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**Development and Application of "Catalyzer type De-inking agent".
-Development of "Hydrolyze type Pitch control agent"-**

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Since recycling of waste paper is an important problem for environmental protection, the paper industry strives to improve the utilization rate of used paper. On the other hand, maintaining the quality of deinked pulp is becoming important as the demand level of quality for deinking pulp has become higher.

In recent years, printed matters by UV curable ink have been increasing for environmental reasons such as energy saving and no content of VOC (volatile organic compound). The UV curable ink is a factor that significantly reduces the quality of the deinked pulp because the conventional deinking method is not applicable to miniaturize UV cured ink which forms strong film.

So far, conventional drying oils based ink (oxidation and polymerization drying ink) using for newspaper etc. is relatively easy to miniaturize. However the ink is too adhesive to remove, then lead the problem of the difficulty to improve the quality of deinking pulp even if further operation condition is optimized such as the flotation process and the dosage of bleaching agent like hydrogen peroxide.

To provide the solution of these problems, we've successfully developed "catalyzer-type de-inking agent" combining the techniques of interface science and catalyst science for the first time in this industry.

On the other hand, matters called pitch (dust, dirt)-are generated during the production process of paper using waste paper. There are a lot of origins of pitch such as the adhesive for postal slip, back glue and resins in coating agents. As conventional pitch control agent provide only the performance of solubilization, emulsification and dispersing of resins, in some cases, pitch is generated due to aggregation and giant growth of particles by demulsification or dispersion-break which are caused by external factors like pH change, shear force and addition of fixing agent like aluminum sulfate.

These pitches adhere to paper, or paper manufacturing equipment such as aging towers, concentrators, rolls, dryers, etc., in some cases, the accumulated pitches drops off and re-adheres to paper. This reattachment causes problems such as quality loss of paper and decrease in productivity and workability due to paper breakage.

In particular, waste paper recycling plants are facing this pitch (dust, dirt) problem as the same level of frequency as the problem by UV cured ink. Thus the development of the new generation of pitch control agent as the solution of pitch problem has been requested for many years in the paper industry.

In this paper, we further introduce newly developed "hydrolyze-type pitch control agent" by applying the catalyst technology of "catalyzer-type deinking agent". This new pitch control agent accelerates dissolution of pitches and prevents giant growth by decomposing the resin.

System for Improving Productivity, Operation Efficiency and Environmental Health

Hiroki Katsura
Kurita Water Industries Ltd.

The recent environment surrounding the paper industry has changed, especially with regard to the increase in paper recycling rates. It causes fluctuations in furnish quality, which affects the running stability of the machine and the paper product quality. In this complex situation, we focus on the "water" often used in the papermaking process to improve productivity. The combination of inorganic slime control agent and aeration stabilizes the water quality more efficiently than ever. The "S. sensing[®] system" has three functions: monitoring, analysis and control.

First, we monitor water quality and accumulate machine operation and paper quality information from customers. Next, analyze the correlation between them. Third, control the water quality, improve the operation stability of the machine and the quality of paper products. In this report, 1) the drainage load reduction by the water quality stabilization technology by inorganic slime control agent and aeration, 2) improvement of operation by correlation analysis of operation and water quality, 3) control case using S. sensing system are introduced.

Proposal for Solid Fuel Conversion of Waste Pulper Kiln

Yasuo Oguma

Oguma Iron Works Co.,Inc.

In recent years, while the reduction of by-products, which are by-products, and zero emissions are called for in production factories, the present situation is that the reduction of essential waste has not been achieved. In addition, the sharp decline in the export of plastic waste to China has triggered the rise in the cost of industrial waste disposal in Japan, and the reduction of waste at the factory level and the reduction of internal waste have been required. Most pulpers generated as wastes in the papermaking process using waste paper as the main material are mostly plastic, and high moisture content is discharged. Although these are temporarily treated, they are still incinerated or industrial waste treated with a high water content of 60% or more. On the other hand, paper companies that own biomass boilers purchase fuel from waste plastic from outside as RPF. RPF is originally molded from waste plastic and paper etc. with low moisture content * 1 JIS standard. During molding, frictional heat is generated and the melted plastic melts and solidifies in a form that mixes paper. However, since the pulper cake has an originally high moisture content when discharged, the heat of melting necessary for forming is taken away by the heat of vaporization, and solidification is almost impossible. As a solution to this structural problem, the machine separates the part where water is discharged, and uses a compression mechanism to compress the pulper weir in the previous stage to separate it from the water and discharge it from the lower part of the machine. Molded in. Pulverizer with high moisture content can be converted to solid fuel.

Realization of Functional Safety Management for Plant

Shintaro Tajima

Yokogawa Solution Service Corporation Solution Business Division

Essentially, the highest priority in plant operation is "safety" and it means that damage to people from plant accidents should never be occurred. In Japan, plant safety has been protected by strict maintenance and education and training for users. However, in a society where the working population declines as the birthrate declines and the population ages, visualization of tacit knowledge and the problem of technology transfer are emerging as safety issues in various industrial fields. In this paper, to tackle this problem, the design and systematization method of functional safety of plant based on international standard IEC (International Electrotechnical Commission) is introduced.

Analyze current situation by Digital audit, and system installation

Kanato Mizukoshi

P&S sales department, Voith IHI Paper Technology Co., Ltd.

Industrie 4.0 is a project in the high-tech strategy of the German government and is the title given to the next fourth Industrial Revolution. As part of Industrie 4.0 Voith Paper has already started to introduce and promote the Papermaking 4.0 concept globally. It based on the next generation of cyber-physical systems, encompassing the full life-cycle knowledge and intelligence necessary for the autonomous decentralized control of manufacturing plants. This coupled with big data analytics providing better insight and predictive capabilities allows for the next leap in productivity and cost reduction.

Concept of papermaking 4.0 is pervading at paper industry. However no installation reference in Japan so far. And because of this many of us think this is still future technology and not yet adaptable in Japanese market. When we look at oversea market more and more reference are made.

Thanks for this opportunity, VPIT introduce actual installation of OnE strength which is one of PM4.0 product. Value added assessment (VAA) is carried out ahead of OnE installation. VAA is kind of process and digital audit. Find out what kind of model can adapt to individual machine. This audit result give the customer clear image what kind of benefit they can get thorough PM4.0 installation.

ADVANCED ONLINE PROCESS ANALYZER FOR CHEMICAL RECOVERY AND PULP MILL CONTROL

Thanh Trung
FIT NIR Analyzers Inc.
Tomohide Mogami
Toko Instruments, Inc.

With increasing competition worldwide, the pulp and paper manufacturers require greater emphasis on cost reduction and increased product efficiency and quality. Chemical recovery process continues to be a critical component of a pulp mill, providing chemical, steam, and power. The mill's economic viability rests in large part from efficient and optimized chemical recovery operations. The use of Fourier-transform Near Infrared Spectroscopy (FTNIR) has been fully developed by FPIInnovations (formerly Paprican) and its Alliance Partners, as proven process analyzers for online measurements of various streams in the chemical recovery processes, including: raw green liquor for TTA control, clarified green liquor for TTA trim control and feedforward slaker control, causticizer white liquors for CE control, as well as weak black liquor residual effective alkali, lignin, organics, inorganics, and total solids content to provide feedforward for evaporator control.

These measurements have led to new advancements in control strategies which take advantage of the multitude of liquor chemical compositions, starting with advanced control of the dissolving tank TTA to feedforward slaker control and final CE control. With the implementations of these analyzers and control strategies, mills have reported significant process variability reduction, typically from 40% to 60%, allowing for target shifts to higher TTAs and higher CEs. In addition, these mills have reported significant reduction in purchased lime usage and all mills reported reduction in pressure filter maintenance, reduced plugging in evaporators, and plugging in recovery boiler. In one case, increase WL strength and debottlenecking recausticizing area resulted in significant increase in digester production. ROI ranged from \$500K to \$3M.

This paper will briefly review the technology and will give further details on economic impacts achieved through efficient and optimized chemical recovery operations with the use of process analyzers and control.

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Development of Xanthated Cellulose Nanofiber

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Cellulose nanofiber (CNF) is produced by fibrillating pulps to the nano-sized fibrils either through chemical or mechanical processes. It possesses interesting properties, such as high strength, high elastic modules, low thermal expansion, and thixotropy of the suspension. For these properties, it can be used for various applications, and is drawing great attention in recent years as a promising next-generation material. It is well known that CNF with a particular microfibril unit fineness and high aspect ratio can be obtained by firstly introducing either carboxylate or phosphate groups into cellulose, followed by gentle mechanical fibrillation with the help of the electrostatic repulsion and/or osmotic effects caused by those introduced anions.

Our company, Rengo, has been manufacturing cellophane from pulps for many years. Since cellulose xanthate, an intermediate product in the production process, is also an anionic cellulose derivative, we put our effort on this intermediate to make CNF. We found that xanthated cellulose nanofiber (XCNF) with a diameter of about 3-10 nm can be generated efficiently by maintaining the crystallinity of cellulose type I and controlling the degree of substitution to prevent the formed cellulose xanthate from dissolving in the solution through the fibrillation process. Such obtained XCNF can be easily converted (regenerated) to a non-substituted cellulose nanofiber (RCNF) form by treating XCNF with either heat or acid. Although some agglomerates were observed, the diameter of RCNF is still in the range of a few nanometers. As a non-substituted CNF, our product is extremely small in diameter and with high transparency. Moreover, since it is cellulose, its heat resistance is close to that of pulps. Based on these characteristics, various applications are under development.

New Development of Cellulose Nanofibers -A Composite Material of Carbon Fibers and CNFs-

Junji Nemoto
Novel Materials Development Office, Hokuetsu Corporation

All-cellulose composites in which cellulose was adhered by dissolved cellulose were proposed in the mid-2000s and have shown good mechanical properties in laboratory scale. Although they have been considered as new materials, it is not certain that the processes can be applied for practical production. Vulcanized fibers use the same concept as the all-cellulose composites and are robust all-cellulosic materials in which cellulose micro fibers are adhered with cellulose nanofibers (CNFs). They were invented in 1850s and still have been manufactured industrially. Recently a new composite material was created from carbon fibers and the vulcanized fibers. The materials were lightweight and showed better dimension stability even after exposure to a humid condition. This composite material based on carbon fibers and CNFs can compensate for the conventional shortcomings. Therefore, new development of CNFs is expected in the future.

Preparation of Phosphorylated Cellulose Nanofiber and Its Utilization

Yusuke Todoroki
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Cellulose nanofibers (CNFs) are obtained from wood pulp by isolating crystalline microfibrils in which molecular chains of cellulose are regularly arranged. Since CNF is not only a sustainable natural resource but also has unique features, its multifaceted utilization is expected. By subjecting softwood bleached kraft pulp to phosphorylation and then mechanical treatment, the CNFs with phosphate groups on their crystal surface could individually be dispersed in water. The dispersion had unique rheological properties, and the phosphate groups provided stability in a wide pH range to the dispersion. These features emerge even when the fibers in the dispersion have broad distributions of width and length. The aqueous dispersion of phosphorylated CNF was commercialized as a thickening and dispersing agent for cosmetics, taking advantage of its high transparency, high viscosity and high dispersant ability. In addition, phosphorylated CNF was adopted for the pump primer to prevent

concrete blockage in pumping pipe by forming a thin and uniform lubricating layer on the inner surface of the pipe at construction sites. Due to the rheological properties of the CNF, lubricating layer can be stably formed, and components in pump primer can be stably dispersed and the pump primer can adapt to pumping speed. Phosphorylated CNF with further modification can be dispersed in organic solvents. The CNF is provided in powder form and is dispersible in various organic solvents, and the dispersion has characteristics common to CNF aqueous dispersion. This CNF powder made it possible to study applications for use in non-aqueous solvents. On the other hand, we can manufacture CNF sheet from aqueous dispersion in which phosphorylated CNFs are individually dispersed. In addition to its high tensile strength, high thermal dimensional stability and flexibility, high-precision patterning on the CNF sheet had been succeeded. Its application to flexible electronic device is expected. We will further promote the utilization of phosphorylated CNF.

The current status and future prospects of CNF R&D

-CNF would be found in articles around you.-

Fuminari Nonomura
Nippon paper Industries Co., LTD

Cellulose Nano Fiber (CNF), a recyclable new material made from woody biomass, has unique properties such as high aspect ratio, ultrafine width, crystalline structure, light weight, high elastic modulus and special rheological characteristics. CNF research and development has started in Japan around 2000, and more than 200 companies are developing their manufacturing technologies and applications supported by related governmental ministries.

Nippon Paper Industries Co., Ltd. (NPI), which started CNF R&D activities officially in 2007, are now operating two commercial CNF production facilities (TEMPO-oxidized CNF at Ishinomaki mill, CM-CNF at Gotsu mill) and one pilot facility (CNF-reinforced resin at Fuji mill).

Metal ion attached TEMPO-oxidized CNF has been utilized for deodorant sheet, CM-CNF has been adopted for cosmetics as well as food such as Dorayaki (pancakes stuffed with red bean paste) by taking advantage of its rheological property and moisture control ability. We have been providing CNF-reinforced resin for Nano Cellulose Vehicle project funded by Ministry of the Environment which is aiming for weight saving automotive parts.

CNF is abundant biomass material on earth and also it has wide variety of unique properties which are unassociated each other. This allows the CNF to have potential to be used in every possible area. We believe that in near future, the world is to come in which we go like "Look, CNF is all around us!"

However we recognize there are some hurdles to overcome for early realization of it.

To solve it, mass production technology, established CNF modifying technology suitable for its application, and application development by collaborating with related companies and organizations are important.

It is our responsibility as a pulp and paper company to promote practical realization and expanding market of CNF.

Cladding technology for the outer circumference of long pipes using the cooling function by ultrafine-bubble-coolant

Yuuki Shimizu and Yoichi Shiraishi
Welding Alloy s Japan LTD. Engineering Department

Shinichi Ninomiya
Nippon Institute of Technology

Tubes in various boilers such as super heaters, in-bed tubes, and connecting tubes is in a severe corrosive environment like the furnace wall. Our company has established a corrosion and erosion-resistant wear construction method by welding all around the outer surface of a tube exceeding 8m, and has developed a device that has cleared the problems of equipment size, rigidity, cost, etc. Normally, when welding the outer surface of such a tube, it is necessary to cool the inside of the tube with cooling water in order to prevent meltdown and deformation of the tube due to welding heat.

In this report, focused on the cooling water and conducted experiments by adding Ultra Fine Bubbles, which have been applied and used in the fields of fisheries industry, industry, agriculture, medicine, etc., to the cooling water in recent years. In result, it was able to be developed a cooling system that reduced the amount of deformation and shrinkage of the tube.

**A world of reliable rotation
-SKF performance based solution-**

Keisuke Taniuchi
SKF Japan Ltd.

Business for rotational equipment has been changing from transactional to performance based solution.

NUKOTE POLYUREA LINING SYSTEM

Atsushi Yamazaki and Kohei Ota
NEW BUSINESS DEVELOPMENT TEAM KANAMORI CO.,LTD.

Due to the repeated earthquakes and big storms, damages to the people and structures are frequently happening recently. Traditionally hard type epoxy linings and FRP linings have been used for the protection of metallic and concrete structures of plant facilities due to their cost and performance. However, while hard type lining materials have advantages of strength and chemical resistance performance they do not have the elasticity due to which cracks tend to occur frequently if the those linings are applied to hard substrates like concrete. Therefore, wish to explain the merits of using polyurea resin for the lining for its favorable features and properties that have both strength and elasticity.

**A Report on TAPPI PaperCon2019
-May 5-8, 2019 at Indianapolis,USA-**

Takahashi Masanari
Takazawa Marina
Ishinomaki Mill, Nippon Paper Industries Co.,Ltd.

Sotooka Ryo
NPI Research Laboratory, Nippon Paper Industries Co.,Ltd.

PaperCon 2019 was held in Indianapolis, USA on May 5-8, 2019 hosted by TAPPI(Technical Association of Pulp and Paper Industry). There were 11 sessions and over 200 lectures in the conference. We report on summary of 10 presentations and some topics.

Odor in Pulp and Paper Mills, Identifying the Cause and Finding the Solution by Efficient Chemical Approach.

Yuken Ishikawa
Nissin Kagaku Kenkyusho Co., Ltd.

