber

Kouju Sugiyama
Cellulose Materials Research Department, Central Laboratry, Rengo co., Ltd.

Our company, Rengo, found that xanthated cellulose nanofiber (XCNF) with a diameter of about 3-10 nm can be generated efficiently by controlling mercerization and sulfurization conditions. Such obtained XCNF can be easily converted to a non-substituted cellulose nanofiber (RCNF) form by treating XCNF with either heat or acid[1]. As RCNF, our product have extremely small in diameter and with high transparency. Moreover, since it is still cellulose, its heat resistance is almost same as normal pulps. Furthermore, RCNF slurry exhibited emulsifying performance for many oily substance[2],[3]. Based on these characteristics of RCNF, various applications are under development. In this presentation, we reports about making method of RCNF drying thing, the heat resistance and the addition effect to polyurethane.

All-Cellulose Structural Material

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Masahiko Uchiyama, Katsuji Kasahara and Hideki Okada
Industrial Research Institute of Niigata Prefecture

Vulcanized fiber is a robust all-cellulose material in which cellulose micro fibers are adhered with cellulose nanofibers (CNFs). In order to expand the potential of this all-cellulose material as a structural material, we investigated adhesives and press molding. The values of adhesive strength of commercially available adhesives and a conventional metal rivet were 0.7 to 8.5 N/mm^2 and 2.4 N/mm^2, respectively. A hot melt adhesive could bond the materials by irradiating ultrasonic waves only for 1 second and the highest adhesive strength was 2.9 N/mm^2. Furthermore, a small string of the all-cellulose material could be used as a bonding material like a stapler, showing the strength of 4.0 N/mm^2. In press molding, by optimizing the conditions on both the press and the material, wrinkle-free molded products were obtained. In conclusion, we could expand the processing technology and possibility of this all-cellulose material as a structural material.

Characteristics of Bamboo- and Wood-derived Cellulose Nanofibrils Produced by Aqueous Counter Collision

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The surface characteristics of materials provide significant information for design and feasible applications. Especially, the anisotropic surfaces of materials are expected to have great potential as building blocks for self-assembly due to the unique surface characteristics and have inspired widespread applications in various fields. Therefore, it is required the understanding and evaluation of the surface characteristic of materials.

The surface characteristics of cellulose nanofibrils (CNFs) produced by aqueous counter collision (ACC), which called ACC-CNFs, were focused in this study. ACC-CNFs were assumed to have amphiphilic surfaces due to exposure of both hydrophobic faces derived from glucopyranose rings and hydrophilic faces derived from hydroxyl groups on their surfaces. ACC-CNFs are likely to exhibit specific phenomena because of their anisotropic two faces with different physicochemical properties, which are individually present along the entire single fiber axis in aqueous systems. In previous studies, it was also found that ACC method provided CNFs with different surface characteristics from various cellulosic raw materials having different hierarchical structures depending on their species.

In this study, surface characteristics of ACC-CNFs derived from Bamboo bleached kraft pulps (BBKPs) and Leaf bleached kraft pulps (LBKPs) were evaluated. To evaluate amphiphilic surfaces of ACC-CNFs, degree of hydrophobicity on ACC-CNFs was quantitatively determined by measuring monolayer adsorptive amounts of Congo red (CR), which is the site-specific probe for the hydrophobic planes of cellulose crystalline surfaces. Occupied area ratio of CR was calculated from monolayer adsorption amounts of CR, specific surface area of ACC-CNFs, and cross-sectional area of CR. As a result, degree of hydrophobicity on ACC-BBKPs was higher than that on ACC-LBKPs. Furthermore, the degree of hydrophobicity was corresponded to thermal decomposition and emulsification properties of ACC-CNFs. Thus, these results indicate that the starting raw material species of ACC-CNFs affect their hydrophobic surfaces and characteristics. It is expected by these understanding that more feasible material design for advanced materials will be possible in a wide range of field utilizing the ACC-CNFs.

TEMPO-oxidized pulp related products in Nippon paper Industries:
-Expanding the utilization technology of chemically modified cellulose not only for CNF-

Takeshi Nakatani
Nippon paper Industries Co., LTD

Since people's interest in the environmental problem has grown significantly over the recent years, it is widely expected that low carbon society or sustainable society will be implemented. Pulp or paper products are expected to become an alternative materials of current fossil fuel based products, because biomass are sustainable which repeat planting and harvesting. Nippon Paper Industries Co., Ltd. provides wide variety of biomass based products by adding novel function to wood based paper or paper pulp. Cellulose nanofiber and the related products are also one category of these biomass based products.

TEMPO oxidized pulp, which is one of the intermediate products of CNF, has several unique features such as high reactivity to metal iron and ammonium ion, excellent handling character like wood pulp, and possibility of wide variety of utilization.

In this paper, 3 types of utilization patterns will be introduced, ① Hydrophobic modified cellulose, ② Metal ion doped cellulose which adsorb highly (8～20% higher than normal pulp) metal ion on the surface of pulp, ③ Microfibril cellulose (MFC) which control fibrillation degree for the appropriate physical properties.

Paragon winding
- Our revolutionary patent-pending winding technology-

Taihei Kashibe
Paper Converting Machine Company Far East Inc. Japan Branch

PCMC's New Surface Rewinder "Paragon"provides unmatched simplicity, productivity, and product quality for premium tissue products. It is designed based on our Forte Rewinder what has an unique winding technology.

Some of technologies and contents introduced in this paper include patent information, so we are sorry that we cannot disclose all of them, but we hope that you will be interested in these innovative and epoch-making technologies.

Some familiar technologies that has been followed from the conventional model are included in these newness designs, and each parts are rigorously designed to reduce concerns from operators and maintenance personnel due to complexity.

We would like to thank you for this opportunity to introduce us to a wonderful technology to meet the demands of the market.

Introduction on how KAWANOE realizes "together with our customers" utilizing our pilot plants and the tissue machine for hygienic paper

Masaya Onishi
Kawanoe Zoki Co., Ltd.

Due to recent heightened awareness of sanitation generated from COVID-19 outbreak, we as a machine supplier have responded to the customer's needs such as capital investment in increased production of hygienic paper products including towel paper.

In the paper making industry, paper as information media such as newspaper continues to decline, while production facilities are shifting toward the increasing use of corrugated board and hygienic paper.

We offer a variety of paper machines, primarily for hygienic paper (household tissue paper) equipment, to the converting machines. Under these circumstances, we have received orders and manufactured hygienic paper production facilities that reflect the needs of the market, such as the BestFormer Yankee paper machine for household tissue paper, IF-200 towel paper Inter Folder machine, and TR-8 toilet winder.

In addition, in order to reflect customer demands on actual machines, we are preparing for a pilot facility for a non-stop winder that can verify operation data assuming the production and actual operation of prototypes that could not be handled until now, and is scheduled to begin its operation in October of this year.

We are also researching and developing cellulose nanofiber, which is expected to be a next-generation material, focusing mainly on its dewatering technology.

A pilot machine is produced together with Ehime University, etc., which we are collaborating, and further technology development is carried out based on the patents already obtained.

Andritz Tissue Pilot Machine

Satoshi Konishi
Andritz K.K.

Despite the global spread of the COVID 19 and the economic damage due to the virus, the global market of tissue paper and hygiene products tends to grow. The growing demand will be met by existing tissue paper suppliers and the newcomers, but they must require the advantages of the types of products and product quality to survive. And in recent years, the introduction of digital transformation and AI technology in plants has made remarkable progress, becoming the key to factory efficiency.

This report introduces "*Prime*Line TIAC" the most modern tissue pilot plant in the world. The plant is running in Graz, Austria since March 2018 to engage in our future theme. This machine can provide as many as eight configurations in one machine, the customer will be able to do trials that match their future vision. It can handle multiple requirements and purposes not only for tissue suppliers but also for pulp suppliers, chemical suppliers, and clothing and filter fabric suppliers.

And, this pilot machine is controlled by *Prime*Control E which is Andritz digital solutions. It can operate as many as eight configurations in one control system, and save time, cost, and energy by the optimization of monitoring with mobile devices and the predicting that equipment failure or malfunction. As a result, the plant efficiency can increase. The OPP service optimizes the process performance by collecting data continually, analyzing and proposing the improvement. It already has more than fifty contract achievements in more than eleven countries.

We hope you will be useful this pilot machine for changing the products and developing the new products.

Revolutions in the history of civilization induced by paper
The summary of the series : Part 1

Kiyoaki Iida

Until the paper was invented, letters were written on clay tablets and papyrus rolls for more than 3000 years and on bamboo slips for over 1000 years. Those media and letters on them, at their beginning, helped dynasties to administer territories, then gave birth to literature and philosophy in about 500 years and further contributed to development of physical and medical sciences by keeping various records. The result accomplished by help of clay tablets and papyrus in 3000 years was Greek civilization which prospered in Ancient Orient and Mediterranean coast, and the outcome by bamboo slips was civilization of Han dynasty in China.

In around 100 A.D., a revolutionary process of making paper was invented in China. One of its technical advantages was to use, as raw material, several kinds of bast fiber as well as usual rags. The process spread around, East Asia and South-east Asia using bast fiber which grew naturally there, and Central Asia being dependent on rags. In about 500 years since the invention, tribes in those regions, having paper in hands, created their own letters, and developed their own civilizations which were modified from that of china. Buddhism took great part in the spread of paper and reformation of civilizations. Japan was typical among them.

In the 8th century, Greek and Roman civilization was recorded on papyrus and parchment in Middle East and Mediterranean coast. Tribes in Central Asia, and East and South-East Asia made record of their own civilizations on paper they newly obtained.

Trends in Nanocellulose Related Standards

Eiji Kojima
Nanocellulose Japan, Standardization Subcommittee

Specific discussions on the standardization of nanocellulose began in 2005, when the new TC (TC 229: Nanotechnologies) started its activities within ISO. In particular, the role of the American Technical Association for Pulp and Paper (TAPPI) has been significant, and after holding a series of related workshops to discuss the types of standards that may be needed and the schedule for their publication, the basic policy was summarized in the form of Roadmap for the Development of International Standards for Nanocellulose (TAPPI-roadmap) published in 2011. After that, taking into account the policy of TAPPI-roadmap, the development of standards has been promoted in two systems, ISO/TC229 and ISO/TC6 (Paper, Board and Pulps).

In this paper, the overall picture and each theory of the standards discussed in the TC229 and TC6 is explained. In addition, ISO information necessary for a better understanding of nanocellulose relevant standards is summarized. Lastly, the outline of the development process of ISO/TS 21346, which has been developed by Japan's initiative, is presented in the hope that it will be useful for future standard development activities in this field.

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Process Control and Automation/IoT

Topics & Information

Review Article (Original Paper)

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IoT measures for production facilities with general-purpose AC drives

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We, Yaskawa Automation & Drives Corp. undertake system engineering of electrical equipment for iron-steel and Industrial plants and sales & after-sale service of Yaskawa Electric products and general industrial motors.

Recently, trend for productivity improvement is becoming active at manufacturing site with introduction of IoT (Internet of Things) which connects "things" and internet.

With that, demands are growing more to avoid unexpected abnormal stop with visualization of malfunction and anomaly and failure prediction instead of reporting after production machinery breakdown has already occurred.

With YASKAWA general purpose AC drives, status of machines and facilities can be monitored continuously, and any anomaly can be detected not just via AC drives but also via motors, with result of which efficient maintenance can be planned to realize productivity improvement and machines and facilities without unexpected abnormal stop.

In this article we present ideas to lower the bar of introducing IoT, DX in production facilities employing YASKAWA general-purpose AC drives.

European Commission Energy-related Products Ecodesign Directive and Fujitsu's Environmentally Conscious Design regarding Electrical and Electric Equipment

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FUJITSU LIMITED

The climate change has led to a rapid demand for carbon neutrality in recent years. In addition, the increasing use of ICT and digitization has raised concerns about the environmental impact of electrical and electronic equipment. Under these circumstances, this paper introduces EU's Energy-Related Products Directive (2009/125/EC, Eco-design Directive), which concerns environmental considerations related to electrical and electronic equipment, and Fujitsu's Environmentally Conscious Design for products. Fujitsu implements Life Cycle Assessment to reduce environmental impact and improve product value. In addition, this paper outlines global trends where not only environmental consideration of products but also the attitude of brand owners are required.

Approach to Smart Maintenance with Digital Technology

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The significant changes in the external environment in recent years, all industries are working toward digital transformation in order to ensure that companies maintain their competitive advantage and develop. This change has been accelerated in various fields and sectors, including production, operations, energy, and maintenance. In response to the shortage of personnel and human resources, which are the challenges of maintenance, it is important to implement a new asset management by applying the technology and data currently in use and new digital technology to the maintenance activities. This is smart maintenance through digital transformation.

