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2016 January JAPAN TAPPI JOURNAL

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Power Market Potential of the Paper Industry and Its Evaluation
—The Business Opportunities in the Power System Reform—

Masayoshi Watanabe

Ministry of Economy, Trade and Industry

Electric power system reform is pushed forward in the government. The perspective of the reform is comprised of three phases of the next. It is full-scale liberalization of expansion, retail of the wide area system use and the generation, securing of neutrality by the legal separation of the power transmission and distribution section. Revised work of Electricity Enterprises Law is pushed forward along this policy in the Diet. I organized an investigation committee composed of main papermaker and Japan Paper Association in Ministry of Economy, Trade and Industry. I arranged contents and positioning of the energy business to advance in paper manufacture industry in the investigation committee and examined a paper manufacture industry common problem and measures policy. In addition, I performed an investigation, analysis and, parallel to trend analysis in the paper manufacture industry, gathered an example as a report about compound energy business in other industry. This report summarized a part of the examination result of the report concerned.

Innovation of Inspection Technology with the Color Camera

Masahiro Nakata

Inspection Systems Business Div., Omron Corporation

In 1992, OMRON put color printed web inspection system on the market. After that in 2000, "Color Age" was developed for plain web inspection. since those inspection systems had different architecture construction, it was difficult to become widely used in those days. However, in 2009, we finally developed "Super NASP Color" in order to meet inspection needs as follows.

- The integration of architecture construction of inspection system
- Reasonable price to introduce for paper production

- Improvement of the usability and the processing capacity for quantity of color data
- Function to distinguish a harmful red-colored defect that reminds consumers of human blood

Our color inspection technology has led to an innovative inspection method to make practical use of the difference in wavelength of Red, Green, Blue and Infra-Red. Today, we would like to show you the basic technology of color inspection, and also indicate an application possibility to the inspection system based on the difference in wavelength.

Development of SE Rotor Vane

Yujiro Deguchi

Rotor Industry Co., Ltd.

Due to the steep rise in the cost of generator fuel and the need for measures against greenhouse gas emissions, pulpers, which have traditionally used more electricity than other devices, are also required as a part of energy conservation measures. In addition, it is known that more efficient defibration by pulpers can decrease the amount of electricity required by screen devices used after the material-creating process. The need for a rotor vane capable of stronger defibration than existing devices has become evident. While the potential for energy saving has existed in currently available rotor vanes, such energy savings come at the sacrifice of processing quantity. We developed the SE Rotor Vane to address this issue.

Operating Experiences of SE Rotor

Yasuyuki Yamada

Gifu Mill, Oji Materia Co., Ltd.

We have pulper, screen, a process of manufacture, it is the facilities that pulper, screen and refainer use a lot of energy.

We simplified pulp process equipment , and have implemented various energy-saving measures, such as concentration of equipment.

This time we focused on the rotor in the pulp process that consume the most power at Nakatsugawa mill and Ena mill, introduced 90 Type SE rotor is made of six blades by Rotor-Kogyo Co., Ltd..

I will introduce the operating experience and energy saving about the Rotor in the case of

Nakatsugawa mill, that was introduced in June 2011.

Expansion of the Biomass Generation Business with the Paper Production Decrease

Takashi Fukuzako

Fuji Mill, Nippon Paper Industries Co., Ltd.

Due to a reduction in paper production, we have launched initiatives for utilizing surplus electricity, by realizing stable electricity generation and by further increasing the amount of electricity. As a result, Nippon Paper Fuji Mill has been able to achieve significant outcomes for its electricity business.

In this paper, we report introduce the action that was able to utilize the biomass electricity that became the surplus energy effectively.

Operating Experience of Wash Press in D₀-stage in the E-line Bleaching Process

Ken Nozaki

Niigata Mill, Hokuetsu Kishu Paper Co., Ltd.

There are three bleaching lines (D, E and F-lines) in Niigata mill, Hokuetsu Kishu Paper Co., Ltd. The E-line started to be operated in 1998 at 1200 T/D production capacity with a D₀-Eop-DnD bleaching sequence, which was the first operational ECF bleaching large-scale plant in Japan. In 2001, the productivity increased to 1300 T/D by remodeling E-line, a bleaching sequence was changed to D₀-Ep-D₁. E-line has still been operated at 1300 T/D productivity, which is about a half of a total production of three lines, because of remodeling digester, new construction of the F-line and others.

The bleaching agents consumption rate of E-line is the worth of the three. The D₀-stage washer has recently been changed an atmospheric diffusers with a wash press to improve bleaching agents consumption rate. In this paper, changes of operating conditions by changing D₀-stage washer were reported.