The ability to identify odors, or sense of smell, varies among people. An odor that is viewed as unpleasant by some people cannot be perceived unpleasant by others. Due to its subjective evaluation, it was very difficult to properly control odors and taking countermeasures to eliminate them has remained a major issue for pulp and paper mills. The problems associated with odors have been greatly improved by the Offensive Odor Control Law that defined the offensive odor as pollution and established the regulation standards. However, offensive odors that are not completely removed can still arise from factories, adversely affecting not only residents in the neighborhood, but also operability of machines, productivity and quality of products, and efficiency and safety of workers. In this report, we will identify the cause of odors released from pulping and papermaking processes, propose effective chemical approaches to remove them and find the solution for paper quality improvement and stable operation.

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Facility diagnosing by AI technologies

Naouya Wakamatsu
NEC Corporation.

In recent years, achieving safe and stable operation of plants has become a common challenge facing the process industry due to the increasing complexity of aging and highly modified systems as well as the exodus of skilled and experienced workers from the industry upon retirement. Meanwhile, as machine resources and AI technologies grow in sophistication, we are seeing IoT, BigData, and AI being used as a solution to ensuring the safe and stable operation of plants.

NEC utilizes its technologies and engages in initiatives to provide solutions for plant operations. In this paper, we introduce the Plant Failure Predictive Monitoring System as one such solution that focuses on the relationship between the sensors at plants. Through the use of AI to leverage plant data that has been overlooked until now, NEC aims to deliver advanced security at plants to prevent accidents, improve operational efficiency, reduce maintenance costs, and ensure the succession of technology.

We hope our paper will encourage you to consider augmenting the skills of your experienced workforce and your control system-based monitoring with the introduction and application of AI to support the safe and stable operation of your plant.

Introduction and utilization of Artificial Intelligence Technology

Naoki Kawamura and Koichi Suzuki
NTT DATA INTELLILINK Corporation

AI (Artificial Intelligence) has recently become a common word on everywhere. It has been common for several years, but in fact, artificial intelligence has been studied and used for nearly 40 years. However, it was a little different from the speech recognition and image recognition that we can see today. Here, we will give a basic explanation on the technology of artificial intelligence, which is currently called the third boom, and once again organize the technology and give tips on how to use it.

Advanced analytics improve mill performance and reliability

Atsushi Yamamoto
Valmet KK

The Industrial Internet has enabled the unlocking of the value of vast data resources in a modern pulp and paper mill. Combining process and business data from different mill systems, applying advanced analytics and utilizing industry knowhow allows advanced companies to launch new data driven analytical applications. The applications can just visualize the big data, but also incorporate artificial intelligence to predict future outcomes and increase overall level of intelligence. New applications enable assisted decision making by mill operators and create more intelligent setpoints to the automation system.

Analytical applications and remote connections can be also used by suppliers process and machine experts in their remote support centers. Their analyses, discoveries and recommendations are being used to optimize the performance of mill sub-processes and the whole mill. Suppliers and pulp and paper producers collaboratively implement and sustain mill performance and reliability improvement programs based on various analytical applications for assisted decision making, closed loop optimization and knowledge based services. Specific case studies are presented where productivity has been increased, raw material and energy costs lowered, quality optimized and process uptime improved through advanced analytics leveraged both by operators and suppliers in their services.

The future of data analytics will involve common solutions by suppliers in a so-called “digital ecosystem”. Concrete steps in building this ecosystem are being taken by combining the resources and solutions of an automation supplier with a supplier of enterprise resource planning and manufacturing execution systems.

Building multivariable predictive control for pulp processes with slow response

Kunihiko Seto

Honeywell Japan Ltd. Honeywell Connected Plant

Controlling slow response process such as continuous digester and bleaching unit by regulatory control system is difficult. Model predictive control technique is effective for slow process. Applying soft sensor will help to control slow response qualities of these processes. However, processes with large deadtime have further difficulties to control. Deadtime will be varied by feed rate change and make model mismatch. Variable dead time is required but typical variable deadtime function still has some issue. Custom variable deadtime has been used to support this case. Multivariable model predictive control with soft sensor updated by on-line sensor using custom variable deadtime compensation is one of the solutions to control such slow response processes.

Failure prediction function development for “e-Musen Junkai”

Susumu Nozoe

Akita Mill, Nippon Paper Industries Co., LTD.

"e-Musen Junkai" system monitors vibration and temperature of equipment. The system enables users to spend less time for equipment regular inspection, and to predict equipment failure more easily before break-down. Even though it is effective to monitor by setting a threshold value, failure prediction function has been developed by analyzing correlation of data from two set of sensors installed both drive end and non-drive end of rotating equipment such as motor, fan and pump. The function can capture changes on bearing health conditions. This report introduces the predictive maintenance technology by "e-Musen Junkai".

Instrumentation introduction example after operation of biomass boiler

Takushi Honda

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

Sendai Mill, Chuetsu Pulp & Paper Co., Ltd. Sendai Factory has abundant timber resources in South Kyushu and a system that can collect timber cultivated through paper business. The feed-in tariff system for renewable energy (FIT system) started in July 2012. In November 2015, a new biomass fuel power generation facility using this system was established. Two problems occurred after the introduction of the equipment. The first is a decrease in output due to fuel moisture, the second is the output decreased due to the fuel input method. In order to solve these problems, we installed a moisture sensor (MCT460) manufactured by Process Sensors corporation. And Moisture meter instruction was incorporated into ACC (automatic combustion control) control which is boiler control. In addition, a microwave level meter (MWLM) manufactured by Matsushima Measure Tech Co., Ltd. was installed. As a result, the power generation output was stabilized. This paper introduces the background of the introduction of both instruments and the situation after the introduction.

Efficiency improvement by optimizing coal boiler control

Syuuichi Tsukidate

MPM OPERATION Co., Ltd.

Power generation facilities at Hachinohe plant of Mitsubishi Paper Mills Limited consist of a coal-fired boiler, a waste boiler, black liquor recovery boilers and steam turbines. These facilities are being operated to satisfy both the steam and power demands fully while using many fuel sources such as heavy oil, coal, black liquor and waste efficiently.

Recently, we introduced new optimum parameters to a system of a conventional controller to operate a coal-fired boiler. The system has solved some operating problems and reduced power generation costs.

Real-Time performance monitoring -Need for Powerful Analytics Tool Enables Smart Operations -

Sadao Ueno
Honeywell Japan LTD Honeywell Process Solutions

Demanding performance requirement, aging workforce and data integration to action. Today, process plants across globe face common challenges. With an accurate measurement of process performance continuously compared with a proven benchmark, personnel can better operate their plants and ensure production has been fully optimized. Industrial facilities also need timely notifications to take the right proactive actions, which minimize degradation, poor performance and secondary damage to equipment to ensure lower costs, increased throughput and higher profits. This paper explains the mechanics of the powerful analytics tool for industrial operations.

Optimization of operation by monitoring paper machine deposits -Benefits of SmartPapyrus™-

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

Maintech innovates and distributes technology of chemicals and spray equipment to avoid deposits on paper machines. 95% of domestic paper making mills adopt Dryer Surface Passivation(DSP) as a deposits and paper breaking counter measure, also 673 chemical spray machines 'MistRunner' and 'ShowerRunner' are in operation across the world.

In recycled papermaking, as the Deposit levels and profiles on the fabric and rolls often change, it is required to adjust the chemicals and chemical spraying equipment according to the conditions. However, it is dangerous for workers to check the fabric condition inside the dryer hood in a high temperature and humidity environment.

We have been developing the 'SmartPapyrus' system which visualizes and quantifies the deposits of paper machines and optimizes the amount of chemicals depending on the deposit conditions. We have also developed the system 'SmartDepo.' to visualize the Deposit conditions on the fabric in the dryer hood with heat resistant camera, and quantification by image processing.

Also, we have begun applying the 'SmartChemical' system which controls the discharge amount of chemicals, the total management of usage at the office, and the ordering of chemicals automatically subject to the usage of chemicals.

I will talk about its concept and the results in the main context.

Introduction of Cooperative Process Optimization between Paper Machines and Stock Preparation -A New Approach to Improving Control Performance and Automating Grade Change Operations-

Ken-ichiro Wada
IA-PS Analyzer Center P&W Solutions Dept., Yokogawa Electric Corporation

In existing paper mills, improvement activities of control efficiencies are continuing aiming at improving operational efficiency. However, such efforts typically do not extend beyond optimizing individual processes. This paper introduces our approach to improving the control efficiency of a plant composed of multiple processes by optimizing contiguous processes, and outlines our technologies for analyzing huge amounts of data and computing optimal control parameters. The paper also introduces a newly developed software product to reduce time required for grade changes.

Work style Reformation of Inspection Work -About DX efforts by "inspection cloud service teraSpection" -

Iwao Kakegawa
Digital Solution Service Business Division, FUJITSU LIMITED

In this paper, we will introduce the "Inspection Cloud Service teraSpection" (manufactured by Fujitsu) that is effective as a digital transformation startup in the field of maintenance.

Importance of Rheology and Viscosity in Paper and Board Coating

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Market demand for coated graphical paper has declined steadily as a result of electronic media. However, other coated grades such as coated board and barrier coated packaging papers and specialties are forecasted with decent growth rates. Despite of the actual market situation the operational environment and coating functionalities are under continuous investigation. Flow properties i.e. rheology plays an important overall role in optimizing runnability and quality. This paper demonstrates the importance of rheology and viscosity in paper and board coating. A focus is in high shear viscosity that has been demonstrated to be in a critical parameter in coater runnability. Its importance will be discussed both from theoretical and practical standpoints. Furthermore, a new instrument for measuring high shear viscosity fast and easy will be discussed.

Research and Development Trend of Nanocellulose

Takanori Miyazaki
JAPAN TAPPI

2019 International Conference on Nanotechnology for Renewable Materials was held at the Makuhari Messe International Conference Complex in Chiba, Japan during June 3-6, 2019. Renewable nanomaterials, primarily derived from plants such as trees, have generated much excitement because they are renewable, recyclable, and appear to have limited safety, health and environmental issues. They can be produced in large quantities at costs appealing to material users. They possess unique properties that enhance the performance of consumer products and applications when used with other materials. The conference was attended by 400 participants from 26 countries. Invaluable 130 scientific papers were given in oral presentation and active discussion was made. A full schedule of technical sessions gave TAPPI Nano attendees from around the world the chance to focus their time on specific areas. Finland, which has a thriving forest-products industry and ambitious environmental performance goals, is in the right climate for support of new markets for cellulose materials. This makes Helsinki the perfect location for TAPPI Nano 2020, which will be held on June 8-10, 2020.

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Construction of Defect Reduction System by Improving Wet-end Chemical Retention

Hiroyuki Oishi, Koichi Tadaki and Kazutaka Kasuga
Technical Div., Technical Dept., SOMAR Corporation

By applying the highly functional retention agent “REALIZER R, FX series” and the multi-functional coagulant “REALIZER A series”, which introduced our new technology “Reactive Polymer Technology”, various internal additions of the paper machine. It has been found that the fixability of paper chemicals can be improved, the amount of paper chemicals used can be reduced, and paper defects can be reduced. We have been promoting the application of “Reactive Polymer Technology” to the paper field, but in recent years, we have been promoting the technology cultivated in the paper field to the paperboard field. This paper gives examples of paper and paperboard machines and introduces their effects and features.

As a design technique for improving the fixability of various internally added paper chemicals that are being tackled in parallel, there is the introduction of special monomers to retention agents and coagulant polymers. With the introduction of special monomers and reactive polymers, the functionalization of retention agents and coagulants is accelerated, and it is approaching the point where it can be established as a fixing agent for internal additives.

In order to optimize the wet end and reduce paper defects, not only the review of various internal additives and the optimization of the addition amount, but also the number of bacteria in the system is a very important factor. So far, we have conducted many DNA analysis of paper defects, and it is known that many paper defects are related to microbiological factors. This paper also introduces examples of paper defect reduction by applying our latest slime control agent “CURECIDE System”.

Quality improvement of Paper with Dirt inspection camera system for Pulp

Ai Amihara
MATSUBO Corporation

Pulp quality demands have been steadily increasing year by year with the increasing demands of pulp end users, particularly producing household paper such as tissue, diapers, etc. Traditionally pulp dirt count control has been done by manual off-line visual method. Pulp dirt count measurement system “*PULP-Inspector*” by Papertech is introduced in the article. The system is using high speed and high resolution digital camera and can detect the smallest 0.04mm² various contaminations such as shieves, metal, oil and insects, etc. The system has been already ensuring pulp quality in many overseas mills.

Papertech inc. is based in Canada. They are increasing the sales of their products, Web inspection system and Web monitoring system for household paper using special camera and have the advantages of good operability and optimized software.

Numerical simulation for packaging products

Takao Kobayashi
Packaging Innovation Center, Oji Holdings Corporation

The purpose of research on paper physics is to model paper theoretically and experimentally so that the quality of the end product can be predicted by simulation. In this report, we introduce paper mechanical models required for numerical simulation of packaging products and specific application examples.

Since paper has properties such as an elastic body, an elastic-plastic body, and a viscoelastic body, a mechanical model may be appropriately selected and handled approximately according to the target case. In nonlinear finite element analysis, the actual phenomenon can be reproduced more than elastic analysis by considering three nonlinearities, material nonlinearity, geometrical nonlinearity, and boundary nonlinearity.

The following four are shown as analysis cases. First, by considering the difference in hygroexpansion coefficients between top and bottom sides of the sheet, it is possible to simulate curling and warping of the laminated paper and the corrugated fiberboard. Next, in consideration of elastic-plasticity, the wrinkles in the paper web were reproduced on the roller and developed into folding wrinkles. In the compression tests of corrugated board boxes, good agreement was found between experiment and analysis, both in the box compressive strength due to the effect of hand holes and in the buckling mode. Finally, dynamic analysis shows that the box falls free and collides with the floor surface and bounces back.

Operating Experience of Catalyzer type De-inking agent

Hiroshi Tsuda
Iwanuma Mill, Nippon Paper Industries Co.,Ltd.

Iwanuma Mill is a main newspaper production site in Nippon Paper Industries Co., Ltd. Majority of the raw material is DIP but increase of wastepaper which includes UV print often causes quality issues in recent years. The problems are that UV ink fragment remains in pulp because conventional De-inking agent can't make finer its tough surface.

On the other hand, facility development to strengthen removal / dispersion ability and recyclable UV ink development are proceeded, we don't still come to prevent deterioration of the sudden DIP quality with considering ROI balance.

Our new approach for UV print recycles is installing catalyzer type De-inking agent (NICCA CHEMICAL., Ltd). This chemical works as catalysis and breaks down ester bond in an oligomer ingredient of UV ink. With this reaction, UV ink which is difficult to deal by conventional De-inking agent can be made finer. This catalyzer type agent also has an outstanding performance by ester decomposing reaction against conventional oxidative polymerization type ink.

In comparison with conventional De-inking agent, this catalyzer type De-inking agent has an excellence in detachability and fining ability, and it brings us great benefit by settling several problems - brightness drop in summer season, quality issues caused by UV ink and so on.

“Servolution” Service approach as a life cycle partner “Process Audit”

Yasushi Tachikawa
P&S Div. Voith IHI Paper Technology Co., Ltd.

Due to the structural change of paper and board market, production mill site is under pressure of production man power reduction and efficiency improvement. In such a market environment, Voith IHI is focusing on the Maintenance business (Products & Services business) and enforcing the products and services to improve the energy saving, productivity, stability of production. In this paper below three topics which described focused Service business were briefly introduced.

- 1) Service portfolio of Voith IHI Paper Technology
- 2) Benefit and results of “Process Audit”
- 3) Reference of improvement in “Process Audit” for off machine coater line

“Process Audit” is the structured service product which have Maintenance point of view to figure out the required maintenance and Production point of view to improve the efficiency and stability of production. This tool supports customer to easily decide their direction for the Production, Rebuild, Maintenance. This paper introduces “Process Audit” with some of actual improvement in recent reference audit for Off Machine Coater.

Application of digital technology to pest management

Tomohiro Ohba

Earth Environmental Service Co., Ltd

In the current pest management, we collect data on various factors that affect insect contamination, and consider effective countermeasures based on the analysis results. In order to formulate effective countermeasures, it is desirable to use a lot of data and to analyze and evaluate it from various aspects. For this purpose, the use of digital technology is effective.