In this paper, we describe the technology of making smart maintenance and digital technology by YOKOGAWA, which contributes to solving maintenance challenges.

Contribution to Carbon Neutrality through Optimization Technology

Michihisa Suzuki
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The Government of Japan is aiming to reduce greenhouse gases by 46% in FY2030 compared to FY2013 and to be carbon neutral by FY2050.
Against this background, utility plant operation optimization by optimization technology is drawing attention as one of the methods for realizing carbon neutrality with immediate effect. Operational optimization is a very investment-effective Quick Win approach that improves the energy intensity by improving the operation of existing equipment without the need for new equipment / renewal / modification. (Recovery period is from a few months to 2 years).

Furthermore, it is becoming important to control the consumer side by the optimization method as a function of the aggregator that adjusts the supply and demand between the electric power distribution company and the consumer side.

This paper introduces our solution by optimization technology toward the realization of carbon neutrality.

The Time to Start Archiving the Operation Data and Its Full Leverage in Pulp & Paper Industry at the "Big Data" Era.

Yasuyoshi Iwase
Honeywell Japan Ltd. Honeywell Connected Plant

The archiving the long-history operating data, and the connection with digitalized records and reports systemizes the operational intelligences, reveals the overlooked values, and finally reaches the goals of an innovative business that we never seen in pulp & paper industry. The first step on this way is to implement the Historian, a historical database software, to store time-series operation data in 100 years the longest. This "Big" data archive lets you go the right way. This data-driven decision can be made on the useful insights obtained via clear visualization of the plant performances, derived from sanitized, true and real-time plus history data. What we do from today is to build the plant archive, by correcting the sensor & operation data in the control system, and synergized with another data source, and reveals the operational insights.

Implementation of "Smart Factory 4.0" for the Paper Mills
–Cost Benefits Achieved with Prediction Models and APC–

Nozomu Wada
Voith Turbo Co., Ltd. BTG Japan, Process Solutions

The Smart Factory 4.0 was introduced by the German government in 2011, as a next generation advanced technology which based on Industrial Revolution 4.0, that expands digital computing technology of Industrial Revolution 3.0 in 1980s-2010s with Internet of things. In the 2020s, we are now going on a rapid growing stream of development of Factory automations as beyond of the last generation's digitalization.

In this generation, we can use big data with high frequent scanning which includes tons of information, such like process values, quality check results, production stocks, production plan, PID loop status and so on.

BTG's dataPARC and CONTROLsuite provide sophisticated visualizations such like health diagnostics around PID loops, valves, actuators, and the other sensors, easy to handle historical trends that project future status with prediction models, and more which make the operator's awareness/thinking/actions/reviews so much easily. Furthermore, BTG's MACS solutions provides predictive control based on the prediction models which considers much complicated multiple cross-correlations between each unit operations in processes.

In this paper, those BTG's solutions are introduced as which useful for achieving smart factory 4.0 at the paper mills with its implementation results and procedure. To make the projects be succeeded and utilized while long time after the implementation by the mill operators, BTG provides continuous improvement which reflects the operators thinking, and discussion/ reviewing.

Efforts to make maintenance work smarter

Hideyuki Ito
Matsumoto Mill, Ojimateria co.,ltd.

Japanese society is facing a shortage of labor force and a decrease in skilled engineers due to falling birthrate and the aging population. This is also an important issue for us and we have taken on various challenges to improve productivity and pass on technology. In Germany, the concept "Papermaking4.0"is set up as part of Fourth Industrial Revolution and paper mills are becoming smarter and more productive.

For these reasons, our company "Oji Materia Co.,Ltd – Matumoto Mill", have attempted to make us smart to use IoT technology since last year. There are many methods to make smart such as using a platform that major vender has released for making smart of whole mill and analyzing the data obtained from the reasonable sensor on cloud.

In the past, when the introduction of DCS progressed rapidly in paper mill, benefits of DCS could be expected. However the benefits of IoT are unknown for us. So we decided to verify the usefulness of IoT technology by using reasonable tools.

Sharing and early resolution of issues through digitalization of operational information toward DX

Nobutaka Maki

Energy Technical Department, Energy Business Division,
Nippon Paper industries CO., LTD.

In recent years, many companies have been promoting Digital Transformation (DX) using IoT, AI, Big Data analysis, etc., and our company is also striving every day to build a next-generation business model. For process data in production plants, systemization has already been established with the introduction of DCS and main control systems. However, the operational information is lagging behind for digitalization. That's why we introduced PLM (PlantLogMeister) manufactured by Toshiba Mitsubishi Electric Industrial Systems Corporation in 2019, and started digitalization efforts for issues sharing and early resolution between each mill and head office.

Revolutions in the history of civilization induced by paper
The summary of the series : Part 2

Kiyoaki Iida

Tang Dynasty collided Islamic Empire in the 8th century in the central Asia to which paper making was transferred. Islam made use of it, translated previous cultures on paper and developed sciences and arts of themselves.

Islamic paper making was then transferred to Italy where paper mills started production in the 13th century. In the same period, Europe began to transform itself dynamically. A huge volume of literature was translated and studied in the Renaissance. In the 15th century, metal-typo printing was invented that brought a new phase in the history of paper. The Reformation starting in 1517 was called a media revolution as many printed matters circulated. Reading books became common in the Enlightenment Age. The Industrial Revolution in which information exchange was essential was supported by paper industry in U.K. The rise of paper industry brought economic development, and then social reform followed.

In the 19th century, GDP increased at the rate 3-4 times of that in preceding ages. Paper machine was invented and became wider and ran faster. Wood was finally pulped. USA, being rich, enjoyed a society of mass-production and mass-consumption. Packaging paper and boxes, made of paper, for promoting marketing, and corrugated boxes for distributing goods were developed. The system spread in the world, and its output became as much as that of traditional paper.

The development in digital technology has worked out new devices for information storage, and the volume they take is increasing exponentially. Paper, on the other hand, is drastically losing its share.

Preservation and persistence of new devices are a subject of the present culture.

Process Optimization by OnEfficiency.Strength

Nodoka Furubayashi
Sales department, Voith IHI Paper Technology Co., Ltd.

Papermaking processes have been automated in recent years, but there are still many processes that depend on the experience and intuition of operators, and it can be said that there is room for improvement in the goal of "maintaining product quality at necessary minimum costs." OnEfficiency, the solution developed by Voith to reduce such unnecessary costs, realizes smart control of processes through the three steps of "visualization of process fluctuation", "process stabilization", and "process optimization" by the autonomous distributed control modules using big data analysis.

OnEfficiency.Strength, one solution in the OnEfficiency product line, aims to optimize paper strength using virtual sensors that calculate paper strength parameters online in real time. In closed-loop control, where the effect of OnEfficiency.Strength is most exerted, OnEfficiency.Strength automatically operates the actuator to keep the strength value within the target range in real time, reducing the production cost to the limit.

dataPARC for Digital transformation
- Frist step for digitalization in pulp & paper mill -

Takuya Maekawa
Voith Turbo Co., LTD. BTG Japan

BTG is a technical company who has been innovating and providing several advanced sensors, analyzers, consumables (High performance blade and rod/bed) to pulp and paper mills in the world. Under BTG clear strategy -selling value and saving customer's cost-, now BTG is focusing Digital transformation (DX) in pulp and paper mills tying to our PIMS "dataPARC" to the market.

Pulp & Paper mills seem to face difficulties in data utilization across their pulp and paper making processes, despite DX is recently highly promoted by METI (Ministry of Economy, Trade and Industry). Their challenges in approaches to carrying out DX is the employees and managers often less interested in DX, but a true meaning of DX is to transform organization, people's behavior and way of thinking to become more competitive in market.

If the mills cannot overcome these challenges, -leaving the existing old system became "Legacy", lack of IT engineer and maintenance cost increasing for old system-, they may suffer huge economic loss of up after 2025. This is report by METI as "2025 Digital Cliff"

dataPARC innovated by Capstone technology (BTG group since 2016) is a solution for this challenges work as a strong digitalization platform to integrate and utilize all existing data in mills. dataPARC is well known in North America mainly and the installation reference is around 400 cases in P&P industry, 800 in all industries.

Making Conductive Materials from Paper as an Insulator :
Chemically Morphology-Retaining Carbonization from Various Cellulosic Materials without Thermal Decomposition

Mutsumasa Kyotani and Tatsuhiro Okada
Tsukuba Fuel Cell Laboratory, Inc.

Paper is made from plant fibers obtained mainly from wood pulp and non-wood pulp. Cellulose is a main component of paper. However, cellulose materials are very hard to carbonize at high temperature because they decompose thermally and change to hydrocarbons having low molecular weights even in inactive gases. Most of the hydrocarbon molecules tend to evaporate as various gases at high temperature. So, we are not able to make a two-dimensional carbonized paper in conventionally reported method. We have tried to make carbon materials from various organic ones including paper. We have found that iodine is an effective catalyst in the carbonization process of cellulosic materials such as paper at high temperature. However, experimental apparatuses are tended to be contaminated by iodine. After that we also have found that sulfonic acids having leave group activity are more appropriate for the carbonization process as a catalyst.

In this paper, we have described that well carbon sheets having electrical conductivities are able to be made from various papers treated with a methane sulfonic acid solution by carbonization at a temperature of 800℃ in a nitrogen gas. The carbon sheets are amorphous and tend to crystallize with heat-treatment at higher temperature. Mechanical and electrical properties of the carbon sheets are improved by the heat-treatment.

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Welcomig New Employees

2022 April JAPAN TAPPI JOURNAL
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HSE improvement and machine condition monitoring by wireless noise surveillance system

Shinichi Saito
Yokogawa Products HQ Sensing Center, Co-innovative Solution Section TF1 Group
Yokogawa Electric Corporation

The Wireless Noise Surveillance System is a new digital Health Safety Enviroment (HSE) system consisting of a WN 100 radio noise meter and WN 30 noise map software, which provides the first real-time noise monitoring system for noisy and harsh environments.

The main purpose of this system is to prevent the hearing impairment of workers in the plant and to optimize the working hours limited by the noise level. Recently, however, the system has been applied to the improvement of HSE in the local community by monitoring the amount of noise propagating from the plant to the neighboring residential area, and to the condition monitoring to detect the failure by measuring the sound.

Improving operations by optimizing chemicals!
A practical chemical approach to solving problems in wastewater treatment process

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

The pulp and paper industry is a water-based industry that requires an extremely large amount of water compared to other industries. Wastewater in the paper manufacturing process includes discharges from the steaming and bleaching processes, the paper making process, the deinking process, and the washing process. Although progress has been made in saving water and reducing water use by reusing and closing off water for each process compared to the past, large-scale wastewater treatment facilities are necessary to treat the large amount of wastewater from various processes.

In the wastewater treatment process, pollutants are treated with a combination of organic decomposition by biological treatment, coagulation sedimentation, and pressurized flotation. The industry is struggling to deal with these problems, but wastewater treatment facilities are not directly related to production, so it is difficult to make capital investment in them.

In this report, we are going to focus on the foam and odor problems from among problems in the wastewater treatment process. First, we explain the basic concept of foam control, the mechanism of odor generation and its adverse effects, then describe how our company to deals with each problem.

Know your pulp, control your process

Ryo Yamashita
Pulp & Paper Group, Process Automation Business, ABB K.K.

All papermakers know that variation in raw materials significantly affects process stability and product quality. To overcome this, we need to seek a way of adapting our processes to the naturally variable incoming fibers to both stabilize quality and reduce costs. Many paper companies dedicated to reuse raw materials for sustainability and recycling in recent years. However, to ensure output of the highest quality, the paper company must face the challenge of working with a wide variation in the properties of incoming fibers.

In this paper, I would like to share functions and features of the L&W Fiber Tester Plus, which is a fiber analyzer for the laboratory. Especially herein, I introduce the following three options in detail. Impurities: Kink, vessel cells, minishives, flocs and dirt are analyzed via special software, which has recommended settings for vessel cells and shives. Blend: Analyze the ratio of reference fiber species in a fiber mix in a software option. Crill: Determine crill quota in a separate measuring cell, by a method based on how particle diameter interferes with different parts of the light spectra. This product has been delivered more than 20 customers in Japan. This product is used not only for fiber analysis but also for CNF research today.

And, I continue to explain features and benefits of L&W Freeness Online, L&W Fiber Online, and our new solution, L&W Freeness and Fiber Online which can combine the online measurements of freeness and fiber properties. I also introduce ABB's pulp sampler, which has high reliability and durability. Customers give these product high marks for the automation and stabilization of freeness measurement.

Reliable system of offline and online pulp analyzing 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. Offline and online pulp measurements have their own unique benefits. We attain a new level of process stability, reducing production costs through lower energy consumption by eliminating over refining. Finally, I would like to introduce the Wet End Control of ABB Ability ™ APC. You can optimize raw material by analyzing data through APC process control.

ACA Permi Online Air Premeability Analyzer and RoQ Roll Hardness Profiler

Takuya Sasaki
SHIN-NIHON CORPORATION

The RoQ roll hardness tester is a next-generation roll hardness tester that replaces the Schmidt hammer, which allows anyone to easily measure the roll hardness in the width direction with a minimum pitch of 1 mm. Since it can be profiled in the width direction, it is possible to detect wrinkles inside.

Permi Online Porosity Analyzer is an epoch-making system that can measure air permeability online in real time. Quality control methods and process reductions that were not possible with conventional offline sampling inspections will be realized.

Since the shear rate and viscosity are not correlated, it is necessary to measure the viscosity at the shear rate of the coating color (750,000 1 / s or more) at the actual coater part. The ultra-high share viscometer Ax-100 is a viscometer that can measure viscosity at a maximum shear rate of 1,000,000 1 / s, which was not possible with conventional rotary viscometers. As a new function, extensional viscosity can also be measured.

The FlOW WR Water retention tester (compliant with TAPPI T-701) has been newly developed as an analyzer to replace the existing water retention meter. It can be used in combination with the ultra-high share viscometer AX-100 for research and development of coating colors, and it is also possible to inspect and optimize the water retention of coating colors and prevent dehydrated cakes in dry parts.

Numerical simulation in compressive strength analysis of corrugated box

Takao Kobayashi
Packaging Innovation Center, Oji Holdings Corporation

Corrugated fiberboard boxes are often stacked and used for transportation and storage, and a considerable load is applied to the bottom box. If the box cannot withstand this load, not only will the box collapse, but there is also the risk of package stack crumbling on the pallet. Therefore, the box compressive strength measured by the box compression test is one of the important qualities as an index of the box's resistance to crushing. If this box compressive strength can be predicted in advance by simulation, it will eliminate the repetition of experiments and trial production, and will lead to shortening the development period of new products. In this report, we will introduce an example of performing box compression analysis on corrugated box by numerical simulation using nonlinear finite element analysis.

First, we developed an analysis method. The corrugated board is a three-dimensional structure consisting of two linerboards and a corrugating medium, but the box was modeled using shell elements, assuming that it can be approximated by a single plate. The top panel of the box was compressed by applying a compressive displacement, and the maximum load of the load-displacement curve obtained at this time was calculated as the box compressive strength. As a result of the analysis, it was possible to reproduce the difference in buckling mode and the order of strength depending on the presence or absence of a hand hole. Next, we examined a corrugated box with a regular polygonal cross section, and showed that increasing the number of angles could approach the buckling mode of a cylinder and increase its strength. Finally, a compression analysis of the corrugated boxes stacked on the pallet was carried out, and it was possible to show that it is possible to prevent the package stack crumbling depending on the stacking pattern.

Analysis of the bleeded compounds on paper surface by XPS and TOF-SIMS

Toshitatsu Takei, Tang chen ying
Material Analysis Center, Innovation Promotion Division, Oji Holdings Corporation

The phenomenon that low molecular weight components come out to the plastic surface is called “bleeding”. Resin components of pulp may bleed to the paper surface and it is important to do research on the bleeded phenomenon to analyze the surface changes on the paper. X-ray Photoelectron Spectroscopy (XPS) and Time-of-Flight Secondary Ion Mass Spectrometer (TOF-SIMS) are surface analyzers which can analyze the depth region of several nanometers of the substance. Therefore, these are essential for research and development and quality control in various industrial and scientific research fields. The bleeding phenomenon is also known in paper fields, and we studied on the bleeding phenomenon that occurs on the liner board surface and the effect to the decrease in the friction coefficient of the liner board. We verified the correlation between the bleeded components and the friction coefficient.

XPS with the Argon Gas Cluster Ion Beam (Ar-GCIB) was established as a method for detailed analysis of organic materials. It is widely recognized that the milder etching of a sample surface can be achieved by Ar-GCIB sputtering, comparing to the conventional Ar^+ sputter etching. It is because of its low energy per atom and lateral sputtering effect. By using the Ar-GCIB sputtering, we have developed a method to analyze the surface modification of polymer materials.

Report on the Results of the Fiscal 2021 Follow-up Survey on" JPA's Carbon Neutrality Action Plan" 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 Plan towards a Low Carbon Society" which is renamed "Carbon Neutrality Action Plan" this year 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 2021 follow-up survey (actual results for fiscal 2020), fossil-energy derived CO_2 emissions in fiscal 2020 was 15.59 million tons, a 5.9% reduction compared to the fiscal 2019(16.57 million tons). Compared to BAU scenario, fossil energy-derived CO_2 emissions were reduced by 3.13 million tons, achieving the target of 1.39 million tons reduction by fiscal 2020.
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 "Countermeasures against Global Warming aiming at Net Zero GHG emission from the Paper Industry– Long-Term Vision 2050' "and the latest information of countermeasures against global warming.

The summary of the history of Japanese paper industry

Kiyoaki Iida

Japan, triggered by the Meiji Restoration, accepted the social and industrial structures of the Western countries, and changed itself toward them. The paper industry came up to supply paper for printing which made information exchangeable and paperboard which supported distribution of goods. Since then, for the period of 150 years, the industry has contributed to Japan's economic growth as one of the industrial members.

The paper industry took off at about 1905, and kept increasing its output at the yearly rate of more than 10%. Along the way, it extended its territory to Hokkaido and then to Sakhalin, and developed its own business model.

After crushed at World War II, the Japanese economy recovered extraordinarily. It, however, slowed down in 1970-1975. The paper industry filed to a list of negative industries, as it had such problems as environmental pollution, raw material shortage, menace from import and highly energy consuming. With technological break-through and intensive recycling of products which were bio-degradable in their nature, it was regarded one of sustainable industries.

As the volume of digital information increased exponentially since 1995, the demand for printing paper is declining for the first time in its history.

Properties of Mitsumata Paper Produced by Pressurized Cooking Process

Naoichi Muto
Research Institute, National Printing Bureau, JAPAN

The bast fibre of Mitsumata(Edgeworthia papyrifera Sieb. et Zucc) has long been used as a paper material in Japan, and the paper made of Mitsumata has characteristic egg yolk colour and unique texture. To obtain the fibre material, the bark of Mitsumata is cooked in the aqueous alkaline solution, and pressurized cooking process is generally employed for mass pulping production. Parenchyma cell is a non-fibrous cell contained in Mitsumata pulp, and it is known to have considerable effects on the optical and physical properties of paper.

In this paper, the effect of the alkaline cooking reagent on the properties of Mitsumata handsheet was studied. The bark was cooked with the aqueous sodium hydroxide solution in a pressure cooking device. Sodium hydroxide solution makes the bark swell, and dissolves the substance such as pectine. Sodium hydroxide solution also neutralizes the acidic substance which would be eluted from the bark and would cause the degradation of fibre. Handsheets made of Mitsumata were observed by optical microscope and scanning electron microscope. It was found that the colour of the handsheet depends on the coloured components within the parenchyma cells rather than the parenchyma cells itself. As the addition rate of sodium hydroxide increased, the fibre strength given by wet zero span tensile strength increased, and the fibre bonding strength given by dry and wet short span tensile strength decreased. Mitsumata pulp was fractionated into fibres and parenchyma cells by passing the pulp through the mesh sieve, and properties of the handsheet made of the fractionated fibers and Py-GC/MS analysis were examined.

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Deplasticization

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Development of coated paper products for packaging, "barricote®" and "barrisherpa®"

Masanori Nagoshi
Mitsubishi Paper Mills Limited

The realization of a sustainable society has become an issue in terms of countermeasures against marine plastic waste and global warming caused by the rapidly increasing consumption of plastics for containers and packaging worldwide.

In response to this challenge, Mitsubishi Paper Mills Limited (MPM) Group's subsidiary in Germany, Mitsubishi HiTec Paper Europe GmbH, has quickly commercialized "barricote®", a paper-based coated paper for food packaging, as an alternative material that can contribute to reducing waste plastic. The products have been highly evaluated and adopted by major European food manufacturers since spring 2019.In order to meet a wide range of packaging needs in the Asian market, including Japan, MPM is currently developing and marketing "barricote®" and "barrisherpa®", coated paper products for packaging, in Japan. In this presentation, we will introduce the products developed in Japan.

Cellophane or Paper Packaging as Alternative for Plastic Packaging

Taro Yotsumoto, Susumu Sakata , Yoshihito Fujimoto and Keiko Imai
Central Laboratory, Rengo co., Ltd.

Recently, environmental pollution by marine plastics and micro plastics has been popularized as a global problem. In addition, social demands for plastic reduction are becoming more and more full-scale, such as strengthening the regulations on disposable plastics, promoting the use of biomass-based materials, and changing the behavior of companies related to SDGs. In Japan, the Resource Circulation Strategy for Plastics has been formulated, and some efforts toward “3R+Renewable” have been strengthened. Brand owners also have great interest in it, and the adoption of new technologies is becoming active.

To meet these plastic-free needs, our company has also developed an eco-friendly packaging, “REBIOS” that combines biodegradable materials based on cellophane and paper. In this study, we suggest “cellophane-based packaging” and “paper-based packaging” as alternative for plastic packaging. For example, we developed heat-sealable, moisture-proof, and oxygen-barrier packaging material made of cellophane coating a PVDC(oxygen permeability 5[cc/m2・day・atm] at 23℃65%RH condition). Other hand, we also developed paper-packaging which can be recycled as paper, heat sealable, and with good printed surface.

We will continue the efforts to expanded our series and contribute to creating a better and sustainable social environment through the creation of high-quality, high-value-added packages while effectively utilizing resources and reducing the impact on the global environment.

New Concept Paper Container "SPOPS" to Replace Plastic Refill Pouch.

Takaharu Noda
Paper-Pak Sales Division, Nippon Paper Industries Co., Ltd

In the Japanese market, refill pouches are widely used in toiletry products, because it can reduce the amount of plastic waste compared to using plastic bottles as disposables. According to the consumer interview, the most of them have some kind of frustrations with refill pouches about the usability. In addition, single use plastic reduction has become a global important issue due to the ocean plastic problem. Under these circumstances, Nippon Paper developed new paper container "SPOPS®". Compare to refill pouches, it can improve usability and reduce single use plastic amount. Recently, ‘SPOPS Hygiene’ with specifications compatible with sanitizer has been developed to meet the growing need for sanitizer containers due to COVID-19.

Effort for deplasticization and plastic reduction by utilizing wood pulp material

Kenta Arishima
Marketing & Development Dept. Sales Div. Oji F-Tex Co.,Ltd

Japanese government has set a target to reduce the emission of one-way plastics and declared its intention to achieve zero emission of greenhouse gas, in other words, carbon neutral society by 2050.

Under these social situations, paper and cellulose materials made from carbon-neutral woody biomass are attracting a great deal of attention, and manufacturers are considering replacing plastic materials with paper materials.

Paper products, such as paper cups and paper plates, have been used for a long time, but film-based materials have been the mainstream packaging material for barrier and heat-sealing properties.

Therefore, we have developed a new packaging material "SILBIO series" based on paper material that can be used as an alternative to film-based packaging materials. The lineup of "SILBIO series"is paper-based barrier material "SILBIO BARRIER," a filmless packaging paper with heat-sealing property "SILBIO EZ SEAL," a transparent paper-based barrier material "SILBIO CLEAR," and an aluminum-vapored paper-based barrier material "SILBIO ALBA".

These products meet various needs by combining properties such as transparency, concealability, esthetics, and texture like paper.

We believe that we can contribute to a carbon-neutral society by expanding sales of SILBIO series.

Development of moisture resistant coating agents derived from biodegradable biomass material

Teruyuki Matsushima
PAPER CHEMICAL BUSINESS DIVISION, SEIKO PMC CORPORATION[*1]

In the global trend of reduction of plastic products that originated due to the Marine plastic debris problem, the movement to replace plastic material with paper material is spreading all over the world. Paper is a biomass material made from wood. Due to biodegradable and recyclable nature, it is attracting attention as an ecofriendly material that has a less environmental impact. In order to use paper as a substitute for plastic, functionality equivalent to that of plastic is required. In response to this problem, studies have been made to impart various functions to paper by coating it with aqueous resin. In this paper, I will introduce moisture resistant coating agents "SEIKOAT® T-EF102 and T-EF103" that have biodegradability, as coating agents that have a less environmental impact, mainly using biomass materials.