We provide pest management support tools using digital technologies such as real-time monitoring system EMS-Q, insect image analysis system ESCO-AID, and integrated information management system ESCOEVO. Furthermore, we developed a system (RIG system) that can determine the type and number of insects captured by the trap with AI analysis and collect data in real time.

The application of these digital technologies improves the accuracy of data collection, analysis and evaluation, and enables cost reduction. Reduced costs can be turned into resources for improvement.

Report on the Results of the Fiscal 2019 Follow-up Survey on” JPA’s Committed Action Plan for a Low carbon Society” and Related Information on Measures against Global Warming in the Japanese Paper Industry

Yasuharu Sakina

Japan Paper Association

The Japan Paper Association (JPA) established its “Voluntary Action Plan on Environment” in 1997, in response to The Japan Business Federation’s call to the Japanese business community to organize “The Voluntary Action Plan on Environment”. Since then, JPA has carried out a follow-up survey and published the results every year.

As the Voluntary Action Plan finished in fiscal 2012, JPA newly started “the Action Plans towards a Low Carbon Society” and has been actively addressing global warming prevention in order to achieve the following targets set in the plan:

- Compared to BAU scenario(based on specific CO₂ emission rate of 2005), reduce fossil energy-derived CO₂ 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 2019 follow-up survey (actual results for fiscal 2018), fossil-energy derived CO₂ emissions in fiscal 2018 was 17.39 million tons, a 2.5% reduction compared to the fiscal 2017(17.84 million tons). Compared to BAU scenario, fossil energy-derived CO₂ emissions were reduced by 3.44 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 the next phase of JPA’s Action Plan for Low-Carbon Society spanning the ten-year period from fiscal 2021 through 2030 and the latest information of countermeasures against global warming.

A Report of the 20th ISWFPC (International Symposium on Wood, Fiber and Pulping Chemistry)

Takanori Miyanishi

JAPAN TAPPI

The 20th International Symposium on Wood, Fiber and Pulping Chemistry (ISWFPC) was held at the University of Tokyo during September 9th -11th in 2019. It was supported and co-organized by Japan TAPPI and was also co-organized by the Japan Wood Research Society (JWRS) and the Lignin Society. Although the emphasis is on basic research, extended delignification, oxygen delignification and ECF/TCF bleaching have characterized the development of pulping technology over the past 30 years. Application of biotechnology and fast-growing trees for pulping is closely related to the outcome of this symposium. In recent years, ISWFPC has played an active role in R&D on the chemical use of woody biomass, such as nanocellulose, polysaccharides and lignin.

Reviewing progresses in technologies by their annual growth rate changes

Part 1: Stagnation of progress of technology in the industrialized society

Kiyoaki Iida

When studying growth of a certain phenomenon in a long term, focusing on its yearly growth rate is sometimes more informative than focusing on its yearly output. With this view point, the progress in technology in industrialized society is reviewed.

The growth of Japan's economy expressed by GDP experienced two turning points, one in 1975 and the other in 1990. After the latter, the annual growth rate of GDP was almost zero percent, and that of pulp and paper sector was minus one percent. Why the economy stagnated is a subject of this series of paper and I believe that the stalemate of progress of technology is one of the factors.

The paper machine was invented in early 1800's, and, maintaining its basic design, have been increasing its running speed and machine width. Reviewing them by their annual growth rates, the running speed increased at almost the same yearly growth rate of 2.6 % until 1990 and then stagnated. The machine width increased, in the same manner, at a yearly rate of 1.5 % until 1950 and then slowed down to 0.4 %. Other technological progress like the volume of blast furnace in steel industry also slowed down in late 1900's. It is reasoned that scaling up production process, one of key technologies since the industrial revolution, became stagnated as various goods mainly made of iron and steel have reached their physical limits. The solid state technology, invented in the 1950s, helped them reach their physical limits, but could not enlarge their limits. It, instead, has worked out a new society called information society, which will be discussed in the next issue.

An Essay on Methodology for Innovating “JAPAN TAPPI JOURNAL”

Part 1 : An analysis of the historical development of the *Japan TAPPI* and current status

Fumihiko Onabe

Professor Emeritus, The University of Tokyo (Paper Science)

At the beginning of the 2020s, the author was asked by the Editorial Board of the *Japan TAPPI Journal* to deliver personal comments and methodology expecting innovative progress of the Journal. The first article of this series is intended to analyze the historical development of the organization of Japan TAPPI and current status.

The overall contents are described as below.

1. Introduction
2. The characteristics of the Japan TAPPI stemmed from its developmental process.
3. The characteristics of JAPAN TAPPI JOURNAL and their unique points.
4. The editorial areas covered by the JOURNAL.
5. The reason and way to maintain diversity of contents in the JOURNAL..
6. Specific double-sided nature of the Japan TAPPI: Industrial & Academic.
7. From author's personal experiences
8. Epilogue.

Neutral Sulfite Semi-Chemical Pulping of Moso-Bamboo

Vu Thang Do, Keishi Tanifuji, Guangfan Jin and Hiroshi Ohi

Graduate School of Life and Environmental Sciences, University of Tsukuba

This research investigates the potential of neutral sulfite semi-chemical (NSSC) pulping method using moso-bamboo (*Phyllostachys pubescens*) as raw material. NSSC treatment took place in laboratory cooking system. Cooking liquor contained a mixture of sodium sulfite (Na_2SO_3) and sodium carbonate (Na_2CO_3) with a weight ratio of 2 to 1. Total chemical charge was 12% based on oven-dried weight of bamboo chips. Liquor to solid ratio was 4 to 1. Two-stage refining was used to fabricate fibers from cooked chips. The first stage was at 0.2 MPa and 120 °C and, and the second stage was at normal pressure. A control experiment was involved under the same conditions with no charge of chemicals. NSSC pulping of bamboo resulted in providing a low brightness pulp but high pulp properties (tensile and tear indices) compared to the control pulp. NSSC method could help to reduce the contents of un-separated fiber bundles and shives. NSSC method provided a high aspect ratio of fibers compared to the control. After fibers development and fibrillation during refining, NSSC pulp contained a lot of ribbon-like fibrils which then contributed to a good fiber-to-fiber contact. In addition, the internal bonding between fiber-to-fiber of NSSC pulp may be increased reasonably by a significant amount of parenchyma cells appearing as fines (100 mesh pass) fraction, which were revealed by SEM images evaluation.

Application of SEM Observation on Coating Layer for Latex Binder Improvement

Natsuki Okamoto

Latex Group, Research & Development Center, NIPPON A&L INC.

Observation of a coating layers is one of the most effective ways to improve latex binder for paper coating. For many years, we have studied coating layers and their latex binder with many analysis methods such as electron probe micro analysis, quantitative analysis of starch and scanning electron microscopy (SEM). Field emission scanning electron microscopy (FE-SEM) provides us with sharp images at high magnification (Fig. 2). By using FE-SEM, we clarified a relationship between a coating layer and latex binder properties. In this paper, we show following three results of our works: 1. an effect of different drying conditions of coating layer on latex distribution in coating layers, 2. a relationship between latex particle size and dry pick strength of coating layers, 3. observation of coating layer with the new generation High-Performance latex.

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Andritz Yankee Dryer Inspection

Toshio Okunishi
Andritz K.K. Capital Systems Sales

"Yankee is a heart of the Tissue machine." This is a word which shows importance of the Yankee in making the tissue. Yankee decides the production capacity and the sheet quality of moisture profile and crepe. The Yankee is also a 2nd class pressure vessel in Japan law. The performance related to these very important roles of the Yankee greatly depends on the maintenance work for the Yankee. This paper describes some of Andritz Yankee life cycle management service, that is, first we describe the Yankee inspection based on TAPPI. The routine periodic inspections can record the actual Yankee situation and make a database for the scheduled maintenance work. Next we describe the OTR(On The Run) measurement for the Yankee. It measures the Yankee surface profile and temperature profile at Yankee running status. It can provide important information about crowing, next grinding timing, status of condensate discharge and others. Andritz Yankee life cycle management service described here will provide the information for the proper maintenance work of the Yankee.

Stock Preparation Equipment for Household Paper -Improvement of Pulp Treatment, and Solution for Lower Grade Waste Paper-

Nobuhiko Okumura
Aikawa Iron Works Co., Ltd.

The household paper industry that is closely related to our daily life expects to keep growing, boosted by the influence of the inbound demands. On the other hand, concerning fine paper waste which is used as a raw material for recycled products, well sorted waste paper has been more and more difficult to get, and this tendency expects to be continued. Therefore, it seems necessary to be prepared to use the low grade waste paper, such as mixed office waste (MOW) or confidential waste paper and so on. In this report, the following stock preparation equipment which are for efficiency improving, labor saving and quality demands is introduced for house hold paper mill.

- 1) Pulper feeding equipment
- 2) High consistency disperser
- 3) Floator and washer comparison
- 4) POM system, approach process improvement

—Three Periods with Household Paper— Leading Chemical Approach to Improve Productivity in Paper Mills toward the New Reiwa Era

Satoshi Ishikawa
Nissin Kagaku Kenkyusho Co., Ltd.

In recent years, pitch troubles by sticky materials have been increasing, because decreased in the amount of high quality waste paper due to restrictions on imports of mixed waste paper in China, and increasing in the utilization rate of afforestation trees such as acacia. Pitch trouble is one of the difficult subjects for paper engineers who explore the stable operations and the quality improvements.

The pitch contained in the raw material is removed to some extent in the pulping process, but residual pitch is brought into the paper making process. The pitch deposits and adheres to each process, and causes deterioration of quality and operability such as web breaks and defects.

Our company regards pitch control in the pulping process as the most important solution for pitch trouble. In addition, limited and effective pitch control in the papermaking process is thought to lead to improved quality and productivity.

This report described our company's efforts to improve productivity in household paper mills, especially pitch trouble.

Characteristic and latest trend of forming fabric for tissue machine

Kei Furutaka

Technical Dept. PMC • EF In-House Company Nippon Filcon Co.,Ltd

Forming Fabrics are a necessary and integral component for modern papermaking machines, which serve three main functions: 1) Draining pulp slurry 2) Forming the sheet 3) Transporting the sheet to the press section.

Adequate sheet formation is one of the greatest concerns of paper makers, because it directly impacts the sheet qualities as a finished product. There are also various requirements to draining and conveying capabilities as the basis weight ranges vary greatly. Recently, high quality and high productivity have both become top requirements of papermakers. Paper machines have evolved, increasing in size and speed. To meet the current demands of papermakers and the latest machines, it's critical that forming fabrics evolve as well. The production and quality demands for tissue continue to grow even though demand for a variety of other paper grades have diminished in recent years. In Japan, the demand for tissue and bath in the restaurant and hotel industries have increased due to the steady rise of foreign tourism. Overseas, the demand for tissue and bath have grown due to the increase of population and improvement of their sanitary surroundings. The demand for tissue and bath will continue to grow globally. They have variety of tissue and toilet machines. We have developed our forming fabric design based on their requirements from each machines. Modern tissue machines require a high fiber support capability, drainage capability, clean-ability and stable run ability from their forming fabrics. Therefore, it is important to choose a suitable forming fabric design for each machine. Machines for home paper have been increasing in size and speed. Further improvement of drainage capabilities and stable running (shrink in width and elongation) are required. We have developed a new wire which meet today's high standards for high drainage ability, improved paper quality (lateral strength improvement) and energy saving effect as a wire that meets many requirements. Those effects have been confirmed in practice. We will introduce the features and latest trends of forming fabrics for home paper.

『ViscoNip』 :KAWANOE / VALMET the latest press technology for tissue machine -For increased product flexibility and energy saving-

Michinori Tamai

Design Dept, KAWANOE ZOKI Co.,Ltd.

KAWANOE / VALMET have been providing Crescent Former DCT series since 1996, after concluding the technical collaboration. The recent trend among tissue makers is the efficient equipment which produces high-value added products in addition to energy saving. 『ViscoNip』 is the latest press technology KAWANOE / VALMET offer and the major feature of ViscoNip is the unique ability to adapt to the Yankee dryer shell using element made of polyurethane. ViscoNip users will be benefitted a number of advantages such as one can easily change the operating conditions while running machine, increased product flexibility and quality, the most efficient operation, long life time for belt and other equipment.

The number of ViscoNip installation counts 50 all over the world since its launch and the first ViscoNip has been successfully installed and running in Japan earning good reputation. We would like to introduce the latest press technology which provides the benefit of high-value added products as well as energy saving.

Factors that Affect Creping and Solutions Appropriate to Machine Characteristics

Jungo Nishimuki, Hitoshi Tsuchida, and Naoka Nakai

Technical Service Engineer, Technical Sales Dept., Chemical Solution Company Hakuto Co., Ltd.

The sanitary paper industry continues to grow steadily and gain attention in the paper industry. Creping is a very important factor in the stable operation and quality improvement of sanitary paper, but it is difficult to manage because it is affected by various factors. Therefore, Hakuto devised a method that numerically and visually grasps the performance of the coating film that most affects creping. These techniques are expected to simplify the quality control of the coating film and make it easier to understand what happens on the machine.

In addition, we have developed creping control agents "HAKULEAD 800 series" that are resistant to fluctuation factors using these technologies. This product contributed to operational stability and creping quality improvement at the machines with variable moisture content.

New Creping Adhesive of PAE

Yukie Suzuki and Koji Yoshitani
Chemical Business Division, SEIKO PMC CORPORATION

In the household paper industry, in order to enhance competitiveness in Japan and overseas, the company is promoting cost reduction by speeding up and reducing the basis weight of paper machines, and improving the quality of paper by using softeners. Crepe adhesives are essential chemicals for operational stabilization and good crepe quality.

The crepe adhesive has been improved so that it can cope with a wide range of conditions of the paper machine and changes in the paper making environment. This paper introduces a new crepe adhesive CA6034 made of polyamide epichlorohydrin resin (PAE) together with the technological trend so far. CA6034 focuses on the aggregation energies of various functional groups in PAE, and achieves high performance by increasing the ratio of amino sites to amide sites in PAE.

Andritz Novimpianti Yankee hood technology -Improving drying energy efficiency-

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Andritz Novimpianti S.R.L. based in Lucca / Italy, who is a manufacturer of yankee hood system. This company is established in 1983, and answer to the increasing needs of local paper industry. Their yankee hood system has special construction, and their steam generator and yankee dryer insulation also help to save the energy for yankee drying part. Andritz Novimpianti can propose energy saving by replacement from existing system to their system.

ITOCHU-MACHINE-TECHNOS CORP introduces about outline of Andritz Novimpianti and their yankee hood system.

ANDRITZ A-Recovery+ Chemical Recovery Concept

Kazunori Ohmori, Masato Tsuchitana
Andritz K.K. Capital Systems Sales

Over the years, chemical recovery technology suppliers have worked with pulp mills to “close” the chemical recovery loops in order to reduce emissions and effluent – and also to increase recovery efficiency. These loop closures have sometimes led to a build-up of certain chemicals and the creation of side streams that are either ignored or disposed of.

A major target of ANDRITZ's recent development work has been to innovate solutions for utilizing the side streams of a Kraft pulp mill to unleash the hidden potential for generating profit, as what was once considered “waste” can be converted to valuable raw materials for commercial-grade bio-products. The objective continues to be operating chemical recovery systems as efficiently and environmentally sound as possible while minimizing capital investment and maximizing profits.

Mill audit for Kraft pulp mills and its benefit

Masaharu Menjo
Valmet K. K.

In this paper, a mill audit (i.e. technical diagnosis to equipment by original suppliers) for Kraft pulp mills is briefly described. In Japan, many of KP plants were installed in 1970's and 1980'. Nowadays the effective maintenance such as preventative maintenance is not actively being conducted in some mills due to limited workforce and limited budget for maintenance work. To prevent unexpected accidents for equipment as well as production loss, mill audits by original suppliers should be very beneficial. Valmet has a wide range of references about KP plants, therefore, the technical knowledge about equipment can be utilized for better maintenance. There are 2 types of mill audits, meaning mill audits during operation and during shut-down.