"SEIKOAT® T-EF102 and T-EF103" have four characteristics below:

- The percentage of biomass material in the solid content is more than 85%
- Biodegradation degree (relative value) of more than 75%
- Conform to FDA21CFR § 176.170, § 176.180
- Moisture permeability: under 80 g/m^2 with a coating volume of more than 12 g/m^2

By applying these coating agents to paper, I believe that plastic substitution by paper material that has a less environmental impact will be possible.

Water based coating agent to impart barrier layer, for paper and paperboard

Wakako Masuda and Shunsuke Hayashi
Paper Chemicals Development, R&D Center, R&D Company, Harima Chemicals,Inc.

In recent years, the plastic waste problem has become global concern. In addition to recycling plastic materials, the solution to this problem is to reduce usage. Also, using paper as an alternative to plastic is one of the solutions to this problem. Paper is mainly produced from pulp, which is a biomass material obtained from wood, and has little impact on the environment. However, because paper has many voids, it is often laminated with a plastic such as polyethylene (PE).

Paper materials that have been given various functions by laminating are also used in food packaging containers such as paper cups and food packaging boxes. On the other hand, PE-laminated paper has problems such as low recyclability such that the paper and PE film are required to be peeled off, and low degradability of the film used in the natural world.

We developed new water-based coating agent, “HICOAT BC series”, which can add various functions to paper to replace PE laminate. The products can be applied to food packaging grade and reduce plastic usage. In this paper, regulations on food packaging in various countries as well as technology of HICOAT BC series are reported. In addition, we report new product using high ratio of biomass raw materials, which is under development.

Revision of JIS P 8116
Paper -Determination of tearing resistance- Elmendorf tearing tester method

JAPAN TAPPI, Testing Standards Committee

JIS P 8116: 2022 Paper -- Determination of tearing resistance -- Elmendorf tearing tester method was published in February 2022 after being consistent with the corresponding international standard ISO 1974: 2012.

The main revisions from the old standard (JIS P 8116: 2000) are as follows.

a) Clarified in the scope that it is not suitable for determining the cross-direction tearing resistance of highly directional paper (or board).

b) Described the specifications of the Elmendorf type tearing tester in the main body of the standard.

c) Specified the depth of the clamp as 15 mm ± 1 mm.

d) Added a calculation method for digital read-type devices when obtaining measured values as tearing resistance.

e) Added an annex about precision.

In addition, the issues and results under discussion regarding the number of test pieces, the width of the test pieces, and how to round the numerical values are reported.

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Decarbonization solution by using renewable electricity

Tatsuya Takamatsu
SINANEN CO.,LTD

This paper explained how to procure electricity from renewable energy for decarbonization. The first issue that companies should consider in order to achieve decarbonization is whether or not they will invest themselves and strive to improve the ratio of renewable energy. If you are not willing to invest, you can solve it by consulting a power retailer and using the environmental value of the existing power plant. If you are willing to invest (additionality), I think the three methods described in this paper will be very informative. Particularly with regard to the Corporate PPA, although it is the most noticeable method, the understanding has not progressed, so I would be grateful if you could understand how to operate it in this paper.

Initiatives for low-carbonization in Kanto Mill(Katsuta)

Kai Matsubara
Kanto Mill（Katsuta）,　Hokuetsu Corporation

In Hokuetsu Corporation Kanto Mill (Katsuta site), the No.2 biomass boiler (2B) and No.2 steam turbine generator (2T/G) generate steam and electric power for the whole facilities, and the surplus electricity is supplied outside for sale. This boiler mainly uses wood chip derived from construction waste, coal, and paper sludge and waste plastic generated inside the mill. On calorie basis, about 90% of the fuel is wood chip and paper sludge, about 1% is waste plastic, and the rest of around 10% is coal.

Our company set a goal in 2021, that it will achieve virtually zero of carbon dioxide emission by 2050. For this goal, we have already started efforts to reduce coal used for fuel in 2020. In this report we introduce the examples of coal reduction so far and future policies.

Fuel conversion of lime kiln

Shigeyuki Ido
Kani Mill,　Daio Paper Corporation

Daio Paper Group has declared that we will aim for carbon neutrality in 2050 toward the realization of carbon-free society. In order to reduce CO_2 emissions at Kani Mill, the fuel for lime kiln, which is one of the main source of CO_2 emissions, was converted from heavy oil to city gas.

By converting fuel, CO_2 emissions will be reduced by 11,173t in 2022. This is 8.9% of CO_2 emissions of Kani Mill.

In the future, further reductions in emissions can be expected to be achieved by reducing emission intensity on the supply side.

Activities for Energy Saving in Ishinomaki Mill

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

The Nippon Paper Group is working to reduce GHG emissions through three key initiatives: shifting to alternative fuels, promoting energy saving in production and logistics processes and absorbing and fixing CO2 through the appropriate management of company-owned forests.

We will introduce four improvement cases at Ishinomaki mill.

「Efficiency increase by a 7B black liquid heater of the indirect system」
「Improvement of practical use of 8B SAH」
「Increase of RPF by control improvement of 1B GAH」
「Load stabilization of a 8B by improvement of 6T control」

Control System to Optimize Cooling Tower Type Condenser Cooling Water System

Toshiaki Shimizu
Chubuplant Service CO.,LTD.

Cooling tower type condenser cooling systems are greatly influenced by atmospheric conditions. Moreover, since they are designed for the hot and humid summertime, excessive cooling for most of the year results in a large waste of power. To solve this problem, this system optimally controls the rotation number of the auxiliary machines of the condenser cooling water system: the cooling tower fan and the circulating water pump, thereby reducing the station service power of the power generation equipment and increasing the amount of electricity selling. Specifically, the total power of the cooling tower fan and the circulating water pump is minimized by controlling both the cooling air volume of the cooling tower fan and the cooling water flow rate of the circulating water pump to prevent overcooling of the cooling water and at the same time, the degree of vacuum of the condenser is controlled to a constant level.

In an in-house power generation facility that had introduced this system, the power reduction amount was 1,337 MWh / year (crude oil equivalent 337 kL / year), and the reduction rate was 52.2%, which means the amount of power was reduced to less than half. In addition, the condenser vacuum value had been controlled to be mostly constant throughout the year, contributing to the improvement of turbine efficiency.

New way of applying stabilized halogen application in paper mill

Takayuki Fujii , Akira Yamakawa
KATAYAMA CHEMICAL,Inc.[*1] and KATAYAMA NALCO,Inc.

From the standpoint of environmental concern such as preservation of forest resource and waste disposal, importance of the reuse of waste paper is increasing. As the utilization rate of waste paper increases, the strength of the paper decreases due to the reduction of fibrils on the surface of the fiber and the increase of short fibers as the paper is recycled over and over. In addition, there is a growing demand for the reuse of low grade waste paper that has not been used in the past. Besides, the trend toward closed systems in consideration of the environment has led to problems such as pitch trouble and reduced effectiveness of internal chemicals due to deterioration of process water quality. Manufacturing process of waste paper pulp are disintegration of waste paper, dust removal, deinking and bleaching. Those waste paper pulp is used in the preparation process to add internal additives and to adjust the pulp density, then it goes through the paper making process to be completed as paper. There are several problem in each process such as difficulty in disintegration and deinking, pitch trouble and increasing paper strength agent usage due to decreased paper strength. In order to solve these problems, we focused on stabilized halogen and conducted several studies. We have products that produce stabilized halogens, and we have verified its effects other than biocide, such as accelerated disintegrating, improved deinking, suppression of pitch trouble, and enhanced paper strength.

The latest trends in technologies of heat transfer improvement
-Kurita Dropwise Technology-

Ippei Tanaka, Mitsuru Komatsu
Kurita Water Industries Ltd,

Kurita Dropwise Technology has been installed to over 100 factories, mainly in Japan and South east Asia. From these references, the improvement of steam consumption by 3~20 % and other new values were also confirmed, such as the improvement of the paper machine speed, the cut of maintenance operation, the decrease of loss products, the time saving of pre-heating and so on.

In recent years, this technology has been installed not only to paper factory but also other factories, and great effects were confirmed in each factories, such as a condenser of power boilers, a corrugator in cardboard factories, a cooking instrument in chemical factories, and so on.

We have had trials for applying to new facilities, such as a turbine condenser in power boilers, an 1E can and condensers in black liquor evaporators, a steam dry process in pulp sheet machines, and so on. Kurita believes that we can contribute to create the new value for society and companies, by installing this technology and maximize heat transfer efficiencies of more factories.

Contributes to power saving （CO_2 emissions reduction） and maintenance cost cut with HFD System (Hyper Flat Drive System)

Takemasa Yoshimi

Power Transmission Belt Design Group Engineering Department Industrial Products Division, BANDO CHEMICAL INDUTRIES,LTD.[*1]

We are a comprehensive belt manufacturer with a history of over 100 years and have been researching and developing products that efficiently transmit energy even before the adoption of the SDGs.

Years of developing high efficiently products, Bando's “Hyper Flat Drive System (HFD system)” is here now to annouce proudly winning the Energy Conservation Award in 2013 and 2019 (sponsored by the Energy Conservation Center of JAPAN; as well as by the Ministry of Economy, Trade and Industry of JAPAN). Below you will find Bando HFD system features and benefits, along with how HFD contributes to the next green environmental society.

The features of Hyper Flat Drive system are as follows.

1. Compared to V belt, BANDO flat belt of HFD system leads highly effective energy savings due to the belt's hyper flexibility features to the pulley
2. Thanks to the the unique technology of the pulley and auto-tensioner combined device, maintenance-free and longer life are possible by the meandering prevention control and tension control.
3. The range of application covers large capacities from 2.2kW - 22kW to 30kW - 75kW for commercial and industrial HVAC (heating, ventilation, air conditioning) applications.
4. Adjusting the tension of V-belt and attaching and detaching the belt, it is necessary to work with a large number of workers, and there is always a risk of a injuries caught between V-belt and V-pulley. The HFD system does not require tension adjustment, and the flat belt can be attached / detached safely and easily.

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Energy Saving Ⅱ

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Hybrid Power Conditioner Cooler -The High Efficiency Cooling Unit with a Thermo-Siphon HEX-

Shoichi Yamaguchi
DENSO AIRCOOL CORPORATION, Design Center 3, Engineering Dept. 2

DENSO AIRCOOL CORPORATION developed a high-efficiency hybrid cooler for power-conditioner used in a PV power plant. The new hybrid cooling system can save the power consumption and also can be a long-life operation. The key technology of the hybrid cooler is a thermosiphon. A thermosiphon works by the differences of a heat-energy between ID and OD air temperature. We put a thermosiphon heat exchanger at the upwind of the evaporator in the hybrid cooler unit. We also developed the special heat-exchanger for thermosiphon based on an automotive air conditioner technology. These technologies make the hybrid cooler work more efficient than conventional air-conditioner.

Factory Equipment Optimization Solution based on Data Science

Toshihide Mochizuki
NTT FACILITIES

Ferdinand Baulez, Kyohhei Kamono
METRON JAPAN GK

As a major contributor to global warming, the industry in general and the paper manufacturing industry is compelled to find solutions to not only reduce its energy consumption but also decarbonize its production assets. To contribute to this endeavor, our platform was integrated with a paper manufacturer in Colombia to visualize key performance indicators, model and optimize the energy consumption of its paper machines, in real time. That manufacturer produces paper pulp from bagasse, the fibrous residue of sugar cane, passed through a mill to extract the juice, which is primarily composed of cellulose. Such a waste recovery method is used by less than 10 plants worldwide.

As the paper-making process is a large consumer of steam, each optimized area can bring significant results in terms of energy consumption. Hence, the optimizations were focused on the paper machines, which allowed for a 4.5% reduction in steam consumption in one year, in addition to significant reduction of the chemical agent consumption.

Energy-saving Technology for Public Water Treatment Energy-saving Rotary Blower "TBS/RSH series

Masayuki Kinoshita
General Manager of Industrial Division TAIKO KIKAI INDUSTRIES CO.,LTD

Actions for development of water resources to solve the global water problem and reduction of greenhouse gases to prevent global warming are increasing worldwide. In the water treatment market, since roughly 60% of the electricity is consumed by blowers including rotary type, reduction of power consumption has become a major issue, and energy saving of blowers is the most important issue.

Therefore, we have developed a new rotary blower "TBS / RSH" series that fulfills high energy saving to reduce the environmental load.

By adopting a unique "RiS-brid curve" for the impeller shape, optimizing the rotation speed, improving the silencer and gear case, etc., it achieved energy saving of 10 to 20% compared to the conventional product.

As of December 2021, we have sold 300 units or more, a large number record has been made including replacement / new projects.

In the future, in addition to the water treatment, it could be used for various applications, such as a pneumatic transportation, combustion air supply, vacuum pumps for paper mills machines, and dust collection. we will contribute to society by supplying energy saving blower to a wide range of field.

Energy saving by modifying drainage system of paper machine 1

Kotaro Iiyama
Mishima Plant, LINTEC Corporation

Amid calls for concrete action for global warming, The Japanese government declared that Japan aims to reduce its greenhouse gas emissions by 46% in fiscal year 2030 from its fiscal year 2013 levels, setting an ambitious target which is aligned with the long-term goal of net-zero by 2050. Furthermore, he stressed that Japan will continue strenuous efforts in its challenge to meet the lofty goal of cutting its emission by 50%. To realize this, it is much more important for companies to make an effort to reduce their CO_2 emission. Besides, company must address energy-saving and CO_2 reduction activities as the Energy Saving Act calls for an effort to decrease annual average energy consumption intensity more than 1%.

This paper introduces a case of energy-saving and CO_2 reduction by remodeling drainage system for paper machine 1 at Mishima plant of LINTEC corporation.

Energy Saving Case Study of Futatsuka Manufacturing Department, Chuetsu Pulp & Paper Co.,Ltd.

Taisuke Kato
Futatsuka Manufacturing Department, Chuetsu Pulp & Paper Co.,Ltd.

In order to prevent global warming which is caused by the greenhouse gas CO_2 emission is taken measures on a global scale, responsibility is increasingly against the corporate environment. In the pulp and paper industry, energy saving and resource saving are proceeded and making efforts to reduce CO_2 emissions also. In addition, cost reduction by energy saving in terms of production has become a major subject, it is still the situation that must be stacked to further effort.

In our manufacturing department established the Energy Conservation Committee in 1990, it has been focused on day by day energy saving activities. Due to the recent paper demand reduction, improvements by large scale equipment modification are not expected, we only have to build up a small energy saving result.

This time, we will introduce the efforts content and examples that we have implemented.

Energy Saving of Chlorine Dioxide Generation System (R8)

Joichi Nii
Ebetsu Mill,Oji F-tex Co.,Ltd

Ebetsu mill is working on the environmental objectives for ISO14001, such as promoting energy conservation, controlling waste, designing products with low environmental impact, and devising manufacturing methods.

As part of the environmental response of the pulp and paper industry, the pulp bleaching process was converted to ECF (Elemental Chlorine Free), and a chlorine dioxide generation system (R8) was installed accordingly.

This report introduces several examples of energy saving implemented by this chlorine dioxide generation system (R8).

New Challenge to Paperboard Machines with "AXISZ System"

Miho Kato, Koichi Tadaki
SOMAR Corporation

"REALIZER Series", which is retention aids and coagulants that introduce our new technology, "Reactive Polymer Technology", has been used more and more in the paper field. In this field, there were many issues such as improvement of ash retention and fixability of paper chemicals. In recent years, we have tried many tests to introduce "Reactive Polymer" into the paperboard field. A major problem for paperboard machines is improvement of papermaking speed to increase production. In addition, deterioration of quality of DIP causes decline of paper strength and sizing. This problem is also critical. Particularly it is difficult to increase papermaking speed with conventional "Reactive Polymer (1st-Generation)". Therefore, we have developed "Reactive Polymer (2nd-Generation)" to be suitable for paperboard machines. In this paper, we report the results of laboratory tests and actual machine tests to improve the speed of papermaking with this polymer. The concept focuses on improving water squeezing rather than improving yield.

In addition, this is effective for paper defect and improvement of the fixability of paper chemicals, so we will introduce the mechanism and examples.

Split Mechanical Seal for Agitator, and Auxiliary Seal

Mioko Takaya, Yuya Sadahiro
Engineering Dept. John Crane Japan, Inc.

The economic environment surrounding the pulp and paper industry is becoming more severe year by year, and it is important to minimize downtime in factories, improve productivity and reduce maintenance costs through stable operation of production equipment. In addition to this, in recent years, it has become necessary to reduce the environmental load by saving energy such as power saving and water saving.

Under these circumstances, shaft sealing devices for rotating equipment such as pumps and agitators are becoming more important, and reliability is required even under even more severe specification conditions.

John Crane has introduced a fully sprit mechanical seal that makes effective use of the characteristic rubber bellows for horizontal axis rotating equipment such as tanks/chests with axial runout, and has achieved many achievements. Furthermore, as a measure for workability and cost reduction during maintenance, we will also introduce an auxiliary seal that does not require drainage in the tank/chest.

Recovery Boiler Online Ash Analyzer and Ash Balance Advisor Applications

Yongse Cho, Matti Selkälä and Jukka Koskinen

Valmet K.K.

An online analyzer for recovery boiler electrostatic precipitator (ESP) ash chemical composition has been developed and piloted in a recovery boiler. The analyzer measures CO3, SO4, Cl, K and Na concentrations from a dry ESP ash sample automatically taken from the ash stream. In addition to the full chemical composition the melting temperatures of the ash are calculated.

By combining recovery boiler flue gas and steam temperature information with ESP ash chemical composition, an advanced ash balance advisor has also been developed. The solution calculates the location in the superheaters where ash is sticky, i.e., 15 – 70 % of ash is molten, and adjusts the ash treatment amount to minimize boiler plugging as well as enabling sootblowing focus to critical areas. The first ash melting temperature is compared to superheater steam temperatures which determines if there is corrosion risk in the superheaters. Overall, the advisor suggests an ash treatment target based on operational marginals that maximize recovery boiler availability and minimize makeup chemical needs. Additionally, optimal ash chemistry allows certain boilers to operate at a higher steam temperature leading to more electricity being generated.

This paper presents the results from the ash composition analyzer with comparisons to laboratory measurements. Further application possibilities utilizing the analyzer are also discussed.

Preparation of Antimicrobial β-cyclodextrin Microcapsules containing a Mixture of Three Essential Oils as an Eco-friendly Additive for Active Food Packaging Paper

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Faculty of Life and Environmental Sciences, University of Tsukuba

This study aims to prepare antimicrobial microcapsules which can be used as an eco-friendly additive for active food packaging paper. Essential oils from aromatic plants, possessing antimicrobial activity, are commonly employed for the treatment of some diseases and symptoms. In this study, an equal volume mixture of three essential oils: oregano, tea tree and cinnamon oils, were embedded into hollow cavities of ß-cyclodextrin to form microcapsules via a microencapsulation technology: co-precipitation. The recovery yield of the mixture of three essential oils/ß-cyclodextrin after co-precipitation and the embedding ratio of the mixture of three essential oils in ß-cyclodextrin were 86.5 % and 30.5 %, respectively. Based on the results of morphological and X-ray diffraction analyses, the crystal structure appeared to differ before and after microencapsulation. The results of gas chromatography-mass spectrometry and Fourier transform-infrared spectroscopy confirmed the formation of microcapsules. A satisfactory antimicrobial activity of the fabricated microcapsules was proved by an antimicrobial assay using *Bacillus subtilis* as the object microorganism, suggesting the microcapsules containing a mixture of three essential oils could be a promising additive for food packaging paper.

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Pulp

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Conversion from paper pulp to cellulose nanofibers (CNFs)

Structures and characteristics of diverse CNFs, and their current R&D and challenges

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The University of Tokyo

In this century, various methods have been found to separate “cellulose microfibrils” from plant cellulose fibers and to convert them into nanocellulose materials. Research and development of nanocellulose-containing organic and inorganic composites has been investigated for preparation of new functionalized materials in the world. If the production mass of nanocellulose is increased, the price of nanocellulose is expected to be reduced when paper pulps are used as the resources. The mass of production and consumption of nanocellulose materials will increase, if nanocellulose-containing polymer composites are achieved to have high strength, elastic modulus, and toughness even at small mass ratios of nanocellulose in the composites, resulting in a decrease in nanocellulose price. Partial substitution from metallic materials, reductions of the mass of fossil resources-based polymers and marine microplastics, and creation of a sustainable society based on biomass resources may be contributed by the quantitative and qualitative expansions of nanocellulose application and utilization. This is because nanocellulose materials are biosynthesized from atmospheric CO_2, and abundantly accumulated as cellulose microfibrils in plant bodies. The use of nanocellulose may also partly prevent and reduce the global environmental and resource issues. In the process of research and development for efficient preparation methods of new nanocellulose materials, various chemical pretreatments have been developed. These chemistry fields of plant cellulose fibers are categorized to new position-selective surface chemical modifications of crystalline cellulose microfibrils. These fields may open new technology of paper-like functional materials using chemically modified wood cellulose fibers containing abundant scaffolds for efficient counterion-exchanges with diverse cationic metal ions and alkylammonium ions under aqueous conditions.

Recent trends of biorefinery in Scandinavia

Makoto Iwasaki
MIP Consultant Office.

The Japanese Government announced in 2020 the goal of making Greenhouse Gas(GHG) emissions net- zero（carbon neutrality）by 2050. In response to this, the Japan Paper Association has developed a similar long-term vision. The association has cited the following three technologies necessary for its realization; ①saving energy, fuel conversion ②CO2 absorption by forest improvement, ③development of CNF and chemicals from wood based material, which is referred to biorefinery . As for the biorefinery technology using wood and wood derivatives , Sweden and Finland have been active in this field for long time.

In this report, I introduce the biorefinery R&D trend and systems in both countries briefly.

Global Market Pulp Demand & Supply

Ken Murakami
Pulp Dept., Marubeni Corporation

In most cases, pulp is integratedly consumed by paper producers. However, pulp is traded in market globally with approx. 70 million tons in 2020. Market pulp is a globally trading commodity and there are many factors to form its price. Among those factors, the balance of the market pulp demand & supply is one of the most important factors.

Looking at supply side, the production capacity gets increased every year and it is expected to be increased further. Especially the growth in South America is significant. Although South America has already become the biggest supply area, there are lots of additional expansion plans there. South America would keep leading supply side. For supply growth by grade, BSKP has some expansion plan, however, majority of the expansion is for BHKP because it has cost competitiveness in raw wood materials with fast growth.

Looking at demand side, the biggest demand area is China. Since 3% demand growth is expected in China through 2020 to 2025, it is necessary to keep monitoring the situation of China. Also, in Asia except for China, Japan and Korea, market pulp demand is expected to increase. On the other hand, in the matured markets, such as North America, West Europe and Japan, the demand is expected to be stable or decreased.

Both supply and demand are expected to be increased. Although demand is gradually increased, supply tends to jump up when the expansion projects start. The demand & supply balance on BSKP is expected to be tightened because of the limited expansion plan. However, that of BHKP is expected to be softened because of the lots of expansion plan. That balance is important when we consider the market pulp price trend.

Lates trend about new Pulp mill projects in the world

Hiroshi Yamashita
Valmet K.K. Sales, Japan

The investment about a pulp mill has been very active recently. Since 2010, 30 mega pulp mills have been built or being built all over the world. Most of them are located in South America or South East Asia where it is rather easy to procure raw material. On the other hand, some investments about a mega pulp mill have been done in Europe, especially Northern Europe. This is very much interesting because the situation of pulp and paper demand in Norther Europe is similar to that in Japan. Printing paper demand has been decreasing in both regions. Although the pulp and paper market in Northern Europe is not growing as rapidly as in South America or South East Asia, the investment about a pulp mill has been rather active. Recent investment about a pulp mill has interesting features. CO_2 emission and new revenue from a pulp mill could be a key factor. Some mills in Europe target to be a bio refinery plant.

Kiln Fuel Conversion Toward Carbon Neutrality

Kazunori Ohmori
Andritz K.K. Capital Systems Sales

In Europe, including the Republic of Finland, an environmentally advanced country, the fuel for combustion in lime kilns has already been converted from heavy oil to natural gas since around 1995. Furthermore, in recent years, they have been reusing the side streams discharged from the pulp production process, aiming to completely closed mill. In addition, in response to recent climate change, each company is working to reduce CO_2 emissions in order to meet the CO_2 emission limit targets set at COP26 held last year. Pulp and Paper mills require a vast amount of fuel for chemical recovery processes, power generation and steam production. The process that consumes the largest amount of fossil fuels is the Lime Kiln. Kraft pulp mills around the world have already begun to switch from fossil fuels such as heavy oil and natural gas to biomass fuels to achieve carbon neutral. For example, bark and sawdust, which would normally be discarded, are being effectively used. These can be realized through gasification of biomass waste.