During operation, some operational data and figures are collected from control rooms. In addition, operational condition of equipment is also checked. During shut-down, Valmet's engineers go inside equipment like digesters and diffuser washers and check whether or not there are something strange inside the equipment. After the mill audits, technical reports are submitted with check-lists where maintenance points are categorized by order of priorities. Because equipment and

operational conditions are different in each KP mills, the contents in the mill audits are not always the same. As target equipment for mill audits, digesters and diffuser washers are focused in this paper and the general information will be introduced as an example of a mill audit. Mill audits by Valmet are not free of charge, but the benefit from mill audits should be valuable to keep the production run smoothly.

Reviewing progresses in technologies by their annual growth rate changes

Part 2: The growth of information volume since the Medieval Ages

Kiyoaki Iida

Books were only one information carrier until 1800. One researcher in Germany reported that the total number of copies of books published in each century from the 6th to 18th increased at almost a constant rate of 1% per year; Information volume would be correlated to paper consumption which was historically correlated to GDP. The yearly growth rate of GDP of Europe from 1500 to 1800 was estimated to be about 0.62%, to which the estimated growth rate of printed copies did not seem to be contradictory..

After 1800, the annual paper production was estimated to increase at the rate of 3-4 % per year; according to data in UK and USA, and by FAO, by which rate the information based on paper would increase.

After 2000, the volume of digital information increased at the annual rate of 20-30% per year. The information based on paper, of which production was stagnating, was drastically losing its share that was about 10% at the turn of the century.

An Essay on Methodology for Innovating “JAPAN TAPPI JOURNAL”

Part 2 : Expectations for exerting journalism functions to “JAPAN TAPPI JOURNAL”

Fumihiko Onabe

Professor Emeritus, The University of Tokyo (Paper Science)

“JAPAN TAPPI JOURNAL” is edited and published inevitably under the constrained environments of the organization of the Japan TAPPI. However, for aiming at attractive and innovated Journal with higher levels of novelty, openness, and dynamism, the Journal has to accept frank exchanges of viewpoints from readers as well as from outside Journal.

The second article of this series is intended to analyze a variety of problems associated with current issues of the Journal in terms of “*Journalism functions*”.

The overall contents are described as below.

1. Introduction
2. The birth of journals and journalism in view of the history of paper and printing
3. The significance of journalism in the contemporary society
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Wet extrusion of wood powder using a cellulose derivative

Production of pipe-shaped material “Wood straw”

Takuma MATSUOKA and Hiroshi NONAKA

Graduate School of Bioresources, Mie University, Japan

Petroleum-based plastics are low in cost, light in weight, excellent in moldability, and used in large quantities, while environmental pollution by microplastics is considered serious. In this study, we aimed to replace them with natural materials and developed wet extrusion of wood powder using a cellulose derivative: hydroxypropyl methylcellulose (HPMC). The influence of the water content, HPMC ratio and wood powder particle size on the extrusion fluidity at 30°C was evaluated using a capillary rheometer. The ratio of wood powder and HPMC was changed from 8:2 to 5:5, and water was added at 70 to 233% relative to the solid weight and kneaded. The material was non-Newtonian fluid exhibiting pseudoplastic flow with a yield value. Water, HPMC and smaller wood particle tended to improve the fluidity, and the water content particularly had a large effect. The kneaded materials were successfully extruded into pipe-shape with outer diameter of 6 mm, air-dried and named “Wood straw”. The larger ratio of HPMC gave smaller diameter and higher density of the material, resulting in higher strength. It is possible that the mixture of wood powder, HPMC and water with good extrudability could be applied to other molding methods to produce all-wood-derived material with various shapes.

Predicting the behavior of paper and board surfaces in gluing, printing and coating processes

Daniel Ohndorf
emtec electronic GmbH sales department

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Sanyo Trading Co.,Ltd.

Almost all paper is produced for further converting, it means it may undergo gluing, coating and/or printing. Therefore, normally certain specifications are agreed between the supplier and converter based on standard testing methods like Cobb, Gurley, Bendtsen, HST or Smoothness Beck etcetera and these specifications are binding. The problem is that sometimes there are still problems in the converting although all the specifications are met. In this case, nobody knows why these problems have occurred.

we have to take a look at the rough principles of the three typical converting processes like gluing, printing and coating.

It is important to understand that nowadays all these processes are very fast and things happen within milliseconds or just a few seconds. Because these processes are so fast, the surface of the paper or board that is converted plays a very important role.

If we look more detailed at the gluing process, we can basically split it into 3 phases.

In the First PHASE, a liquid film is applied on the paper or board surface by a pressure impulse within very short time. Here we talk about microseconds or milliseconds.

The result depends on the rheology of the liquid, the strengths of the pressure impulse (which depends on the machine speed and settings) and the surface porosity of the substrate. Here, most important for the anchoring of the glue is the surface pore structure which is the relevant parameter to characterize.

In PHASE 2, the water from the glue that has been applied will be absorbed. This is mainly controlled by the surface sizing / hydrophobicity of the substrate. Here the surface sizing or surface hydrophobicity is very important for the dewatering of the glue and to increase its viscosity to reach an optimal bonding.

So, the surface hydrophobicity is the relevant parameter to characterize in this phase.

PHASE 3 is the drying and hardening of the glue film which takes place after several minutes and hours. we should briefly discuss why standard testing methods often provide not enough or partly wrong information when it comes to characterization of the surface of a sample.

For example, we compare a paper sample with a different pore structure on the top side and wire side.

If we would test this sample with a Bendtsen porosimeter, where the air flow through the sample is measured, the results would be same for both sides because the air flow is controlled by the smallest pore diameter in the sample independent from its location. This means Bendtsen will give no information about the surface pore structure and not enough respectively wrong information for prediction of converting problems. In that case, PDA / EST is useful instrument made by emtec. These devices evaluate penetration from very short time, several mS with one side. This technique is dynamic measurement and suitable for converting process.

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New Technologies to Reduce Carbon Dioxide Emissions Energy Saving, Renewable Energy, and the Challenge to Artificial Photosynthesis

Taisei Nishimi

Japan Technological Research Association of Artificial Photosynthetic Chemical Process (ARPCChem)

There has been increased attention on Carbon Recycling, which involving capture, storage and utilization of CO₂. For the purpose of commodity chemicals production from CO₂, Artificial Photo Synthetic Chemical Process (ARPCChem) are proposed. According to this concept, the ten-year program has been in progress since 2012 under the support of NEDO. The project is composed of three scientific subjects (Photocatalyst, Separation Membrane, and Synthetic Catalyst). In addition to ARPCChem technologies, Direct Air Capture (DAC) of CO₂ using ultra-thin membrane is also important for Carbon Recycling.

IHI's action towards decarbonization of energy sector

Toshiyuki Suda

Resources, Energy & Environment Business Area, IHI Corporation

In order to prevent global warming and to contribute to the sustainable world, reduction of CO₂ from energy sector is our essential duty. However, there is no ultimate solution for reducing CO₂, and the situation of CO₂ emission differs by the users. Therefore, IHI is preparing multiple solutions to reduce CO₂ emission to provide the best solutions for our customers. In this paper, three major solutions are introduced : (1) Ammonia utilization technology , (2) Carbon recycling technology and (3) Optimized utilization of renewables. Ammonia utilization technology is to use ammonia directly as a fuel in power plant (coal fired boiler, gas turbine and SOFC). Carbon recycling technology is to capture CO₂ from the source, and to convert it to valuables like methane or lower olefins with the reaction with hydrogen. Optimized utilization of renewables is to use the electricity from PV not only as an electricity, but also convert to heat, fuel and feedstock in order to use all of the surplus energy in local grid. All of these technologies are under development, but the basis are already developed and could be commercialized in the near future.

Saving energy by improving steam turbine efficiency

Shigeyuki Ido

Kani Mill, Daio paper.co.ltd

In order to save energy by reducing purchased power, we introduced high-efficiency technology in conjunction with the renewal of turbine blades and steam nozzles.

The high-efficiency technology was introduced into the No. 3 turbine, whose performance has declined after 30 years of operation.

The power generation performance improvement of 1,573 kW (about 6% of the rated power generation) was obtained by recovering the performance deterioration due to aging wear and the introduction of the turbine blades by three-dimensional fluid design and Aft Loading Minimum Diffusion nozzles.

Reduction of steam consumption by chemical in #5M/C dryer section

Hideto Miyata

Sobue Mill, Oji Materia Co.Ltd.

In Sobue mill, Oji Materia, there are three paper machines, #5, #6 and #7M/C. #5 and #6M/C produce white paperboard, and #7M/C produce liner board.

Although We have attempted energy saving in the papermaking process continuously, steam consumption of #5M/C dryer section was higher compared with one of #6M/C which produce white paperboard as well as #5M/C. Therefore improvement of it was our task.

The chemical company offered us that we could reduce steam consumption in #5M/C dryer section by

adding chemical into dryer steam line. We had test to confirm it, and as a result we achieved 4.7 % reduction of steam consumption rate.

In this paper, we will explain our experience about reduction of steam consumption by chemical in dryer section.

Heat Loss Reduction by the Aerogel “Over Wrapping Method ”

-Grand Prize for Excellence in Energy Efficiency and Conservation (Product Category & Business Model Category) Minister’s Prize, Trade and Industry -

Kazuya Kurosaka and Hiroyuki Ikeda
NICHIAS Corporation

Rain water taken into insulation results in a risk of “Energy Loss”. The thermal structure 「Over Wrapping Method」 by the aerogel insulation is effective against this problem. Here we introduce its system and effect through the verification experiment.

Operating experience of RPF manufacturing facilities for wastepaper tail

Osamu Kozuka
Otake Mill, Nippon Paper Industries Co.,Ltd

The utilization of wastepaper as papermaking materials is a recycling and a contribution to reducing waste products. On the other hands, the wastepaper lees, materials which is not used for papermaking, is removed from re-materializing process of wastepaper, and either disposed as an industrial waste or incinerated.

Even at Otake Plant of Nippon Paper Industries, all the wastepaper lees removed from re-materializing process of wastepaper operated by nine (9) cardboard-making machines have been disposed through industrial wastes disposal company.

In the meantime, biomass boilers are operated as energy plants using coal and RPF as main fuel sources. Wastepaper lees and RPF are both composed of plastics and fibers (paper and pulp), and their ingredients are the same. Therefore, the solid fuel conversion of wastepaper lees for thermal recycling was attempted. However, the result was not as expected due to a lack of plastic ingredients and an excess percentage of moisture. The production of solid fuel from wastepaper lees was finally succeeded by the enhanced dehydration function and the adaption of molding machine suitable for the characteristic of materials.

During the consecutive operation of solid fuel conversion process using wastepaper lees, we have experienced several troubles, such as contamination of foreign substances like metal piece, drainpipe clogging by leaked materials, conveyer clogging by wastepaper lees etc. Introduction of sorting machine and modification of existing equipment etc. has eliminated such troubles and contributed to achieve the stable converting operation.

From April, 2019, Otake Plant has started the solid fuel conversion of plastic waste, which were collected from citizen, by mixing with wastepaper lees by the agreement with Otake City.

As a result of accepting civil plastic waste, production volume at solid fuel conversion process is drastically increased than original plan. And the thermal recycling with solid fuel as a substitution of coal, made from civil plastic waste and wastepaper lees, are achieved at the newly introduced energy boiler.

Activities of energy-conservation at Mishima Factory

-Energy conservation by introducing the gas engine cogeneration system-

Naoki Omori
Mishima Plant, LINTEC Corporation

A new International Framework, Paris Agreement, came into effect in November 2016 as a global initiative on climate change causing serious problems such as global temperature increases, sea-level rises, and ocean acidification. Under the objective of "reducing greenhouse gas (GHG) emissions by 26% by FY2030 compared to the FY2013 level", the Japanese government strongly urges companies to make efforts to reduce GHG emissions.

It is mandatory for companies to address energy conservation activities because reducing the energy consumption intensity by more than 1% per year is an objective in the Act on the Rational Use of Energy.

This paper introduces a case in which energy (waste heat) was effectively utilized and contributed to

the reduction of the energy consumption intensity by selecting and installing auxiliary equipment which suits the energy consumption method of the plant when installing cogeneration.

Low carbon type business using paper powder to enter plastic market

Takamichi Matsushita
Eco Research Institute Ltd.

The problem of plastic waste, which is being taken up every day, is causing global environmental pollution, and it cannot be avoided in developed countries as well as in developing countries.

In Japan, nearly 9 million tons of waste plastics are discharged every year, and plastic material recycling is only 2,060,000 tons (23%), indicating the difficulty of plastic recycling.

The first step is to reduce the amount used, but it is not possible to eliminate all the plastic products that are indispensable for our daily lives. In Europe, the United States, and China, bans on use and production are banned at a tremendous speed, but Japan is still at the level of self-regulation and lagging behind.

Among them, the ones that must be solved immediately are disposable food containers, such as trays, drink lids, and straws. Our company products MAPKA which is a molding material with a fine paper powder weight ratio of 51% or more, as a point of appeal that the amount of plastic used will be 50% or less. Since it was put on the market and the seat grade was developed in 2017, it decided to enter the disposable food container market.

Mechanical properties and possibilities of unique hard boards

Toshihiro Fujita
Central Research Laboratory, Hokuetsu Corporation

An unique hard board named PASCO has been manufactured by a wet forming method from plant fibers since 1971 in Nagaoka mill, Hokuetsu corporation.—Raw materials of PASCO are fresh pulp, waste paper and recycled materials and interestingly adhesive binders are not used in the board. Therefore, PASCO is an eco-friendly product and has been applied for various fields for many years.

In this presentation, we compared PASCO with other hard boards and resin boards, measuring bending strength and Izod impact strength as mechanical properties.

When suitable raw materials were selected to PASCO production, it showed better mechanical properties compared to conventional tip boards or particle boards and had superior impact strength than those of resin boards, even though the board had no adhesive binders.

Considering the microplastic and plastic pollution in the world, we will promote to use paper-based products such as PASCO in order to reduce the environmental impact.

Operation Experience of Ishinomaki Hibarino Power Plant (149MW Biomass Co-Firing)

Hiroshi Osugi
Nippon Paper Industries Co.Ltd.

Nippon Paper is expanding the energy business with using our know-how of power generation at paper mills. Especially we are actively working on wood biomass energy with the aim of reducing greenhouse gases.

The Ishinomaki Hibarino power plant, which started operation in March 2018, adjacent to our Ishinomaki Paper Mill is a biomass co-firing power plant that uses wood biomass (pellets and chips) and coal as its main fuel, and its co-firing ratio boasts up to 30%, the highest in Japan for pulverized coal boiler types.

Biomass co-fired power generation contributes to the reduction of greenhouse gases compared to coal-only combustion, but it is necessary to consider combustion management in the boiler and transport / storage of fuel. Also it is required establishment of co-firing technology and improvement of co-firing ratio.

In this presentation, I will report the outline of Ishinomaki Hibarino power plant, the operation experience about biomass co-firing, and the efforts to improve the biomass co-firing ratio.

Reviewing progresses in technologies by their annual growth rate changes

Part 3: The Beginning of Information Society

Kiyoaki Iida

The industrialized society which started from 1800 stagnated in scaling up equipment and plants and shifted itself to the information society in around 2000, in which the social paradigm was quite different from the former. Its future is understood in the context of optimism as well as pessimism.

Taking the annual growth rate of per capita GDP as a parameter, developed countries that are now in the information society are suffering from smaller growth rates of less than 1%, compared to that of 2-3% while they were in the industrialized society. On the other hand, the amount of energy consumed to produce unit GDP is decreasing at the annual rate of several percent every year. The information society may not increase GDP as in the industrialized society, but improve efficiency of energy consumption in society by using information technology.

An Essay on Methodology for Innovating “JAPAN TAPPI JOURNAL”

Part 3 : Organizational Dynamics and Power Structures

Fumihiko Onabe

Professor Emeritus, The University of Tokyo (Paper Science)

The organization of Japan Tappi has dual nature: i.e., industrial and academic. Therefore, the Japan Tappi has complicated hierarchy and power structure inside the organization. Also, the organization is under the influences of the state powers. The editing of JAPAN TAPPI JOURNAL is conducted within the control of its mother body, i.e., the Japan Tappi.

The third article of this series is intended to analyze the possibilities of innovation of the Journal using the modern organization theories in business administration in terms of “*Dynamics of Organization and Power Structure*”.

The overall contents are described as below.