Typical delivery examples include belt dryers, gasification plants in combination with multi-fuel burners for Lime Kilns. The belt dryer uses the low-temperature waste heat available at the mill, and the gasification uses a gasifier based on circulating fluidized bed (CFB) technology. ANDRITZ has already installed four CFB gasification plants for pulp and paper mill (for Lime kilns) in the Republic of Finland, the People's Republic of China, and the Federative Republic of Brazil. The following is an overview of the advanced gasification technology.

Advanced technology to counter the increasing foreign matter

Yoichiro Iwatani
AIKAWA Iron Works Co.,Ltd.

There have recently been substantial changes on the domestic recycle paper supplies in Japan, following the import restrictions of the used materials in China. It is expected to continue the tendency of such difficult procurement of the good quality recycle papers, which would lead to increase the use of un-sorted recycle papers.

To adapt these changes, we need to recommend the upgrade of the stock preparation processes for proper handling I will introduce the process that focuses on the pulping system, together with some case studies.

Operational Experience of MaxiTrasher and MaxiSeparator

Masatake Yoshizu
Iwanuma Mill, Nippon Paper Industries Co., Ltd.

The domestic newspaper production has been declining due to the development of digital technology in recent years. Furthermore, waste paper market is expected to decrease and hard to get waste newspaper because the export of used paper has expanded. On the other hand, the recovery rate of overall used paper is high in recent years due to increase in environmental awareness and the recycling rate of waste paperboard. Considering the current situation of collecting wastepaper, there is an urgent need to increase the use of low-grade wastepaper.

For the above reasons, Iwanuma Mill DIP-2 installed Aikawa Iron Works MaxiTrasher and MaxiSeparator to use more low-grade wastepaper in November 2019. This report describes the experience of operating the new system.

Development of online pulp color dirt observation equipment

Michihiro Fujiyama
Control System Division Nippon Paper Unitec Co., Ltd.

The method of measuring dirt in pulp is performed which are visually confirmed and measured by humans. However, with this method, there is a large time lag when managing dirt on a production line and continuous measurement is difficult. Therefore, OMRON has started manufacturing system that can monitor dirt in pulp in real time. After that, OMRON discontinued the product, and we developed the system as a successor to the product, released the product as a monochrome version of the online dirt meter.

On the other hand, the ratio of DIP used has increased due to the increasing recycling momentum and environmental measures, the operation department needs to manage color dirt that are difficult to detect with monochrome versions such as UV ink and color impurities.

Therefore, we worked on colorization of the online dirt meter in collaboration with Nippon Paper Industries Iwanuma Mill, and started developing system that "visualizes" color dirt in pulp in real time. This paper introduces the development of product and functions of this system.

Stabilizing of Stock preparation LC-refining by using Valmet online analyzer

Joensuu Ismo, Marko Loijas
Valmet Automation Inc.
Takeshi Sato, Kenji Matsumoto
Valmet K.K.

Paper properties are determined by the fiber properties. Fiber dimensions are changed by refining. The refining result is affected by many factors such as fiber species, process conditions, refining system, refiner geometry, refiner fillings, amount of refining and intensity of refining. Traditionally, refining has been controlled based on freeness (drainage rate) with either manual or feedback control.

Freeness is the result of the treatment of the fibers and the same freeness can be achieved with very different fiber properties. Advanced fiber imaging techniques have now provided a better understanding of the freeness quality.

Controlling refining by freeness alone may not produce a homogeneous mass on the machine, even if the refiners themselves are at their setpoint. Paper machines can experience unexpected web breaks due to changes in fiber properties even though Freeness (CSF) or Schopper-Riegler are firmly on
target.

The quality of the freeness must be known in order to optimize the refining to produce a better end product.

Introduction of sulfuric acid dilution system with pump control

Naoki Kawasaki, Hiroshi Arai
IWAKI CO.,LTD

In the pulp and paper plants, various chemicals including strongly acidic/alkaline substances, are utilized in manufacturing processes and waste treatment. For instance, sulfuric acid is used for pH adjustment in the bleaching process, neutralization of alkaline waste. Because of its large amount of usage and low-cost perspective, concentrated sulfuric acid is generally used with dilution. However, dilution of sulfuric acid is a highly exothermic reaction, which involves the potential risk of a serious accident. It is critical to select optimal control systems, corrosion-resistant pumps, and cooling systems in order to achieve safe, reliable dilution of concentrated sulfuric acid.

Defoamer for craft pulp manufacturing process

Katsuomi Shimabayashi
SAN NOPCO LIMITED

In this lecture, the basics of defoamers and defoamers for kraft pulp production process will be explained, and the evaluation methods and applications in actual process will be described.

Black liquor contains various surfactants and is prone to foaming. This can lead to a decrease in productivity and quality in the kraft pulp manufacturing process. There are two ways to prevent foaming problems: mechanical and chemical methods that use defoamers.

Optimization of Liquor Recycling System

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DX Development Department Digital Strategy Division, Kurita Water Industries Ltd.

There are a lot of impurities in wood, such as Iron, Silica, Magnesium, Aluminum. As a result, they go into the pulping manufacturing process. The existence of plenty of impurities in green liquor occurs poor sedimentation and impurities leak to the next step. The next steps are slaker and causticizing tank. Impurities disturb causticizing reaction, Causticizing Efficiency (CE) is down, and calcium carbonate particle size becomes smaller. These cause poor dehydration at white liquor filter and lime mud filter, and Lime Availability (LA) decrease. Lower LA means that causticizing reaction needs more new purchased calcium carbonate. Lower CE means that Dead load chemicals (Dead load) increase. Dead load does not participate in pulping reactions in the digester and is circulating through the pulping and recovery cycle. Here Dead load is sodium carbonate. Dead load moves with water in the pulping and recovery cycle. It means that more energy needs at digester, evaporator, and recovery boiler.

In this report, we first describe the problems caused by changes in the raw materials used. Next, we will introduce effective liquor recycling control methods that use a combination of liquor recycling control agents and S.sensing® system. Then, we will report the case where the water quality control of the green liquor clarifier process contributes to the stable operation of the kraft chemical recovery process.

The latest Pulper detrash system.“ S-PAL ”

Kazuma Hagiwara
AIKAWA Iron Works Co.,Ltd.

There have recently been substantial changes on the domestic recycle paper supplies in Japan, following the import restrictions of the used materials in China. It is expected to continue the tendency of such difficult procurement of the good quality recycle papers, which would lead to increase the use of un-sorted recycle papers.

To contribute to establishing a resource recycling society as well as sustaining a consistent paper recycling activity, we need to propose the upgrade of the stock preparation processes for proper handling. On this paper we would like to introduce the latest technology of the recycle paper pulping system (continuous detrash system) based on an actual case study.

First step for Smart Factory , Operational experience and effectiveness of SKF Condition Monitoring System

Hironobu Hemmi
Kanazu Mill,Rengo.Co.,Ltd

In the manufacturing industry, labor shortages are becoming more serious due to the declining birthrate and aging population. In addition, sudden failures are increasing due to aging equipment and machines, and it is necessary to consider the safety of maintenance work.
Therefore, this time, we introduced SKF (Global bearing manufacturer headquartered in Sweden) bearing condition monitoring system to the Rengo Kanazu Mill No. 2 paper machine and remotely monitored it 24 hours a day to detect abnormalities at an early stage and verify their effectiveness.

Since January 2020, SKF condition monitoring system has been introduced and started operation for the rolls to be monitored, and it was found that the number of unplanned accident stops was reduced after the implementation of the system. This is because sensors make it now possible to check the status of bearings that cannot normally be inspected and early detection of abnormalities has made it possible to take early maintenance actions on bearings. It is considered that it is possible to predict and maintain abnormalities of mechanical factors such as roll unbalance and loosening of housing mounting bolts.

In future, we will continue to introduce a condition monitoring system for the bearings of all rolls of the No. 2 paper machine to further strengthen maintenance, and by repeating vibration analysis, we will improve the accuracy of the threshold and make it a system suitable for the No. 2 paper machine.
Because of the success of this trial, Rengo plan to make all of our factories Smart Factories, and the SKF condition monitoring system will be installed at all Rengo factories in the future.

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Papermaking Technology I

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Installation Reference of Energy Saving & Recovery by Dryer Hood and Air System

Hidenori Tsuzuno
Horikawa Engineering Works Ltd.

Jean Desharnais and Lawrence Yane
Enerquin Air Inc.

This is to report on energy saving by Enerquin High Due Pont dryer hood, which is replaced to existing old T&G hood. At the same time existing pocket ventilators are replaced to new Mark II pocket ventilation nozzles. As the result, hood balance is improved and steam saving of paper dryers is evaluated. Also, heat recovery efficiency and Drying Rate efficiency are improved. Power consumption of supply fans and exhaust fans are considerably reduced.

Basic technologies and latest trends for paper machine -dryer to size press-

Toshihiro Katano
Application Eng. Dept., Voith IHI Paper Technology Co., Ltd.

In recent trends for carbon neutral, there is a growing demand for energy and raw material savings in the papermaking process through further energy conservation and yield improvement. The most important factor in saving energy in the papermaking process is how to reduce the moisture content of paper, especially before the pressing process.
Although, the dryer part has the largest amount of energy input and is an important part with potential for energy conservation and improvement.
This section first describes the cylinder dryer part and its ancillary equipment and mechanisms, as well as air flotation dryers and IR dryers. In addition, as a recent trend, sizers have been installed between the cylinder dryer parts as coating machines for external coating of paper strength materials and other applications. The functions of sizers and examples of their use will also be reported.

Modification Example of Dryer and Size press part for grade conversion

Yang Xue
Paper Projects, Valmet K.K

With the development of information and communication technology, the digitization of information is progressing, and the market is changing rapidly. While market demand for newspapers and coated paper has declined significantly, Consumption of tissue and containerboards is increasing rapidly due to the after coronavirus "New Normal" and e-commerce.

Demand for paper is declining, while demand for paperboard is expected to increase in the future. Under these circumstances, attention is focused on the shift from the production of paper such as newspaper and coated paper to the production of paperboard such as liners and cores. In such an environment, the paper industry is also undergoing major changes in demand, and it is required to produce products that meet the demand of each production variety. In order to increase the production of a certain paper, there are two methods, rebuilding (grade conversion) of existing machine and new machine. Since it takes time and cost to construct a new machine, many mills select a method of rebuild to products equipment for newspaper that are not expected to be in high demand and allocating them to the production of board that are expected to be in demand, that is grade conversion.

For grade conversion, we will introduce the rebuilding technology and Modification Example of Dryer and Size press part for grade conversion.

Basic Concept of Drainage System and Possibility of energy reduction

Hitoshi Terashima
MOTOYAMA SHINKOH CO.,LTD.

Compared to the original operating conditions for a paper machine, almost all current operating conditions, such as paper weight and speed, have changed.

Saving energy may be possible by investigating and examining whether or not the drainage system has kept up with these changes.

By changing the drainage system to match the paper being made, there should be many cases that can expect improvements in quality and efficiency as well as realizing steam savings.

Here we report on what can be done from now on for the possibility of saving energy considering the drainage system, within recent significant improvements in drying efficiency through sealed hoods, air supply and exhaust, heat recovery system, etc.

Basic technology of Tail threading equipment

Hiroaki Fukasawa
Paper Machinery Engineering Dept., Kobayashi Engineering Works, Ltd.

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

The core parts of tail threading system introduced here are made in-house by utilizing the process know-how and skills accumulated over many years in the Japanese paper industry. This combination has succeeded in the epoch making improvement of tail threading system for whole parts of paper machine.

SmartPapyrus® Approach to Optimizing Operations

Hitomaru Sakata
Technology Development Team
MAINTECH CO., LTD Fuji Technology Development Center

Maintech has been providing paper machines with Dryer Section Passivation technology (chemical application combined with chemical product, equipment, and application methods) for over 30 years to prevent defect/sheet break due to dryer section depositions. As of July 2021, the number of applications being operated over the world has topped 800 units. In recent years, the number of problems caused by machine deposits has been increasing due to the worsening of the raw material of pulp situation. In addition, it is becoming increasingly difficult to respond to machine dirt deposits in a timely and appropriate manner due to the decrease in the working population at production sites and the retirement of experienced employees. To address this issue, we are developing "SmartPapyrus", a system to prevent defects and sheet breaks by visualizing machine dirt deposits using IoT, analyzing it using artificial intelligence, and using machine dirt deposit prevention technology. For this reason, we developed SmartPapyrus® 1.0, a system that uses AI to automatically classify images of defects. SmartPapyrus® 1.0 makes it possible to determine in real-time when and how many defects have occurred.
As a result, the necessity and effectiveness of countermeasures can be quantitatively confirmed.
In this report, we will introduce SmartPapyrus® 1.0 and discuss some examples of its use.