1. Introduction
2. Organizations in business administration
3. Micro- & macro- organization theories and modern organization theories
4. Max Weber's views on the generation of power structure in organizations
5. Hierarchy, power, control and acceptance inside and outside organizations
6. Academic societies as organizations
7. Business interest associations as organizations
8. An case example of “Dynamics of organizations and Power structure”: The problem of camouflage of waste paper blending ratio in postcards occurred in 2008
9. Epilogue

Development of Composites Using Cellulose Nanofiber and Functional Materials

Takashi Okuda and Yasushi Ozaki

Research Institute, National Printing Bureau, Japan

Cellulose nanofibers (CNF) are expected to be a valuable new material made by finely pulverizing wood pulp. In addition, various functional materials can be added to paper in order to enhance anti-counterfeiting technology. Among others, these functional materials include magnetic, fluorescent, and pressure-sensitive materials.

In order to develop new functional papers, CNF and functional materials were mixed and treated in a spray dryer. As a result, it was possible to produce cellulose composites into which functional materials and CNF had been integrated.

A water solution of the functional materials mixed with CNF was sprayed from a nozzle into a heated chamber of the spray dryer, which allowed the CNF composites to form. During the evaporation process in this chamber, the CNF composites were formed into spherical shapes by the surface tension of the water. Moreover, no binder for fixing between the CNF and functional materials was necessary due to the strong hydrogen bonds of CNF. In addition, the newly formed cellulose composites were completely resistant to dissolving back into the water.

CNF composites with functional materials could be observed with SEM (scanning electron microscope) and CLSM (confocal laser scanning microscope). As a result, it was confirmed that the functional materials were introduced into the CNF's.

The formed cellulose composites easily dispersed in water due to the hydroxyl groups of CNF. Using this special property, the water solution of CNF composites and functional materials was distributed

onto a web of wet paper using a spray gun on the experiment paper machine. CNF composites with functional materials were fixed on paper with no binder agent. A friction test showed that the CNF composites would not separate from the paper.

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About energy-saving efforts at the Takaoka Mill

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

It is natural for companies to comply with each emission standards, in addition we set and operate according to the internal standards that are stricter than the legal levels. However, it is undeniable that there are facilities that use excessive energy to comply with the high reference standards.

Although compliance with the legal standards is the top priority, we introduce the case of a bio film treatment device that was able to achieve a large effect by taking measures from a new point of view on energy conservation system in wastewater treatment facilities.

High-efficient Flat Belt Drive -Introduction of HFD System(Hyper Flat Drive System)-

Takemasa Yoshimi

Power Transmission Belt Design Group Engineering Department Industrial Products Division,BANDO
CHEMICAL INDUSTRIES,LTD.

Bando have been a pioneer in the non-tire rubber and plastics industries since our founding in 1906, responding to customer needs with new technology and product development. Over the centuries we have expanded upon our core business to meet the ever-changing needs of the times, and we now produce a wide range of products, starting from the first Japanese manufacturer of power transmission V belts, conveyor belts, systems to precision equipment components, and optoelectronic and electronic materials. At Bando, by utilizing the industry's most advanced technology, we believe that any product, even the "workhorse" V-belt, can be built a better way to solve customer needs and also to the environmental initiatives.

As regards to new request and market needs, Bando "Hyper Flat Drive System(HFD system)" is one of the most efficient equipment and eco-friendly processes, for the next generation horsepower tasks to all power transmission application users.

Our HFD system, we recognized the excellent qualities of the flat belt and refined those qualities with further improved transmission capabilities for below points:

1. An operation with ideal tension and improved transmission efficiency leads to energy saving and CO2 reduction.
2. Maintenance free is possible due to the longer service life and tension control by the unique technology of auto-tensioner.
3. Flat belt construction leads, low flex distortion, and reduces noise problems.
4. Development of flat type belt, compact design layout is available, with no influence on the durability.

In addition, to sustain the most efficient power transmission system, Bando developed a unique technology of belt meandering device. This drive system will autonomously control the running belt to the right position and by combining this devise system with an auto-tensioner, Bando overcame the belt side tracking and tension problem. Thanks to continuous research and development today we cover the size line up for the application from 2.2kW~22kW and for the heavy duty users 30kW~75kW.

The Trial of novel wood biomass fuel co-firing in Kushiro N1

Hiroyuki Ogawa

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Kushiro Mill, Nippon Paper Industries Co., Ltd.

This article will report the trial of novel wood biomass fuel co-firing trial, which was carried out at N1 power plant, Kushiro Mill, Nippon Paper Industries Co., Ltd.

N1 power plant is a coal fired power plant, which still holds a key position in generating electricity in Japan. However, tons of CO2 emission from coal combustion is a significant

environmental issue. Woods are considered to be carbon neutral, so that we can reduce CO₂ emission by substituting wood-derived fuels for coals. Under the increasing social demand against global warming, we are researching novel wood biomass fuels usable for pulverized coal boilers as one of the efforts to reduce greenhouse gas emission which contributes to realise a low carbon society.

Since N1 boiler is a pulverized coal boiler, it needs to be crushable with coal mills to use wood biomass fuels. However, it is often difficult to crush the wood biomass because they are usually very rich in fibre and high in water content. It is common to employ stokers or fluidized-bed technologies to burn biomass fuels. Then, we carried out some wood biomass and coal co-firing trial to investigate the availability of so-called “black pellets”, the wood biomass fuels processed by steam explosion or torrefaction technology, for pulverized coal boilers.

In this study, we examined the mixing rate of wood biomass and coals up to 30wt%. The mixed fuels were supplied to the coal mills of N1 boiler. And we ran and adjusted the boiler, monitoring the operating status of the mills and the boiler.

As the result of this research, we found out that we could run N1 boiler burning coals mixed with 30wt% black pellets without any modification to the current mills and boilers. However, we needed to adjust lots of their parameters due to the property difference between coals and biomass fuels.

Also, it is suggested that there is a potential to use the biomass fuels more than these results and it needs a further study.

Introduction of Subordinate Power Generation

-Saving Energy by Installing Small Hydroelectric Generators-

Takeshi Oe

Nakatsu Mill, Oji F-Tex Co.,Ltd.

Pulp and paper manufacturing is an energy-intensive industry and thus Oji Group has been actively promoting energy-savings and introducing renewable energy equipment. Under these circumstances, Oji F-Tex has set up the aim of saving energy; Nakatsu Mill has been working on energy-saving activities such as installing energy-efficient equipment and improving operating procedures. However, different perspectives are needed at all times to promote further energy-savings. Nakatsu Mill has focused on elevation differences in its water treatment facilities and considered installing small hydropower turbines which subordinates to the main hydropower plant. As a result, it has successfully generated power by installing turbines before a sedimentation device with a steady flow of water and also by effectively utilizing idle equipment.

This article introduces a consideration of installing small hydropower turbines utilizing the location of Nakatsu Mill and the results of its power generation.

Operational Experiences of MVR Evaporator in Gotsu Mill

Takuji Okamoto

Gotsu Mill, Nippon Paper Industries CO., LTD.

Gotsu Mill is the only domestic manufacturer of dissolving pulp which is produced by sulfite process. The evaporation capacity of our two evaporators have reduced due to their deterioration after 20 years since their construction. It was a major reason for the reduction of pulp production, therefore a new evaporator was planned for installation. Comparing MVR evaporator with multiple-effect vacuum evaporator based on the nature of sulfite liquor and the energy efficiency, MVR was installed. As a result, pulp production increased by 111% compared to before installation. Energy costs decreased by 13% compared to the installation of multiple -effect vacuum evaporators.

New Type Turbo Blower Saves Energy & Stable Operation With IoT

-Air foil bearing Variable speed Single stage Turbo blower TurboMAX-

Tsuyoshi Masuda

ShinMaywa Industries, Ltd.

In this paper I would like to introduce the advantages and technologies of TurboMAX turbo blower. TurboMAX turbo blower consists of superior technologies like air-foil bearing, permanent magnet synchronous motor, high efficiency impeller, high speed control technique and so on. As for the overall structure, blower, motor, inverter, touch panel controller and blow off valve are installed in one enclosure. This is a new style

turbo blower called “air foil bearing-variable speed-single stage turbo blower”. Compare to the conventional blowers, TurboMAX turbo blower has many advantages in “Saving energy”“Low noise and vibration”“Saving maintenance cost”“Space-saving and lightweight”. Especially, compare to the conventional root blowers, TurboMAX turbo blower can reduce power consumption by 20% on average.

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

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

ShinMaywa Industries, Ltd. launched TurboMAX turbo blower since 2012 in Japan, and some blowers have been delivered to paper factories. As for paper factory, we have delivered blowers to 8 paper factories so far and 12 blowers are in operation now. Especially, one of these blowers are used for flotator which is used in the deinking process during manufacturing recycled paper from used paper, and we confirmed TurboMAX turbo blower can reduce power consumption in non-aeration use too. I expect TurboMAX turbo blower can reduce the power consumption in many other uses too. I hope TurboMAX turbo blower contributes to the energy saving in many fields and it leads to the reduction of environmental burden of the globe.

Operating Experience of Volume reduction solidification equipment

Makoto Hayakawa

Oji Materia Co., Ltd. Gifu Mill.

The Nakatsugawa Mill of Oji Materia, located in Gifu Prefecture center of Japan, produces Corrugated Medium Paper.

We acquire ISO14001, and have been actively working to reduction of waste, prevention of air and water pollution, noise and vibration. And the pollution prevention ordinance is concluded and observed between Nakatsugawa city.

Now, as increasing waste measures, we introduce environmental load reduction using volume reduction solidification device to convert landfill waste and incinerator with Low grade Waste Paper into solid fuel.

Uncompromising Design of The Heat Exchanger Which Contributes to Exhaust Heat Collection of Fossil Fuel Origin

-Energy Recovery Innovation by Air Frohlich Engineering -

Tetsushi Kadowaki

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

With the continuous increase in energy awareness and the urgently required protection of our environment, the interest in energy recovery with heat exchangers is growing. In this June 2019, the Agency for Natural Resources and Energy of the Ministry of Economy, Trade and Industry published the 2019 Energy White Paper. The Chapter 2 gave a considerable space for the "Global Warming Countermeasures and Energy Policies Based on the Paris Agreement."

Factors noted in this vigorous discussion include the reduction of greenhouse gases (GHG) and the conversion of energy from fossil fuels to renewable energy. The technology that has been proposed by ITOCHU Machine-Technos Corp for these directions is a highly efficient energy recovery system using boiler exhaust gas as a heat source.

This paper introduces countermeasures against heat exchanger corrosion by sulfuric acid H₂SO₄, which is an obstacle to the utilization of fossil fuel-derived exhaust gas, and energy cost reduction effects by converting the recovered heat amount into CO₂ reduction amount/fuel consumption amount, based on designs and application examples of feedwater preheaters (acid-resistant heat exchangers) that enable low-temperature exhaust heat recovery from boilers by Air Frohlich Engineering Corporation.

The Keenest Stock Preparation Technologies for Board Paper - Countermeasures for Worse Waste Paper Quality -

Jiro Urata
AIKAWA Iron Works Co.,Ltd.

The changes in China's Waste Paper procurement policy and the trade friction between the US and China significantly change the amount and quality of used waste paper and affect the procurement of Waste Paper in Japan. In 2018, the Waste Paper procurement situation in Japan is new to memory that the surplus and shortage occurred in a short period due to the influence of external factors.

Furthermore, China has announced that it will target zero solid waste imports at the end of 2020, and it is thought that the import of unsorted Waste Paper will be restricted. In the future, there will be a shortage of high quality Waste Paper and an excess of unsorted waste paper, and the frequency of using low grade waste paper will be increased. For that purpose, it is necessary to strengthen the raw material conditioning equipment to be compatible with low grade Waste Paper. In addition, there is also the possibility that raw material costs can be reduced by using inexpensive low-grade Waste Paper.

In this paper, we will close up on paperboard and introduce the latest Waste Paper processing technology that is effective as a countermeasure along with domestic and overseas achievements for each process.

Development of Quality- and Safety-considerate Paper Straws

Junji Yamamoto
Research Laboratory, Research & Development Division, Nippon Paper Industries Co., Ltd.

It was said that 2018 was the first year of the ocean disposal plastic issue movement. A lot of industries have started to disuse plastics and nations have prohibited to disposal plastics from 2018.

Nippon Paper Industries (NPI) set up new department "Paperising Promotion Office" in August 2018 in order to tackle the issue with paper. Paper straws are one of the paperising product. During the development of paper straws, it was found that conventional paper straws which were sold in Japan had some concerns about quality and feeling of use. The quality represented by water resistance and the feelings of use by using paper and adhesives are inferior to plastic straws. They stick to lips when we put them into mouth because of the moisture absorption. Smells and tastes of paper inhibit the flavor of beverages.

Paper straws of NPI are used very high density and smoothness basepaper for outside layer for mouth feel in order to solve the concerns of taste, smell and sticking to the lips. Water resistance and safety concerns are solved by using paper that is strictly controlled in terms of hygiene and an adhesive compatible with food-safety laws. Moreover, the adhesive is selected to have high water resistance and almost no elution in water. Paper straws of NPI designed as described above has performance and safety comparable to plastic straws.

NPI's Paper straws have been available for sale in April, and are currently on sale at Askul's mail-order site. In addition, they were adopted for the first time in the food and beverage industry in June, and are used in multiple restaurants.

An Essay on Methodology for Innovating "JAPAN TAPPI JOURNAL"

Part 4 : In Search for Converting the JAPAN TAPPI JOURNAL to Science/Humanities Fused-type Journal

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

The Japan's "Basic Program for Science and Technology" proclaimed in December 2019 focuses particular attentions to the human & social science as supporting academic environments to the progress of natural science & technology. In alignment with this program, the significance of fusion or integration of natural science with human & social science.

The fourth article of this series is intended to analyze the possibilities of conversion of the conventional Japan Tappi Journal to the fusion of natural science with human & social science.

The overall contents are described as below.

1. Introduction
2. Historical development of the grasping of human-oriented sciences in the Policies of Science & Technology
3. Controversial "Unnecessary human-oriented academic areas in national universities issues" and responses by the presidents of the universities
4. New directions of "Basic Program of Science & Technology" and significant concerns on human-oriented academic areas.

5. Significance of the recognition of “ Ethics, Law, & Society” in scientific activities and newly emerged streams of “The fusion of human-oriented sciences and natural sciences”
6. In search for conversion of the Japan Tappi Journal to fused type journal
7. Epilogue

Analysis of Trace Elements by ICP-OES and XRF in Pulp and Paper Industry

Toshitatsu Takei, Fumihiko Shimizu, Keishi Morishita and Mitsutaka Kondo

Material Analysis Center, Innovation Promotion Division, Oji Holdings Corporation.

ICP-OES (Inductively Coupled Plasma Optical Emission Spectrometer) is an analytical method characterized by the high sensitivity, wide dynamic range and multi-element analysis. ICP-OES is generally used to quantify trace metals in Pulp and Paper Industry samples. The pretreatment method for Fe, Ni, Cu, Zn, Cd and Pb in white liquor was studied by using a solid phase extraction column packed with polyamino-polycarboxylic acid type chelate resins. The recoveries of elements were affected by a pH. All trace metals were found to be extracted with similar efficiency at pH 5.5, indicating that the optimum condition for extraction is pH 5.5. Major matrix elements, Na, Mg, K and Ca, in white liquor were not extracted below pH 7. The optimum concentration of nitric acid for elution after cleaning the column was determined to be 3 mol/L. The assay values agreed well with the pre-set values without the interference of the major elements. Moreover, high recoveries of the elements ($100 \pm 1\%$) were achieved for the white liquor sample. A Cs inhibitor for ionization interference was effective to suppress the ionization interference of alkaline metal (K) in ICP-OES analysis. Assay values by ICP-OES using the inhibitor correlated well with those using IC (Ion Chromatography). Also a simple analytical method with XRF (X-ray Fluorescence Analysis) using Ultra Carry Light filter provided the precise dilution factor easily. Furthermore, cross checking using XRF and ICP-OES improved the precision of the analysis.

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Problem on Operation of A Continuous Digester with Low Quality Chips and Dealing with It By Upgrade of The Existing Cooking Equipmen

Yan Ju

Valmet K. K. Service business line

With increase of the low quality chips to a continuous digester it can be observed that the operation problems as declining the efficiency of removing air and impregnation of the chemicals, unstable the liquor level in the chip chute, improper chip column movement, variation on the load of outlet device and the blow dp etc.. On the other hand, it is possible to obtain a stable operation with COPMPACT COOKING™ even utilizing the low quality chips due to proper steaming and impregnation with low temperature and long retention time, and a lower extraction load on each screens, etc.. Furthermore, it is also possible to minimize the problems by adopting OptiCook™ on a single vessel steam/liquor phase digester due to reinforcing the steaming, stabilizing the liquor level in chip chute by COMPACT FEED™, cold top cooking together with heating up at C5(or C6) circulation with replace the existing old type screens, and to run the existing Hi-heat washing zone as con-current cooking zone by replacing the existing old C8 screen.

Impact of Low quality wood chips and Latest solutions -Effects of Southeast Asian Wood Chips-

Hitoshi Tsuchida, Jungo Nishimuki and Naoka Nakai
Techncal Sales Dept., Hakuto Co., Ltd

In paper and pulp production, imported wood chips are more important than ever to control raw material costs, transportation costs, improve productivity, and apply to other fields.

Wood chips have a significant effect on pulp properties depending on morphological factors (origin, tree species, structure) and chemical factors.

In the pulp production process in Japan, planted trees are often used, so that not only calcium and silica derived from soil but also calcium, potassium and phosphorus derived from fertilizers precipitate, are causing scale problems.

In this report, problems that have actually occurred in the pulp manufacturing process due to the influence of recent wood chips (calcium phosphate precipitation in the digestion and bleaching process, and resin stain in the black liquor concentration process) are discussed.

We also introduce the latest chemical solutions that address these issues.

The Keenest Stock Preparation Technologies for Board Paper - Countermeasures for Worse Waste Paper Quality -

Jiro Urata

AIKAWA Iron Works Co.,Ltd.

Due to a change in the Chinese recycle paper procuring policy, the Japanese recycle paper export has been decreasing and this made a tendency of surpassing the recycle paper supplies in the Japanese market. Also there has been an uncertain status between the U.S. and China, and also the U.S. and Iraq, and this starts affecting the Pulp & Paper industry. We see a shift on our customer requirement that has been changing from yield improving to energy saving since middle of 2019. The energy saving means to increase the capacity with keeping the same power consumption. Improving the specific power consumption requires more capacity on the equipment on which more capability of removing the contaminants is important.

The Chinese government introduces a policy that there will be zero import of recycle solids by the end of the year, and there will be a tendency seen in Japan that high quality recycle paper is more exported, and low quality unsorted recycle paper with high contents of contaminants is more distributed. Using inexpensive low quality recycle paper gives low cost of procuring raw materials, and this is an important factor on how we could handle the low quality recycle paper. In this section we would like to introduce the latest technology on recycle paper handling with a target of improving the contaminant removal.

To improve of causticizing efficiency

Makoto Iwasaki
MIP Consultant Office

Kraft Pulp (KP) is the main pulp production worldwide. In this development, KP chemical recovery process has contributed greatly.

The main role of the KP recovery process, (1) recovery and reuse of inorganic chemicals, (2) combustion of organic material in the black liquor, and recovery of energy from it.

There are three processes in the related to this (1), that is, the clarification of the green liquor sent from a recovery boiler, causticizing white liquor (cooking liquor) from the mixing with the burned lime stone discharged from lime kiln and clarified green liquor and the step of clarifying the white liquor. The keeping high and less variation causticizing efficiency is one of the most important target for the operation for the process related to this (1). Here, I will describe about the outline of each recovery steps which affect the causticizing efficiency, and introduce the measures to improve it.

Best available ClO₂ technologies for the pulp industry

Andrés Quintero
Senior Process Engineer, Eka Engineering, Technology Solutions,
Nouryon Pulp and Performance Chemicals AB
Mikiya Nomura
Nouryon Japan Inc.

Eka Engineering is an engineering and contracting division within Nouryon Pulp and Performance Chemicals that specializes in the design and supply of chlorine dioxide (ClO₂) plants and equipment to the pulp and chemical industries.

Eka Engineering has developed a number of different process technologies, for safe and efficient ClO₂ generation that makes the division a world-leading supplier of chlorine dioxide plants.

ClO₂ is an oxidizer commercially used for bleaching pulp since the mid-1940s. ClO₂ is the most cost-effective bleaching agent of pulp, achieving high brightness while maintaining high strength.

ClO₂ is produced on site by reducing sodium chlorate (NaClO₃) in an acidic solution, either under vacuum (SVP processes) or atmospheric conditions (HP-A process). Different by-products are generated by varying the type of reducing agent and acid.

In this paper we will focus on the HP-A, the SVP-LITE and the SVP-SCW processes which are the most common ClO₂ processes used nowadays.

Also we will briefly discuss about ClO₂ decompositions and other application for ClO₂.

Operational principle of Centrifugal pumps and its example from Sulzer products

Hiromichi Ueda
Sulzer Daiichi K.K.

In Pulp and Paper process various type of pumps are using for from Digester application, Paper Machine application to Waste water application, including so called Water pump, Pulp slurry pump, Quantitative chemical pump. However, the majority of operation in use might be just Centrifugal process pumps than some specialized pump. There should be some specialties of technology depending on pump manufactures, of course. It may be able to say that the pump is exactly "The heart of your process" in the sense of functionality in your process as of pumping liquid. I am pleased to introduce basic issues and some application of centrifugal pumps including our process pumps made by Sulzer Pumps.

At the first paragraph, we hereby explain about the discharge function of pump generated by centrifugal force. Then we get onto the points what is better to take into consideration at the suction area, such as NPSH and Cavitation. We also explain in the latter half of paragraph that pressure loss in the piping, and the advisable piping layout especially for pulp pumping. We also mention here about the performance change led by the difference of impeller diameter and speed.

In the end we introduce pump selection guide for various application in pulp & paper industry process, and then the material selection of pump as well.

This is last but not least, we introduce here cutting edge of technology of Sulzer pumps.

Life assessment for Equipment made of FRP

Daiki Ishii
Sales Dept., Itogawa Industries Co.,Ltd.

Because of outstanding chemical resistance and reasonableness, equipment made of FRP have used widely at various papermaking process and utility since long ago (For example Storage tank, Pipe, Duct, etc).

However, even if it is convenient material, it will gradually deteriorate in harsh environment. Therefore, we have to acquire basic FRP knowledge and information about deterioration for proper management, and that surely leads to safety factory operation.

In this paper, we explain about the basic FRP construction and deteriorate mechanism, and mention the current state of life assessment moreover.

Development of breeding technologies for Eucalyptus in northern Brazil

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

Nippon Paper Industries Co.,Ltd.(NPI) is a comprehensive biomass company that aims for sustainable growth with the slogan " Shaping the Future with Trees" , fully utilizing and recycling renewable wood resources based on sustainable forest management. NPI manages Eucalyptus plantation forests in Brazil, Chile, Australia and South Africa as part of its sustainable resource procurement policy "Tree Farm Initiative". Among them, Amapa Florestal e Celulose S.A.(AMCEL) in northern Brazil owns the largest plantable area, planting Eucalyptus species in plantation and producing wood chips to export to overseas.

We are promoting the development of forestry technologies in the AMCEL plantation. In this report, we would like to discuss the latest situation of our breeding and clone development program, and in particular, our recent effort on a new breeding technology of genomic selection.

An Essay on Methodology for Innovating “JAPAN TAPPI JOURNAL”

Part5 : “Paper culturology” : An Interdisciplinary Systematic Style That Fuses Paper-related Academic Areas

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

Before discussing into creating a new journal, the author has looked back on the historical transition of the natural science from ancient Greek natural philosophy to the contemporary issues of fusing natural sciences with humanities and social sciences.

Germany has unique classification of sciences, i.e., natural science and cultural science. France has philosophy - based specific outlook on paper and gave birth to “mediologie” and the concept of “Pouvours du papier”. The author has proposed “Paper culturology” as fusion of various paper-related academic areas

The fifth article of this series is intended to analyze the possibilities of creating “Paper culturology” and its application for innovating JAPAN TAPPI JOURNAL.

The overall contents are described as below.

1. Introduction
2. Academic transition from the Greek natural philosophy to the contemporary issues of fusion of natural sciences with human and social sciences.
3. French philosophical understanding of paper and “mediologie”
4. Proposal of “Paper culturology” that targets fusion and systematization of paper-related academic areas
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**New Approach for Wet End Operation and Optimization (Step 2)
—First Reference for “iTABLE™” in Japan and Next Step—**

Hiroshi Iwata, Harry Ritter
IBS Japan Ltd. , IBS Paper Performance Group

The global paper market put new challenges into today's paper making. Papermakers are requested to produce paper grade to meet market demand as well as competitive manufacturing cost with each other in order to stay in business.

IBS“iTABLE™” is the perfect solution with advanced drainage technology on a Fourdrinier table to produce consideration in Formation and paper strength improvement as well as remarkable results in energy consumption and chemical cost saving to an extremely short payback period of less than one year.

The over one hundred fifty “iTABLE” are operating in the worldwide and we supplied first reference to the Japanese market in 2018.

This paper introduces the performance results on first reference of “iTABLE™” in Japan and next step for “iTABLE™” with new IBS advanced technology of “Table vision”.

The comprehensive chemical approach to improving productivity by cleaning felts and wires

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

The deposit adherent in the papermaking process causes operation trouble with occurrence of web-breaks and the defects and often brings bad influence to the productivity and the quality of the product in a pulp and paper production plant. There are the various factors that cause web-breaks and the defects, therefore the solution to the deposit problem are also different depending on the situations. We think that solving optimally the complicated deposit problem at the wet end will lead to the improvement of the quality and the productivity by analysis from pleiotropic viewpoint.

We investigated the causes of the deposit troubles in the efforts at the wet end, and examined the deposit cleaning agent, wire cleaning agent and felt cleaning agent, which we developed as an application example of the optimum cleaning method for solving the problem. In this report, we will introduce the development concept of the cleaning agents, the mechanism of effect and the example of effect.

The latest development for forming fabric and press fabric

Ulf Bengs

Albany International Forming Eurasia

Minwon Bae

Albany International, Publication Eurasia

Koji Kawashima

Albany International Japan Albany International is a leading developer and manufacturer of Paper Machine Clothes (PMC), supplies engineered fabrics and process belts used in the manufacture of all grades of paper products, including tissue and towel, board, and packaging and publication. The production of paper and board has experienced a dramatic change during the last decade.

The production of graphical papers has reduced significantly wear as the production of packaging grade paper and board as well as sanitary (tissue) products has increased steadily. This development has had a clear impact on the demand for PMC fabric performance.

Today we are going to present Albany's latest products with the latest technology which Albany International has developed.

Performance and effects of thermal spray application to various wire rolls — TS-03112 μ which greatly extends the life of plastic wire —

Kimiaki Iwane

Tocalo Co., Ltd. Sales Division

In the wire part of a papermaking machine, the wire roll (Wire roll, Breast roll, Drive roll) is usually a rubber cover roll.

Recently, ceramic spraying has been increasing. Rubber cover rolls cause uneven wear in 1 to 2 years due to friction with plastic wire. Uneven wear has an adverse effect on the life of the plastic wire, and it is necessary to replace the wire early at the papermaking site. As a remedy, ceramic spraying has been used for more than 20 years and has achieved a certain effect. However, the ceramic sprayed coating has a low coefficient of friction and easily slips with the plastic wire, and cannot be used for a drive roll. Therefore, the effect of improving the life of the plastic wire is limited. We started to develop special ceramic thermal spray coating (TS-03112 μ) with high friction coefficient more than 15 years ago.

After various evaluation tests with the cooperation of a wire manufacturer, the first roll was delivered to the on-top former drive roll in 2005. After undergoing various evaluation tests with the cooperation of a wire manufacturer, the first roll was delivered to the on-top former drive roll in 2005. As a result, it was proved that the slip ratio was equal to or higher than that of a rubber roll for a drive roll. As a result, it was proved that the slip ratio was equal to or higher than that of a rubber roll for a drive roll. Since then, TS-03112 μ has been mainly used only for drive rolls, but its surface performance has also greatly contributed to extending the life of wires by adopting it for normal wire rolls and breast rolls. Many customers who have adopted TS-03112 μ have reported that the wire life has reached 1.5 to 2 times.

Proposal of Mixing Plate —CD/BW Profile Control Device for Headbox—

Masayuki Nagata

Sales Dept, Kobayashi Engineering Works, Ltd.

Thanks to the partnership with Kadant AES, USA, we have offered several units of "Octopus Stock Approach System" (hereinafter refer as Octopus") and it has been a long time since dilution controls are well known as major methods to control CD/BW Profile from the Headbox.

Today, we would like to introduce you our "Mixing Plate" as a new method to control CD/BW Profile. Needless to mention, uniform CD/BW Profile at certain levels equally are one of the most important key technology in paper production. In order to control these amounts, numerous of equipment has been invented by numerous of suppliers.

Among those equipment, our Mixing Plate features less installation space compared with Octopus with reasonable pricing. Not only to a new build Headbox, but also, it could retrofited to existing Headbox by less modification works too.

Let us start off the explanation of its features and benefits of installation, based on actual cases.

In this case, Mixing Plate was introduced to Evener Roll type Headbox and resulted to improve CD/BD Profile.

Innovative System 「PCA-Poly Clean Applicator」 and Latest Canvas Cleaner to keep dryer surface and canvas clean

Tsuyoshi Yoshino
Design Department / AIKAWA IRON WORKS CO.,LTD.

We have been manufacturing and promoting doctor equipment, surface cleaners and canvas cleaners for the solutions of removing dirt on the dryer surface and cleaning the canvas. There is a high demand for improvement of product quality, as there are more and more contaminants on the dryer and the canvas due to the deterioration of raw material quality in recent years. We have now an innovative solution to prevent dirt from adhering to the dryer and canvas on top of our conventional equipment. We have now started promoting the system called "PCA Poly Clean Applicator" that we hope will play an important role in solving the problems that have not been able to eliminate so far. This article covers the introductions of the "PCA-Poly Clean Applicator" and the latest canvas cleaner.

New Sizing Agent 「SIZEPINE CA-956」

Ken Hisamoto
Research & Development H.Q., Paper Chemicals, Arakawa Chemical Industries, Ltd.

In the paperboard manufacturing, it has become difficult for internal chemical additives to function properly since the increase of calcium carbonate-containing waste paper and more closed papermaking system. Rosin sizing agent, known as a main force of internal sizing agent, is considered to perform poorly under the trend of pH rising in papermaking system. For general sizing agents other than rosin, AKD and ASA are well known. However, even though they have excellent performance, various disadvantages such as slow progressive development of sizing effect and concern for their stability. In such situation, we have newly developed "SIZEPINE CA-956". It is the fourth general sizing agent, following rosin, AKD and ASA, which is able to adapt to wide range of pH.

SIZEPINE CA-956 has long alkyl chains as hydrophobic group, and special polar groups. It also needs Alum to function as traditional rosin sizing agent does. However, compared to rosin size, SIZEPINE CA-956 has a different coordination system, and shows predominance under low Alum dosage, even only with the Alum derived from waste paper material. Furthermore, the performance of SIZEPINE CA-956 is not susceptible to pH and temperature of wet-end as well as drying temperature in papermaking process. Besides, it has no problems such as slow progressive development of sizing effect of AKD and over-time deterioration of ASA.

In preparation for future changes in papermaking environment and market, we are promoting development for further application possibilities of this novel sizing agent.

Enhanced Biocontrol Performance through DNA Technology in the Paper Making Industry

Wen Li Tu
Shanghai Research Development & Engineer Centre, Nalco Water, An Ecolab Company
Laura Rice
Global Paper RD&E, Nalco Water, An Ecolab Company

This study uses high-throughput sequencing technology and metagenomics to identify the biofilm forming bacteria in the paper-making process. Taxonomic classification of bacteria that led to biofilm formation were assessed. Problematic bacteria were grouped and quantified using real-time polymerase chain reaction (qPCR). This technology of identification and detection of causative bacteria in the paper-making process, based on metagenomics and qPCR, was developed by Nalco Water as Metagenomics Analysis Protocol (MAP). One case study using MAP demonstrated that targeted biocontrol treatment resulted in improved paper quality and production performance.

TURBAIR® - The Energy Saving Vacuum Blower-

Mokume Misawa
MAN Energy Solutions Japan Ltd.