Newly Canvas Cleaner 『ACE Cleaner』

Yosuke Sato
Design Department / AIKAWA IRON WORKS CO.,LTD.

In recent years, canvas dirt due to deterioration of raw material quality has increased, thereby causing problems such as lower air intake, deterioration of drying efficiency, and unstable moisture profile. At the same time, since the improvement of the product quality is required, the canvas cleaner is required, especially in paperboard and newspaper product machines. Among them, we started selling high-pressure cleaning equipment for machine tools about 20 years ago, and thanks to that, we have delivered more than 100 units of canvas cleaners. Here,「ACE」cleaner, which is a dirty objects recovery system by newly developed ejector air, is introduced together with various canvas cleaners of our company.

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Papermaking Technology Ⅱ

Topics & Information

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Possibility of Digitalization technology in paper machine

Ryozo Shimizu
Paper Machine Engineering Department, Voith IHI Paper Technology Co., Ltd.

For over five years, customers across the globe have been relying on the Papermaking 4.0 portfolio. Our digital solutions offer enormous potential to increase efficiency and availability of paper production lines. Thanks to individual packages customized for each customer worldwide, we offer the best possible solutions with fast amortization, in less than a year. With over 300 digital installations to date, Voith is the world's leading provider of digital solutions. Our customers benefit from this experience in ongoing projects.

Join us and help shape the future of paper production. Benefit from the huge potential offered by the digital transformation of the paper industry to boost efficiency, quality and productivity, and gain an important competitive advantage.

Let's make papermaking digital.

As a full-line supplier, Voith delivers holistic solutions tailored to the customer's needs. In concrete terms, this means that Voith takes responsibility for Operation and Information Technology implementation and long-term support, as well as maintenance and paper technology. As a result, we make improvements on a holistic level. This approach is also reflected in our modern business models, which ensure we work together with our customers to achieve the right goals. Full-line, full service, full benefit. Benefit from our holistic solutions from a single source for all aspects of Papermaking 4.0!

The latest thermal spraying technology to solve various problems in the paper machine dry part - Breakthrough non-stick thermal spraying and on-site grinding technology -

Kimiaki Iwane
Tocalo Co., Ltd Sales Division

The main problems in the paper machine dry part are paper defects and paper breaks due to dirt and wear on the surface of each roll. In particular, dryer cylinders and canvas rolls have a great influence on paper defects and paper breaks. In the case of the dryer cylinder, wet paper containing a large amount of water and paper coated with a size liquid stick to the high temperature surface, so that surface stains occur. Furthermore, wear and scratches occur due to the doctor blade used to remove dirt. In the case of the canvas roll, pitch stains on the outside roll are likely to occur, and in the case of the inside roll, rust is likely to occur due to the surrounding environment. Both are major problems that directly affect paper defects and paper breaks during operation.

This paper reports on breakthrough non-stick thermal spraying technology, on-site thermal spraying and grinding technology that solves various problems of these dryer cylinders and canvas rolls.

Calender and Reel part of basic theory and the latest trend

Keisuke Seita
Paper technology, Valmet K.K.

In this paper according to improvement of paper machine, machine operation at higher speed and higher quality is needed, also about energy saving is required. Both Calender and Reel part are continuously improved to meet that requirement.

The purpose of calendering is basically to improve paper surface roughness, impart gloss to paper, improve printability. Recently, to save bulk of paper after calender, as a new technology, Valmet have developed Aqua cooling technology.

The purpose of reeling is to make the paper web in a form which is easier to handle. Challenges of reel is coping with wider and higher speed paper reeling, also to keep quality of reeled paper under that situation. In order to meet that requirement, reel was developed from traditional surface reel, to with center driving, and to change reeling on rail. Also, technologies have been developed about spool turn-up. As an example, a water jet turn-up device will be introduced.

The transition and latest technology of dryer fabric

Susumu Takeuchi
Shikishima Canvas Co.,Ltd.

Dryer fabric plays an important role in the final process of the paper machine.
The basic function of dryer fabric is to promote wet paper drying with crimping steam-heated cylinders, while holding and transporting the squeezed paper after the press section process.
Dryer fabric influences not only to the final paper quality, but also impacts greatly energy efficiency. In other words, it leads to a decrease in production efficiency, an increase in energy consumption, and poor paper quality, if you cannot perform by selecting a suitable fabric for each part.

Today, we also introduce the history of dryer fabric starting from cotton fabric and in addition our latest technological trend like the
countermeasures against the DIP-derived contamination problem and recent development to enable to maintain air permeability by using CNF.

In the end, we would like to mention our future view and idea about what dryer fabric can contribute for the said Sustainability Support required socially in these days.

Aikawa Canvas Cleaner

Tsuyoshi Yoshino
AIKAWA Iron Works Co.Ltd.

The used paper utilization rate for the last 10 years has been around 64%, and the utilization rate of paperboard exceeds 93%, so further improvement is difficult. In order to achieve a used paper utilization rate of 65% by 2025, it is conceivable to improve the utilization rate of materials other than paperboard. Therefore, when using it for products that did not use recycled paper in the past, it is necessary to take higher quality measures than ever before, and it is necessary to strengthen the cleaning power of papermaking tools that are directly connected to the product. Here, we will focus on the canvas cleaning of the dryer part, especially for papermaking tools, introduce the types and features of our canvas cleaners, and propose models and cleaning methods according to the application.

The SmartPapyrus Realizes Work Style Reform in Paper Mills.

Hitomaru Sakata
Technology Development Team
MAINTECH CO., LTD Fuji Technology Development Center

Maintech has been providing paper machines with Dryer Section Passivation technology (chemical application combined with chemical product, equipment, and application methods) for over 30 years to prevent defect/sheet break due to dryer section depositions. As of July 2021, the number of applications being operated over the word has topped 800 units. In recent years, the number of problems caused by machine deposit has been increasing due to the worsening of the raw material of pulp situation. In addition, it is becoming increasingly difficult to respond to machine dirt deposit in a timely and appropriate manner due to the decrease in the working population at production sites and the retirement of experienced employees. To address this issue, we are developing "SmartPapyrus", a system to prevent defects and sheet breaks by visualizing machine dirt deposit using IoT, analyzing it using artificial intelligence, and using machine dirt deposit prevention technology. In SmartPapyrus Ver.1, we developed "SmartDepo.", which quantifies the contamination level by visualizing and quantifying the dirt deposit status of the fabric in realtime with a camera that can use high temperatures in the hood exceeding 100 degrees Celsius. We have also developed "SmartChemical", which is linked to "FabriKeeper", a fabric cleaning system, and controls chemicals according to the stain status of the fabric.

This time results of the application of SmartPapyrus Ver.1 will be reported.

Quantitative Approach to Identify the Problematic Positions Causing Defects with SmartPapyrus

Takayuki Shimo
Technology Development Team
MAINTECH CO., LTD Fuji Technology Development Center

In recent years, the working population is expected to decrease in developed countries, including Japan.

Difficulty of acquiring young human resources because of the declining birthrate, and the aging of engineers means that if these trends continue, the experience and know-how developed over many years will be lost due to the inability to pass on technology, and stable manufacturing process may become difficult to achieve.

Japan's paper mills are no exception to this, and as it is difficult to acquire new human resources to work in the harsh conditions of high temperatures and humidity, and as experienced workers continue to retire, the reform of work style at production sites could become a major issue for future management.

As one of the solutions to these problems, we have developed “SmartPapyrus” to prevent defects and sheet breaks by visualizing machine dirt deposit using IoT, analyzing it using artificial intelligence, and using machine dirt deposit prevention technology.

In the process of developing this system, it was important to have information on what kind of defects occurred, “when”, “where”, and “how many” during the operation in order to conduct a predictive analysis of defects and sheet breaks. However, the current defect detectors (WIS:Web Inspection System) are only used to determine whether defective products haven’t been shipped, and do not output information about where defects have occurred on the paper machine.

In order to identify the location of defect occurrence, experienced workers on site have to make decisions based on their experience using the defect information output from the WIS.
In order to make it possible for anyone to make quantitative decisions about the process, we developed an AI that incorporates the hunches and tips of experienced workers through image classification using deep learning, and developed a defect image classification system that supports operations based on the AI inference results.

This time, we will report our past efforts and future prospects.

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Pulp and Paper Research Conference

Topics & Information

Pulp and Paper Mills in Japan (100)

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Retention and functionalization of mechanisms of paper chemicals based on their interactions with cellulose fibers in papermaking process

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Alkyl ketene dimer (AKD), polyamine amide epichlorohydrin (PAE) resin, and aluminum sulfate have been used in practical papermaking process for more than 60 years, and many fundamental and applied technologies have been accumulated in papermaking mills. However, the actual papermaking process is complicated, and no adequate theory has been established for explanation of all the related phenomena and troubles owing to internal and external additions of paper chemicals without contradiction. In the case of addition of internal chemicals, it is necessary to analyze and determine the contents (or retention ratios) of the added chemicals in paper sheets for explanation of their functions and also troubles. This is because most of troubles of paper sheets are caused first by insufficient retention ratios of the internal paper additives, resulting in insufficient paper quality. Trace amounts of sizing components in paper sheets are determined by pyrolysis-gas chromatography. The amounts of cationic or anionic polymers containing nitrogen atoms (such as PAE and cationic/anionic polyacrylamide) are determined by a gas chromatography-type nitrogen content analyzer. Some elementals such as aluminum and sulfur originating from aluminum sulfate are determined for paper sheets by X-ray fluorescence analysis. When the contents of internal chemicals in paper sheets are sufficiently high but paper functionalities are unexpectedly insufficient, some interactions between paper chemicals and cellulose fibers and/or structural changes of the paper chemicals in the dried paper sheets should be considered and analyzed. Particularly, in the wet-end papermaking systems, small amounts of anionic carboxy groups in pulp fibers and fines play a significant role in electrostatic interactions with cationic paper chemicals such as sizes, polymers, and aluminum compounds and surface-anionic pulp fibers in water, their retention rations in paper sheets, homogenous distributions of additives in paper sheets, and resultant efficient functionalization. These concepts of chemical modifications of pulp fibers using carboxy groups as scaffolds with paper chemicals in water may be extended to efficient surface modifications of charged groups-containing nanocellulose with cationic compounds in water to add water-resistance and hydrophobicity to hydrophilic nanocellulose. It is expected that efficient surface modifications of nanocellulose will be developed on the basis of the interaction and functionalization mechanisms of nanocellulose with cationic compounds in water.

Development of oil repellent for paper that doesn’t rely on fluorine

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For more than half a century since 1968, "UNIDYNE" has been used as a water and oil repellent in various fields such as paper, nonwoven fabrics, textiles, and carpets. In recent years, the U.S. Food and Drug Administration (FDA) has expressed concern about impurities in fluorine materials and we are working on developing fluorine-free oil repellents for paper. Our goal is to be able to use fluorine-free oil repellent agents without compromising the paper's inherent properties, such as water vapor permeability and releasability that enables recycling.

We developed XP-8001, a fluorine-free oil-resistant agent for paper. By increasing the crystallinity of alkyl groups with low surface tension, we achieved oil resistance at high temperatures. Compared to other fluorine-free products, XP-8001 makes it possible to prevent oil penetrating while maintaining the paper's permeability. Since the product has demonstrated high performance in evaluations simulating actual applications, we believe that it meets market requirements.

Daikin Industries, Ltd will continue to provide valuable products in the future.

Determination of pH of aqueous extracts in neutral region

Hiroyuki Noda
Tokushu Tokai Paper Co., Ltd.

This work sets out to investigate the determination of pH of aqueous extracts. Tokushu Tokai Paper Co., Ltd uses pH of aqueous extracts as one of the quality standards for paper products used for the conservation papers such as mounting board. The product is applied to the preservation of cultural properties and the storage of documents. The method for measuring the pH of aqueous extracts was updated in 2012 to the method for measuring by adding a potassium chloride solution. The determination of pH of aqueous extracts uses glass electrodes. Therefore, when we measured extract having a small electric conductivity, the deviation was increased. This phenomenon is unavoidable in terms of measurement principle. For many acid-free papers with calcium carbonate added, stable extraction pH measurement results can be obtained with a glass electrode.

ISO29681: 2009 has a method of extracting a paper sample with a 0.1 mol/L potassium chloride solution. For samples with a large amount of electrolyte, the deviation of the measured pH data will be decreased. On the other hand, in the case of acid free paper with a small amount of electrolyte, the deviation of the measured pH data was increased. And it is difficult in principle to measure pH accurately when the amount of electrolyte is low and the pH is around 7. Comparing the determination method with the same paper sample, the pH tended to be lower when the added amount of potassium chloride was large. In the case of the measurement method in which potassium chloride was not added, the deviation of the measured pH data became larger as the water purity was higher. We report that it is affected by the water used for extraction and the added potassium chloride solution.