TURBAIR's green technology offers an incredible saving potential and helps to cut the consumption of energy and process water in paper production. In doing so, it slashes related costs and reduces the environmental CO₂ footprint tremendously. The environmental and economic advantages of MAN vacuum blowers allow customers from the wood-fiber and paper industry to stay competitive and especially in case of higher production output.

The amount of vacuum and air volume required during paper production varies depending on the type of paper manufactured. The TURBAIR® system, which is a state of the art technology, adapts dynamically to the changing conditions to provide the exact volume and vacuum needed for a perfect result. This, combined with a fully controlled vacuum system helps to increase the visibility of the production and quality.

- Suction flow rates of up to 3,000 m³/min per blower
- Vacuum level of up to 65 kPa with our single stage blower and up to 75 kPa with our multi-stage blower
- Efficiencies of up to 85%
- Constant vacuum levels at varying flow rates over the entire working range
- Heat recuperation equivalent of up to 75% of absorbed blower power
- No sealing water consumption
- No wearing parts
- Long lasting device

Activities for Energy Saving at PM6 in Nagaoka Mill

Hiroshi Saito
Hokuetsu Corporation Co.,Ltd.

Key products at PM6 in Nagaoka Mill is industrial paper. Recently received order of industrial paper is increasing. We have to increase production volume. We have tried increasing production volume and reduction of steam intensity. In this paper we report two cases "Reduction of steam intensity by increasing of Double Disk Refiner" and "Reduction of steam intensity by addition of Finesteam" at PM6 in Nagaoka Mill.

Effect of Cooking Method on Wet Tensile Strength of *Kozo* Paper

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Graduate School of Fine Arts, Tokyo University of the Arts
Masaki Handa
Handa Kyuseido Co., Ltd
Masamitsu Inaba
Graduate School of Fine Arts, Tokyo University of the Arts

Usur mino-gami (a kind of thin *kozo* paper) is frequently used as the first back lining paper of hanging scrolls in order to support the main paper with a painting or a work of calligraphy on it. For dyeing appropriate color, the paper is often treated with alkali mordant solution. However, current *usu-mino-gami* product received such comments from conservators that wet tensile strength is weak, and hard to handle. Therefore, improving wet tensile strength of *kozo* paper have to be required. In our previous paper, the effect of sheet forming method on wet tensile strength of *usu-mino-gami* has been investigated. In this paper the effect of cooking method on wet tensile strength of *kozo* paper was subsequently investigated. Wet tensile strength of *kozo* paper which made with different cooking conditions, was evaluated by wet tensile strength using finch device. *Kozo* paper with different amount of parenchyma cell was also be made. The amount of parenchyma cell in pulp was measured with ratio of parenchyma cell film area between fibers on *kozo* sheet by using scanning electron microscope (SEM) images. According to the results, the increase of wet tensile strength and higher amount of parenchyma cell were observed with shorter cooking time, and lower concentration of cooking agent (alkaline). Furthermore, wet tensile strength of *kozo* paper increased when amount of parenchyma cell in pulp was higher.

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Basic concept and latest headbox design

Hideki Sano

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

The function of headbox is defined as “A device rectifies the stock and pours it on the wire with certain thickness and speed”. The function typically demanded on headbox is as follows.

- Makes proper stock dispersion and supplies the stable stock flow to the slice section.
- Jets the uniform stock flow free from streak and diagonal flow in cross machine direction.
- Maintains the stable slice section not influenced by the pressure and temperature variation.
- Keeps cleanness inside and easy for maintenance.

On the other hand, high functional devices such as dilution profiling system, headbox sheet, and eveners rolls according to the client's specification are requested to apply. Therefore, the selection of proper devices depending on paper quality target is very important engineering work. Evaluation of headbox is very much concerned with the paper quality such as basis weight profile, formation and properties.

This reports the latest dilution type profile system as well as the basic function and mechanism of our headbox.

Lubrication management utilizing advanced oil purification method and IoT with cellulose capillary filter

Ken Fawcett

JSD Ltd.

JSD, through the sales of cellulose capillary filters, has been involved in lubrication management in many manufacturing industries throughout Japan, including paper and pulp, metal rolling, machine manufacturing, and semi-conductor manufacturing. Cellulose capillary filters are made through special processing of the capillary system found in trees. Using such a filtering medium, it can remove particles as small as 0.1 μ m (100 nanometers). Such fine filtration causes the oxidation in the oil to stop, thus not only removing the sludge and varnish that lead to machinery wear and breakdown, but actually prevents the sludge and varnish from forming in the first place. The oil is kept cleaner than new oil, which means oil changes are no longer necessary. Furthermore, the oil that is now super-clean will flush the insides of the machinery system. With the contaminant particles removed, the oil will be able to fully function as a lubricant, thus massively reducing maintenance cost due to a large reduction in machinery breakdowns and repairs.

In order to further improve lubrication management while saving labor, oil quality sensors, which monitor the oil condition in real-time, and particle counters, which calculate the particle amount in the oil and show the result in IOS or NAS standards, are available for use. Joining these equipment through an IoT (Internet of Things) system will also be available for implementation in the near future.

Efficiency improvement by optimizing coal boiler control

Syuuichi Tsukidate

MPM OPERATION Co., Ltd.

Power generation facilities at Hachinohe plant of Mitsubishi Paper Mills Limited consist of a coal-fired boiler, a waste boiler, black liquor recovery boilers and steam turbines. These facilities are being operated to satisfy both the steam and power demands fully while using many fuel sources such as heavy oil, coal, black liquor and waste efficiently.

Recently, we introduced new optimum parameters to a system of a conventional controller to operate a coal-fired boiler. The system has solved some operating problems and reduced power generation costs.

Indirect Food Additives for Food Packaging Paper

Kenichi Fukuda and Kazushige Inaoka

Paper Chemicals Development, R&D Center, R&D Company, Harima Chemicals, Inc.

Harima Chemicals Group, Inc. has been supplying various paper chemicals such as strength and sizing agents for paper and paperboard mills in order to provide desired functions on papers.

Paper and paperboard have been widely used in our life not only for printing, wrapping and transporting purposes but also as food packaging materials such as boxboards, paper plates and beverage cartons. Food packaging materials have been regulated in countries around the world, and paper chemicals used in paper intended to come into contact with food also need to be compliant with the regulations.

In this situation, we have developed and begun sales of polyacrylamide (PAM) type dry strength agents, dispersed rosin sizes which were approved by FDA (Food and Drug Administration) for indirect food additives. Both PAM strength agent which has high molecular weight and amphoteric property, and dispersed rosin size which applied synthetic anionic polymer as an emulsifier, are the first products in the world of paper chemicals to meet FDA regulatory requirements.

The FDA approved PAM strength agent, "Harmide KS series", and dispersed rosin size, "NeuRoz® series" as well as the efforts to aim for "the development of safe products as indirect food additives" are introduced in this report.

Next Generation of Automated Paper Testing and Online Pulp Analyzing System

-L&W Autoline and L&W Freeness and Fiber Online-

Mitsuhiro Yamazaki

Pulp & Paper Group, Industrial Automation business, ABB K.K.

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

In this speech, I would like to share our experience and knowledge which has been obtained from installation base of more than 500 systems of L&W Autoline all over the world. Especially herein, I introduce our brand-new small system of automated paper testing, L&W Autoline S, which has been just released this year 2019, based on completely new basic design of its user interface, digitalizing capability and advanced reliability, and able to shorten ROI period.

And, I continue to explain the design concept features 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. Just in 2 years from our product release, almost 20 x systems of online pulp analyzing have been delivered globally including Japan, and it is attributed to the fact that customers acknowledge its advanced and innovative feature as well as its maintenance ability and reliable measurement capability.

Reliable system of automated paper testing 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. It is also mandatory to obtain precise and huge data of quality assurance automatically, and to share, analyze and feedback information necessary for process optimization by digitalization.

Effects of Insecticides on *Ochotellus glaber* and Other Species of Ants

Yasuhiro Tomioka and Goro Kimura

Technical Research Laboratory, Ikari Shodoku Co., Ltd

Nobuyuki Kato

Sales Promotion Division, Ikari Shodoku Co., Ltd

The effects of a new insecticide, piliprolol FL (phenylpyrazole), and a slow-acting insecticide, fipronil FL (phenylpyrazole), on the black house ant, *Ochotellus glaber*, were examined by using the filter paper contact method. The insecticidal effect of the former was higher or as high as that of the latter. Similarly, fast-acting insecticides including two organophosphorous compounds, fenitrothion FL and propetamphos AE, three pyrethroids, β -cyfluthrin FL, bifenthrin AE and etofenprox AE, and a neonicotinoid, thiamethoxam FL, were tested. Propetamphos AE showed the highest potency, followed by fenitrothion FL and bifenthrin AE. Aerosol (bifenthrin 0.07%) knocked down the test ants 100% in 10 minutes after direct spraying, confirming that it was a fast-acting, potent agent against ants.

An Essay on Methodology for Innovating “JAPAN TAPPI JOURNAL”

Part 6: “Psychophysics” : An Academic Area that links Human Aspects with Natural Scientific Aspects by Human Mediation

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

For deep understanding of essentials of paper, human aspects of paper as well as natural scientific aspects are significant. This kind of way of thinking is attracting particular attentions recently with a view to solve the problems associated with paper related complicated issues in the contemporary society. Psychophysics has a possibility to link between human aspects with natural scientific aspects.

The sixth article of this series is intended to analyze the possibilities of applying psychophysics as tools of designing a variety of paper products. Furthermore, this article is seeking for the possibilities of applications for innovating JAPAN TAPPI JOURNAL.

The overall contents are described as below.

1. Introduction
2. Human being as Information Processing System.
3. Psychophysics as an academic area
4. Psychophysics as linkage between Psychology and Physics
5. Psychophysics as paper designing theory
6. Theoretical interpretation of the development of human-oriented papers
7. Epilogue

Rapid measurement method for molecular weight distribution of cellulose using tetrabutylammonium acetate / dimethylsulfoxide (TBAA/DMSO) mixed solvent

Kanako Ikeguchi and Hiroshi Nonaka
Graduate School of Bioresources, Mie University, Japan
Asuka Nagae and Ippei Iwata
Futamura Chemical Co., Ltd.

A rapid size exclusion chromatography (SEC) analysis system for cellulose was successfully developed using a mixed solvent of tetrabutylammonium acetate (TBAA) / dimethylsulfoxide (DMSO). The cellulose sample was dissolved within 30 minutes without pretreatment, the molecular weight distribution measurement was completed in 30 minutes, and the average molecular weight was calculated based on pullulan standards. In the high-purity cellulose samples, a high linear correlation was found between the common logarithm of the weight average molecular weight (M_w) and the viscosity average molecular weight (M_v). In pulp and commercial cellulose powder, peaks or shoulders derived from hemicellulose appeared in the low molecular weight region and the polydispersity increased. Even when hemicellulose was contained, almost the same correlation was observed between M_w and M_v as the high-purity cellulose samples, and the approximate degree of viscosity polymerization could be estimated. The method developed in this study can be a powerful method for measuring the degree of polymerization, which can replace the viscosity method that requires complicated operations.

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Lignin Metabolic Engineering in Grass Biomass Plants for Primary Lignin Valorization

Toshiaki Umezawa

Research Institute for Sustainable Humanosphere, Kyoto University

Trees and large-sized grasses are the major sources of lignocellulose biomass, which is indispensable for establishing sustainable societies. Large-sized grasses have much higher lignocellulose biomass yields than trees. With an overall aim to improve lignocellulose usability, it is important to improve lignin content and simplify lignin structures in biomass plants. In this context, using rice as a model for grass biomass plants, we produced transgenic lines with increased lignin content, which should be beneficial for the solid fuel use of biomass. We also generated transgenic rice lines with increased content of each of the three aromatic (i.e., *p*-hydroxyphenyl, guaiacyl, and syringyl) units of lignins. This helped to simplify the aromatic composition of lignins. These strategies are also applicable for the improvement of usability of large-sized grasses. In addition, in-depth lignin analyses of transgenic rice plants suggested the presence of a biosynthetic pathway that produces the grass-specific β -*p*-coumaroylated monolignols.

Development of “colorless wood block” and its natural hierarchical structure

Yoshiki Horikawa

Institute of Agriculture, Tokyo University of Agriculture and Technology

The highly-controlled 3D structure of wood expresses the outstanding mechanical properties which allow to support the huge body and to live more than 1000 years. In order to apply this natural architecture for the novel biomaterials, we examined the removal of lignin via two-step chemical treatments with maintaining anatomical and cell structure, which is quite different from pulp and paper. The first step was alcoholysis which was conducted by ethylene glycol, and its best condition was determined by fourier transform infrared spectroscopy. The second step was bleaching wherein the delignification gradually proceeded from the surface to the core of the wood block, and finally resulted in complete decolorization. Next, multiple structural assessment from anatomical- to nano-level was carried out. X-ray CT (computed tomography) visualized ordered tracheids which mean to keep the anatomical structure. X-ray fiber diffraction diagrams obtained from “colorless wood block” showed oriented cellulose fibers, indicating microfibrils in the cell wall were unaltered. Furthermore, natural cellulose crystalline structure was kept from X-ray diffraction pattern. Lastly, transmission electron microscopic observation of microfibrils which were prepared by using TEMPO-mediated oxidation technique showed clear cellulose fibers which have long and uniform width. Given various structural analysis, we achieved in preparation of “colorless wood block” while maintaining the natural hierarchical structure.

Andritz Latest Screening technology for OCC Application

Yosuke Takeshita

Andritz K.K. Capital Systems Sales

Well-known with over 5,400 pressure screens installed in numerous stock preparation lines worldwide, ANDRITZ presents the latest evolution in screening – the *PrimeScreenX*. The innovative design of the new screen builds on the successes of the widely valued *Modu Screen* family, but offers innovative key benefits. The improvements in energy efficiency, screening performance, and maintainability are significant. The *PrimeScreen X* is the natural evolution of the *Modu Screen* pressure screen family. The targets for this development were to improve both the energy and screening efficiency, while making the unit easier to maintain. The *Prime Screen X* is exceptional for all screening applications – brown and white grades, recycled or virgin, including coarse, fine, broke, thick stock, and fractionation duties.

Recent Trend in paper machine concept for board making

Arisa Oki
Valmet K.K.

Defining suitable production capacity is key to ensuring the highest possible return on investment. Valmet's focus is on supplying the right papermaking lines with sustainable solutions to serve customers. OptiConceptM is a modular paper and board making concept launched in 2011 which answers these challenges. The OptiConceptM family suits both containerboard & cartonboard grade and fine paper production; Simple, well functioning solutions that meet the customer's needs.

In this paper, we will introduce the OptiConceptM features as well as the recent development technologies for board making.

Advanced optimization method of multivariable predictive controller

Kunihiko Seto
Honeywell Japan Ltd. Honeywell Connected Plant

Multivariable predictive controller (MPC) is widely applied to process industry from its real time optimization capability which makes large operation benefit from the process. MPC utilizes linear programming method (LP) to determine optimum solution under process constraints. Understanding of LP method is essential to utilize optimization function to maximize benefit from MPC. Since LP method is limited for linear algebra, optimization of highly non-linear process is difficult. Advanced optimization methods are developed for MPC to support process non-linearity. One is liner model on-line update method. Another method is hessian update. Multiple unit optimization is also available with real time optimizer. Further large scope optimization which includes production planning and blending is also available.

Wire Part Basic Knowledge and Latest Trend

Osamu Yasui
Application Eng. Dept., Voith IHI Paper Technology Co., Ltd.

The wire part is an important part that determines the paper quality, for example, the formation, the two sidedness of surface smoothness, and the MD/CD ratio of tensile strength. This paper describes the typical dewatering elements for wire parts and their dewatering mechanism, and also explains the typical types of wire parts configuration. The dewatering at wire part are hydrofoil dewatering (blade dewatering), vacuum dewatering, centrifugal dewatering, and wire tension dewatering due to the difference in dewatering mechanism. The types of wire parts are a cylinder molding former, a Fourdrinier type former, and a twin wire type former. Here, a Fourdrinier former and a twin wire type former are described. Twin wire type formers include gap formers and hybrid formers with on-top formers added to Fourdrinier formers. In addition for paperboard, there is a multi-layer former that combines multiple Fourdrinier formers.