Operating Experience of Canvas Cleaning Equipment

Satoru Honda
Fuji Mill, Oji Materia Co., Ltd.

Oji Materia Co., Ltd.'s Fuji Plant owns two paper machines: the N-1 machine for making corrugating medium and the N-2 machine for making white paperboard. Both machines are capable of making paper from 100% recycled paper, and play a role in Oji Materia as a resource-recycling plant.

The N-1 machine, which makes corrugating medium, is one of the leading high-speed paperboard machines in Japan, capable of making paper at speeds of 1,000m/min or more. Caused by dirty tools, As a result, defects are generated and paper breakage troubles are induced. In particular, dirt from sticky substances that accumulates on the dryer parts is a cause of trouble, so we have taken a variety of measures to strengthen cleaning with the existing high-pressure water canvas cleaner and regular cleaning of the blade-type cleaner, but we have struggled to cope with ensuring work safety.

As a countermeasure, we installed the "fabriKeeper" in the most dirty group in the dryer part in August 2021 and obtained good results. We report the consideration of introduction, our operating experience and results.

『Heat loss diagnosis and countermeasure for steam piping』
-「Reduction of heat loss by the Aerogel Insulation Over-Wrapping Method」-

Sho Suyama
NICHIAS Corporation

In industrial field, we can't ignore the heat loss from steam pipes that happens as the water absorption degrades a performance of insulation.

Here we introduce the countermeasure against this kind of heat loss, "The Aerogel Insulation Over-Wrapping Method".

We won the Grand Prize for Excellence in Energy Efficiency and Conservation in 2018 for the countermeasure method, which suggests ① Visualization of heat loss ② Improvement by strengthening heat retention ③Verification of effect.

The latest fiber recovery filter applied for pressure screen

Toshio Dousaka
Voith IHI Paper Technology Co., Ltd.

The recent target of Stock Preparation System is to improve stock quality, to save energy and to save fiber loss. Also the importance of water saving is also getting higher as other target. This means that effluent treatment is also need to be improved to get better recycled water to reduce the usage of flesh water.

Typical effluent treatment has two steps as primary (with DAF: Dissolving Air Flotation) and secondary (with sedimentation). After water clarification, sludge comes out from the system. Sludge includes some short fibers which can be reused, and usually sludge is treated by landfilling finally. If short fibers are reused it would save the cost not only of fibers but also of landfill.

To recover the short fibers usually Disc Filter is applied, but a Disc Filter need big installation area and expensive cost of machine itself. Therefore it is not still applied for many customers yet, especially for the customers in small production.

To recover more short fibers at effluent treatment in relatively small flow ratio, smaller and easier machine is necessary. In this article, I introduce the latest fiber recovery technology with screen basket.

Attractive effect of long-life UV-LED lamp on flying insects

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There is a need to switch from fluorescent lamps to LEDs as the light source to attract insects. We have been selling UV-LED based light trap since 2017. In 2021, we have developed UV-LED lamp that have a longer lifespan and save more energy than conventional UV-LED lamp. In this study, we compared the attracting effect of old and new UV-LED lamp. There was no significant difference in the number of flying insects captured by the light trap with UV-LED lamp before and after the improvement. These results suggested that the new UV-LED lamp would be an energy-saving, long-life, and high insect attractiveness.

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Environment

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Basic Principles of Microbubbles and Their Use in Wastewater Treatment OZAC Wastewater Treatment System

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The OZAC Wastewater Treatment System is an innovative wastewater treatment system that applies the YJ Nozzle, a micro- and nano-bubble generator. It directly decomposes organic matter by free radicals due to the crushing action of ozone fine (micro)bubbles. In addition, high-efficiency microbial treatment using ACB carrier, a special carrier containing activated carbon, enables significant reductions in BOD and COD without relying on chemicals.

This wastewater treatment system enables sludge volume reduction, capacity increase, and energy saving that have never existed before. As a wastewater treatment system for the new era of fine bubbles, it can handle various wastewater treatments, from small septic tanks to large-scale factory wastewater treatment. It has the following features:

1. Since almost no sludge is generated, river discharge is realized without the need for a sedimentation tank.
2. No odor is generated.
3. The amount of chemicals used is drastically reduced, and running costs are also reduced.
4. The processing capacity is more than twice that of conventional methods.
5. Good at processing oil and SS.
6. Reduces power energy consumption.

In addition, since it is possible to install an adjustment tank or aeration tank using it as it is without remodeling the existing facility, there is no need to carry out large-scale construction, and it is possible to significantly reduce costs. It has been installed in several factories and has been well tested in wastewater treatment at paper mills.

Anaerobic MBR for high organic wastewater treatment and biogas recovery

Kazuya Komatsu
Kurita Water Industries ltd.

Anaerobic biological treatment is a wastewater treatment technology that saves energy and waste sludge, and recovers energy, and its application is progressing. However, conventional anaerobic treatment processes such as UASB and EGSB are difficult to apply to wastewater containing SS and oil and high COD wastewater of tens of thousands mg/L or more. Anaerobic MBR is a process that can be applied to these wastewaters without pretreatment or dilution, allowing wastewater treatment and biogas recovery. The features of the anaerobic MBR and application examples for dairy wastewater treatment are described.

Forest Management Projects at the J-Credit Scheme

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The J-Credit Scheme is the Japanese-governmental institution to certify the amount of greenhouse gas (GHG, such as CO2) emissions reduced and removed by sinks. After the 2050 carbon neutral declaration by the Government, forest sink especially gets growing interests as the most traditional and substantial way of negative emissions and rapidly increases the number of its projects registered at the Scheme. In order to accelerate the registration of forest sink projects and certification of their GHG removals, in August 2022, the Scheme conducted the revision to introduce the following rules:

1) If no final cutting is planned or all the final cuttings are planned accompanied by reforestations, a forest management project registrant may omit the demonstration of additionality because of high probability of the project's deficit operation.
2) Not only planted forests with a forestry operation after April 1990 but also natural forests with conservation activities after the project registration can be certified GHG removals.
3) If reforestation is conducted within two year after final cutting, forecasted GHG removals until the standard final-cutting age of the reforested trees can be certified at the year of the reforestation because those trees are highly probable to properly grow until that standard age without final-cutting under the certified forest management plan.
4) A forest management project registrant can have GHG removals, which are regarded to remain contained in harvested wood products for 90 years, certified.
5) A third party who reforest at cut over areas can have GHG removals certified based on the newly-established methodology of reforestation, even if reforested trees are not under the certified forest management plan.

Trends of Sustainability for Biofuels and Carbon Neutrality

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Hokuetsu Corporation

Biomass power generation has been introduced as one of the renewable energies for the prevention of global warming. However, in recent years it has been reviewed from the viewpoint of sustainability, mainly in the EU. The sustainability criteria for biomass fuels were require to ensure the human rights regarding fuel procurement and its legality, and consideration for biodiversity. Furthermore, in the 2018 renewable energy directive, the life cycle greenhouse gas of biomass fuel was required to be reduced by 80% from that of the reference fuel. The following is the background of this revies: Since forest clear-cutting in the EU to procure wood for biomass fuel has been progressing, strong opposition movements by environmental groups occurred; Scientists has proposed "the scope of renewable energy certificates shall be Limited to wood wastes and residues.

In response to these EU trends, the Agency for Natural Resources and Energy (ANRE) in Japan has started to review the sustainability criteria as well, am is proceeding with stufies toward the introduction of sustainability criteria.

Current Status and Challenges of PCB Waste Treatment, Future Prospects

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Polychlorinated biphenyl (PCB) has excellent insulation properties. PCB has been widely used in insulating oil in electrical equipment. Bat, since it has been found to be harmful to the human body and the environment, disposal of equipment that uses PCBs is proceeding.

PCB waste is classified into high-concentration PCB waste and low-concentration PCB waste. High-concentration PCB waste is disposed of by JESCO (Japan Environmental Storage & Safety Corporation). Low-concentration PCB waste is disposed of at facilities approved by prefectural governors and ordinance mayors. The treatment method and the processing deadline are stipulated in the Act on Special Measures Concerning PCB and the Electricity Enterprises Act.

This report explains the disposal schedule and progress of PCB waste, which remains widely throughout the country, as well as how to investigate and identify PCB contaminants and how to deal with them if they are found.

Carbon Pricing for Growth

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Ministry of Economy, Trade and Industry
Bureau of Industry, Technology and Environment

This lecture explained the concept of "Pro-growth Carbon pricing (CP)", while touching on topics such as domestic/international trends regarding climate change and policies by the Ministry of Economy, Trade and Industry (METI).

CP is an economic instrument to move towards carbon neutrality (CN), and various methods such as carbon tax, emissions trading systems, and credit trading exists, depending on the entity which implements CP and the explicitness of carbon prices. The Government of Japan's policy to date has been to promote CP on a voluntary and market basis as "Pro-growth CP", which will enhance the competitiveness of industries, innovation, and investment.

In response to the government policy, METI has established the GX League, in which participating companies voluntarily set ambitious emissions reduction targets and conduct emissions trading to achieve those targets. The GX League also serves as a platform for discussing and creating future visions towards CN, market creation, and rulemaking. Since the announcement of the GX League's basic concept in February of this year, 440 companies have endorsed it, covering over 40% of Japan's emissions.

Simultaneously, to publicize and visualize the price of carbon credits circulating domestically such as J-Credits and JCM, and stimulate transactions, a Carbon Credit Market will be established.

The GX League and Carbon Credit Market are to undergo demonstration tests in FY2022 and to be fully operational in FY 2023, as explicitly stated in the latest government policy documents such as the Clean Energy Strategy and the New Capitalism "Action Plan". METI will continue to promote initiatives regarding Pro-growth CP.

Regarding The Plastic Resource Circulation Act

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Plastic is lightweight, durable, easy to mold, and non-corrodible, making it an indispensable material in society today. And its utility extends to a wide range of products, containers, and packaging.

At the same time, there is a growing need to promote domestic resource circulation of plastics as a way to deal with the issues of marine plastic litter, climate change, and enhanced import control of waste materials in other countries and so forth. The Plastic Resource Circulation Act was brought into effect on April 1, 2022, to strengthen the comprehensive resource circulation system for plastics used in diverse ways. The Act focuses on plastic as a material used in a wide range of products and aims to promote resource circulation of plastics based on the "3R + Renewable" initiative by all stakeholders at every stage of its lifecycle, from product design to waste disposal. Towards the resource circulation of plastics in Japan, a number of initiatives are advancing while collaborating with all stakeholders including municipalities, businesses and consumers at each stage of the lifecycle of plastics.

Supply-chain (Scope1,2,3) emissions accounting and trend in supply chain emissions reduction

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In recent years, the pursuit of the 1.5°C target by the Paris Agreement and COP26, and related initiatives such as the TCFD recommendations, have led to the need to account the emissions not only of one's own company (Scope 1+2) but also of the entire supply chain (Scope 3). There are several methods for accounting Scope 3, but the method based on supplier-specific values (carbon footprint) is preferred over the method based on physical quantity or monetary data. In order to implement reductions in Scope 3 emissions, it is necessary to involve stakeholders as well as the company itself.

Efficient removing of $CaCO_3$ by hydrochloric acid treatment under pH monitoring in paper sludge suspension

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In this study, we aimed to realize a removal of $CaCO_3$ by hydrochloric acid treatment at the optimum amount while pH monitoring was performed on the PS suspension. Initially, as a standard measurement, suspensions prepared with commercially $CaCO_3$ powder were reacted with hydrochloric acid. The $CaCO_3$ powder in suspension was taken to react in about 10 minutes. Furthermore, it was also found that $CaCO_3$ powder could be almost completely removed by adding hydrochloric acid to less than the suspension pH of 2. Using these results, we attempted to efficiently remove $CaCO_3$ in paper sludge (PS) with hydrochloric acid under monitoring pH of suspension. X-ray diffraction and X-ray fluorescence elemental analysis were performed on samples of PS calcined after hydrochloric acid treatment, and $CaCO_3$ in the source PS was almost removed. The removed $CaCO_3$ from the PS was recovered from the treated solution as $CaCl_2 \cdot 2H_2O$. Scanning electron microscopy (SEM) of samples of the PS before and after hydrochloric acid treatment revealed that paper-derived fibers in the PS were hardly dissolved by hydrochloric acid treatment at pH 2. In addition, we confirmed partially self-ignition of the acid treated PS because of the organic-derived fibers remaining in the acid treated PS.