An Essay on Methodology for Innovating “JAPAN TAPPI JOURNAL”
Part 7: “Cultural economics” Analyses on Material values and Cultural values of Paper

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

Paper products shipped from paper mills will give birth to the cultural issues and cultural values in contact with human society. Paper itself has cultural values as well as economic values. Paper industry has potentiality to produce paper products as cultural goods, therefore, often called cultural industry.

The seventh article of this series is intended to analyze the process of creating cultural values as well as material and economic values of paper using newly emerged academic area of “Cultural economics”.

The overall contents are described as below.

1. Introduction
2. Paper as goods and its process of creating values
3. The contents of cultural economics
4. Elements that create cultural values of paper media
5. The social responsibility of paper industry as cultural industry
6. “Creating shared values” for coexistence of economic values and social values
7. Epilogue

Yield Increment of Hardwood ECF bleached Pulp by Addition of Peroxymonosulfuric Acid

Keishi Tanifuji and Hiroshi Ohi
Graduate School of Life and Environmental Sciences, University of Tsukuba
Taisuke Nakahira and Katsuyuki Murai
Tokyo Research Laboratory, Mitsubishi Gas Chemical

The peroxymonosulfuric acid (MPS) was added at 0.1% dosage as H_2SO_5 for the initial stage of chlorine dioxide (D_0) treatment during elemental chlorine free (ECF) bleaching for a hardwood oxygen-bleached kraft pulp (LOKP) to improve yields of the bleached pulp. The D_0 or D_0/MPS treated pulps were followed by alkaline peroxide (E_p) stage and chlorine dioxide (D_1) stage. The final pulp yield (93.1%) of $\text{D}_0/\text{MPS}-\text{E}_\text{p}-\text{D}_1$ sequence was steadily higher than that (90.6%) of $\text{D}_0-\text{E}_\text{p}-\text{D}_1$ sequence. When the dosage of chlorine dioxide was increased during D_0 stage or D_0 with MPS (D_0/MPS) stage at 60 °C, the pulp yield was decreased. When the temperature of D_0 stage or D_0/MPS stage was increased to 70 °C, the yield of D_0 stage was decreased more than that of D_0/MPS stage. On the other hand, the total organic carbon (TOC) concentration of the filtrate from D_0 stage was also higher than that from D_0/MPS stage. The glucan and xylan contents of the $\text{D}_0/\text{MPS}-\text{E}_\text{p}-\text{D}_1$ bleached pulp were higher than those of $\text{D}_0-\text{E}_\text{p}-\text{D}_1$ bleached pulp. It was clarified that decomposition and denaturation of carbohydrates in LOKP during ECF bleaching were reduced by the D_0/MPS treatment, and this would effect on the increment in bleached pulp yield of the $\text{D}_0/\text{MPS}-\text{E}_\text{p}-\text{D}_1$ sequence.

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Latest Wastewater Treatment Technology

Hiroaki Kariyama
Kurita Water Industries, Ltd.

In recent years, environmental problems have become more serious on a global scale with the increase in population, urbanization, and industrialization, and many companies are now working to solve social problems as part of their business activities with the SDGs.

There are four main efforts to solve environmental problems: "solving water resource problems," "reducing waste," "sustainable energy use," and "balancing environmental problems with advances in production technology." In particular, "waste reduction" and "sustainable energy use" should be considered in the wastewater treatment field.

Wastewater treatment equipment is classified into organic treatment and inorganic treatment, but in response to the above customer needs, we have been working on the development of wastewater treatment technology that takes into consideration not only treatment stability but also environmental load reduction.

BIOPLANET[®]SR, which is an aerobic biological treatment, is a technology that makes it possible to reduce excess sludge by utilizing the food chain mechanism while reducing COD in wastewater by microbial decomposition.

The anaerobic MBR system, which is an anaerobic biological treatment, reduces the amount of excess sludge, creates energy using methane, which is a decomposition by-product, and retains microorganisms in a high concentration in the tank in combination with membrane separation technology. This is a technology that enables direct treatment of high-concentration SS and COD-containing wastewater without pretreatment, SS removal, or dilution.

Sensing[®]CS is a technology that measures the turbidity between coagulant flocs and optimally controls the amount of coagulant added. Not only can the chemical cost and industrial waste amount be reduced by suppressing excessive addition, but also the deterioration of treatment performance due to insufficient addition amount can be suppressed because the amount of coagulant can be optimally controlled with respect to the raw water quality.

We have been working on the development of individual equipment technology and chemical technology for the purpose of improving the performance of water treatment technology. As the next action, we would like to establish a water treatment facility that is linked with manufacturing process information in order to truly respond to the solution of environmental problems by our customers. Finally, we would like to develop an overall solution that enables minimization of water use, minimization of water treatment costs, minimization of energy consumption, and labor saving.

Wastewater treatment by membrane separation activated sludge method

Yojiro Sakamoto
Kubota Co.,Ltd.
Membrane Systems Dept. Domestic Sales & Engineering Group, Engineering Team

The United Nations Sustainable Development Goals (SDGs) are set out, including the goal of "6. Ensuring the availability and sustainable management of water and sanitation for all."

Behind this is the problem that the amount of freshwater resources available is gradually decreasing due to the increase in water usage due to population growth and water pollution in public water bodies.

For humankind to survive and achieve economic development, it is important to prevent water pollution and promote water circulation.

Water discharged through industrial activities contains various pollutants. In order to solve the above problems, when water is discharged from each factory (specific facility), pollutants must be purified to below a certain standard.

The methods used for purification are roughly divided into three types: "physical treatment", "chemical treatment", and "biological treatment", and appropriate treatment methods and combinations are adopted according to the type of pollution.

In general, "biological treatment" that can treat a large amount of water at low cost is used in many factories, but it is difficult to obtain stable and high-quality treated water only by "biological treatment", so it is necessary. Advanced processing may be adopted depending on the situation.

One of them, the Membrane Bio Reactor(MBR), is a relatively new technology that combines "biological treatment" with "physical treatment".

MBR is a method that has been increasingly introduced in recent years, taking advantage of its features such as "high quality treated water" and "compact treatment equipment". Due to the high quality of treated water, it is expected to be one of the technologies to solve human problems.

In this presentation, we will show the mechanism, features, and merits of MBR. In addition, we will show an actual introduction example of how MBR is used for purification of factory wastewater in various industries including textile and paper processing industry, and for wastewater reuse needs that have been increasing in recent years. I will introduce it while.

Drive Unit For Sludge Collectors, Thickeners and clarifiers —Long-lasting, Economical, and Ecological Products—

Naonori Tsunehiro
Hanshin Engineering Co., Ltd.

Drive Unit for sludge collectors, Thickeners and Clarifiers is simple and efficiently designed structure. Because of it, easily maintenance checks and long lasting that garner immense praise.

Since the units are centrally driven prevent rail-travelling wheel slippage, which may occur for circumferentially driven types in stormy weather, so the quality of treated water will be stabilized.

In case of an overload, drive units are introduced a chain drive have a play that give a time to start the limit switch and can be stopped before damaging for gear.

The units that have a lifting device can be raised and lowered are able to reset without waste water and sludge removal.

Fundamentals Knowledge of Noise Improvement —About the Fundamentals of Sound, Phenomena and on Noise as a Sense—

Takeshi Hirata
Nihon Onkyo Engineering Co.,Ltd.
Noise Improvement Group, Acoustic Design & Construction Div.

There has always been a noise problem for the outside and in recent years there has been a growing concern about the noise of working environments. The fundamentals of acoustics in solving the problem can provide some pathway to countermeasures. I hope this paper will help.

Chapter 1: The fundamentals of sound will be explained. The mechanisms of sound generation, physical phenomena of sound, differences in sound energy and level, and decibel synthesis are explained. This is followed by a correspondence with auditory perception.

Chapter 2: Sound attenuation by distance and the often-misunderstood phenomena of sound insulation, sound absorption and diffraction are examined using a simple model, and the phenomena of sound in relation to noise control are explained.

Chapter 3: Methods of measuring noise, including metrics for each type of noise, noise control laws, regulatory standards, and assessment locations are described.

Trend on the PCB Waste Treatment -Looming deadline-

Kouji Maekawa
Toyama Kankyo Seibi Co.,Ltd

Proper waste treatment of polychlorinated biphenyls (PCBs) has been led by the government since 2001. It is mandated for those store PCB-contained products to process them on their own or subcontract their process by 2027.

Prefectural/municipal governments are carrying out an investigation targeting the companies who store PCB wastes in order to find further potential wastes that are not notified yet and to promote the completion of their process by 2027.3.31.

Based on our experience of processing over 40,000 low concentration PCB wastes since accreditation. During their process we found some cases where transformers contains capacitors, since both of them have different levels of PCB concentration, they cannot be processed until analysis of the levels for each component is complete. Each enterprise shall play an important role to identify the amount of such wastes and promote the process within a limited timeframe.

Enforcement of Positive List system of Polymer and Regulatory Situation of Paper for Food Packaging Materials

Hideki Nishi
Nishi Packaging Consultant Office

In Japan, The amended Food Sanitation Act was enforced on 1st. June 2020 and the Positive List (PL) system of Resin for Food Packaging was promulgated by the government. However, it needs more several years to complete PL and discussion of Paper is a future theme. This paper introduces latest global trend of Food Packaging Legislations including paper.

Innovations in paper packaging for the realization of a circular-economy society

Toshio Arita
Arita Packaging Consultant Office

In the tide of targeting a circular-economy society, oil has begun to move away, and the renewable energy ratio has begun to increase. Even in the COVID-19 pandemic, the global trend toward the realization of a bio- and circular-economy is steadily accelerating without stagnation. Under these circumstances, packaging materials, packaging technology, and recycling are also at a major turning point. "Less plastics and more recycling" is to reduce the use of plastics and regard used waste as "oil resources on the ground" for maximum recycling.

"Conversion to paper as an alternative for plastics" aims to use paper/cellulose derived from forest resources, which is the largest biomass on the earth, as a substitute for plastics, and there are high expectations for paper. However, in order to realize this, technology innovations in paper and paper packaging are required. Additionally, it is necessary to build an efficient infrastructure for recycling newly developed functional paper packaging materials into raw materials for papermaking. This is a social contribution in which paper manufacturers can take leadership.

Beyond that, the pulp and paper industry itself is required to undergo a major transformation into a biomass industry.

In this paper, 1) conversion to paper from plastics in packaging, 2) paper-based multi-barrier innovations (water-based barrier and heatseal coating, combination with water-based flexographic printing), 3) the establishment of proper recycling standards corresponding to the circular economy, 4) three-dimensional molding technology for paper bottles, and 5) the future prospects forward to biomass industry of the pulp and paper industry are described.

The Current Situations of the Circular Economy in Europe

-Outline of the EU's Second CE Action Plan and the Related Industrial Policies-

Kazunori Kitagawa
Japan Productivity Center

The Circular Economy (CE) is a policy that reduces the dependence on resource consumption in economic activities and promotes the following three main initiatives.

- ① Carefully circulate resources and products.
- ② Regarding products, from sold-out business models, we will provide the function and convenience values of the products as service, emphasize the life cycle management of the products, and promote the extension of lifetime and the use of upgrades.
- ③ Work on the development and implementation of a business model that promotes the above two points.

The purpose of the second CE action plan is to improve the industrial competitiveness of Europe, strengthen the power of consumers, and promote environmental protection.

The priority policy is a sustainable product policy. Its purpose is to ensure that products on the EU market have a longer lifespan and are easier to repair, upgrade, recycle and reuse.

The EU's new industrial strategy is as follows.

-The two of transitions for ecology and digital are called "twin transitions" and affect every part of the economy, society, and industry. We will make investments commensurate with that and develop innovative technologies.

- Innovative products, services and business models require new skills that many people have not yet acquired, creating new types of occupations.
 - In this strategy, enablers (people who make it possible) and regulators (administrative agencies) need to recognize the strengths and roles of the EU.
 - Entrepreneurship and ability to act are important for the new strategy. There, every player in the value chain can do so with a new focus and choice towards the industrial ecosystem.
 - The new industrial strategy shows the vision to be achieved by 2030 and the basis for reaching it.
- Additionally, the author will explain the European digital strategy and the movement to seek a new economic form after the covid-19.

Thermal Energy, Water Treatment, Environment Proposal in Each Field

Takehiro Uwafuji
MIURA CO.,LTD Tokyo MI Sales Department 1

Our company is currently developing various business such as boilers, water treatment equipment, food equipment, marine equipment, sterilizers, water treatment chemicals, etc. The small once-through boiler ZP type released in 1959, which celebrated its 60th anniversary in 2019, has been recognized as the "Mechanical Heritage" of the Japan Society of Mechanical Engineers 2015. The business has spread to the world, and the number of employees is more than 5500 in the group, of which 1500 overseas. As the "best partner of heat, water and environment", we support your life in various fields, and this time we will introduce the latest technology in that field.

Introducing IoT application to reduce cost of industrial waste and save labor

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In cohesion handling of drainage, the appropriate adjustment of the inorganic flocculant depending on drainage load is important in planning stabilization of the processing quality of the water and optimization of a drug and the grime outbreak quantity. The tendency of many kinds is remarkable, and the drainage class drained from a production process does not rarely fluctuate from mass production in small quantities in the recent shop floor during one day.

Two ways of methods usually are almost taken in management of the waste water treatment equipment while it looks like it. It is a method that one assays inorganic flocculant to the drainage of the peak load and injects. When drainage load is low, inorganic flocculant becomes the excessive infusion, and a problem in this method is that the consumption of the neutralizer, the quantity of grime outbreak increase with this. It is the method that a manager adjusts quantity of addition of the inorganic flocculant to depending on the change of the change and cohesion state of the drainage class, and another method is that the problem in this method needs serious personnel expenses. It becomes the understaffed problem more serious today.

For these problems, a technique, the system which automatically controlled appropriate adjustment of the inorganic flocculant depending on drainage load have been bought. This announcement introduces the industrial waste reduction by the IoT application to waste water treatment equipment, labor saving.

An Essay on Methodology for Innovating “JAPAN TAPPI JOURNAL” Part 8: Analyses of Forms of Journals in the Digital Transformation Age

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In the process of conquering the pandemic Covid-19, particular attentions are focused on “Digital transformation (DX)” as powerful tools. Newly emerged this tool has potentiality of improving business as well as national administrative areas, and intended to lead finally to “paperless society”. To what extent this trend will prevail is the major significant concern among stakeholders and researchers in the paper-related areas.

The eighth article of this series is intended to analyze the influence of “Digital transformation” on the wide range of paper related areas. The overall contents are described as below.

1. Introduction
2. Pandemic Covid-19 and Digital Transformation
3. Paperless trends created by removal of imprinting in business and administration documents
4. Flow-type information and Stock-type information
5. In search for optimal forms of journals
6. Necessity of paper-based journals for deep understanding of the contents
7. In search for specific and optimum forms for future Japan TAPPI journal
8. Epilogue

Damage characteristics of silicone rubber caused by abrading the edge of PPC papers cut with CO₂ laser

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We propose to use a carbon dioxide laser to cut the paper which provides two benefits. The blade of the cutting system will not wear without a mechanical cutter and the cut surface can be smoothened by choosing the optimal irradiation of the laser which prevent accidental cutting of the human skin. In the experiment to demonstrate these benefits, a CO₂ laser, a condenser lens, a rotating table, and a silicone rubber that simulates the human skin were used. The thresholds that can cut all the papers used in the experiment with a CO₂ laser was obtained. Simulation experiments using a silicone rubber to characterize the damage caused by the abrasion of the paper edge suggested that the paper edge cut by use of a CO₂ laser was gentler to the skin than the edge cut by use of scissors.

The Degree of Acetyl Substitution of Pulp Reacted in the Demonstration Facility for CNF-reinforced Composites

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We have produced CNF-reinforced composites in demonstration facility on the basis of knowledge gained from NEDO project. The manufacturing process is composed of two parts; hydrophobization of pulp and compounding it with thermoplastics by kneading. It was revealed that undesired large increase of hydrophobicity (the degree of acetyl substitution; DS(Ac)) could be suppressed when a certain amount of water was added into the reactor before evaporation of reagents. On the other hand, it was also shown that the flexural strength of CNF-reinforced PA6 decreased as the DS(Ac) increased in a range of 0.5-0.8. In conclusion, we succeeded in the control of DS(Ac) of pulp and revealed that DS(Ac) has an important effect on physical properties of CNF-reinforced composites.