Iwaki/PM3 Operating Experience of Product Change by Machine Relocation and Remodeling

Yutaka Wada

Linerboard Dept., Iwaki Daio Paper Corporation

A machine stopped N3 machine for Daio Paper Kani Mill (the product kind: Paper) in February, 2014 number 3, and Iwaki Daio Paper completed remodeling and relocation by 6 months and did an equipment test run in August, 2014.

2 months are to manufacture a sampler by 6 factories of related corrugated cardboard company, establish the quality and begin commercial operation as planned in October from equipment operation, and I'm producing 12,000 tons of monthly production at present, existing, I'm producing 40,000 tons of machine and ply metal paper main stencil monthly production by Iwaki Daio PM 1.

Operation Experience of New Liner Machine

Yoshikatu Monma

Marusan Paper Mfg. Co., Ltd.

Marusan Paper PM8 started the trial operation from December 26, 2014, and has produced commercial paper since January 26, 2015. In February of the year, we achieve 500 t/day. Currently extracts various problem towards the stable operation, it is the stage which is carried out operation while solved.

PM8, corresponding to the thin of containerboard growing from the environmental aspects of the needs was built the quality, productivity and cost competitiveness in the concept, was built as a round paper machine PM6 of S&B.

In this paper, we describe operating experience of the up to the present from the start of paper machine equipment overview of the PM8, and commercial operations.

Analysis of the Bleedable Compounds at Pulp's Top-Surface by ESCA and TOF-SIMS

Hiroto Higashi, Tohko Nakamura and Keijiro Soma

Material Analysis Center, Oji Holdings Corporation

It was commonly found that the aging and the manufacturing conditions were influenced on the surface properties of the paper. We assumed that the change of the surface properties was caused by the bleeding of the low-molecular-mass compounds to pulp fiber surface. In order to confirm this assumption we carried out the surface analysis of hand sheets using ESCA and

TOF-SIMS.

A handsheet was prepared from a hardwood pulp. ESCA and TOF-SIMS analysis showed that the bleedable compounds, such as C-C chemical bonds increase on the surface of the sheet at high temperature.

Functional Analysis of Japanese Green Tea Cultivar “Sunrouge”

Masafumi Wasai and Akiyoshi Kawaoka

Agri-Biotechnology Research Laboratory, Nippon Paper Industries Co., Ltd.

Hirofumi Tachibana

Department of Bioscience and Biotechnology, Kyushu University

Sunrouge is a Japanese green tea cultivar containing anthocyanin, developed by Nippon Paper Industries' original “In-container rooting technology” based on a photo-autotrophic culture system, jointly with the National Agriculture and Food Research Organization and the National Institute of Vegetable and Tea Science. In this study, we evaluated suppressive effect of Sunrouge on metabolic syndrome and found that Sunrouge has the highest inhibitory effect of amylase and α -glucosidase activity, a digestive enzyme that hydrolyses polysaccharides into glucose, among the 51 major Japanese green tea cultivars. In addition, we verified that Sunrouge has a suppressive effect on the elevation of the postprandial blood glucose level by oral starch tolerance test in mice and humans, and on the elevation of HOMA-IR by diet-induced obese model test in mice.

Report on 2015 TAPPI International Conference on Nanotechnology for Renewable Materials

Takeshi Nakatani

Nippon Paper Industries Co., Ltd.

The 2015 TAPPI International Conference on Nanotechnology for Renewable Materials was held at Hyatt Regency in Atlanta, Georgia, the U.S.A. from June 22nd to 25th. Approximately 250 delegates attended the conference and most of them were from the US and Canada. Reported at the conference were 110 oral presentations and 45 poster presentations. Summaries of the conference are reported.

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Cutting-Edge Technologies for Recent High Demands on Energy Consumption and Limited Grade Stock

Keiji Yasuda

Overseas Sales Dept., AIKAWA IRON WORKS CO., LTD.

Kazumi Fujita

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

A higher price and a lower quality of the waste paper due to a recently increased export of the good quality Japanese waste paper have been causing the problems of a poor product quality and a lower yield in the Japanese paper industry. It is said by one of the media that the continuous increase of the waste paper import to China has ceased since the beginning of this year, but the decline of the waste paper volume in Japan will continue due to the decreasing number of the paper consumption.

The major problems that Japanese paper mills are facing now are “Lowering product quality” due to introducing the prohibited materials, “Increasing power consumption” due to the higher ratio of the wet-strength, and “Lowering yield” due to decreasing waste paper grade.

In this article we would like to introduce the concept, structural principle and case studies of the latest products developed with the cutting-edge technologies in design and manufacturing processes that contribute to solving the problems that the paper mills are facing.

Felt Cleaning System “SHOWER ROLL”

Narihiro Ohtaka

Aoki Machinery Co., Ltd.

Due to recent poor quality of furnish caused by increased use of recycled paper, increased dosage of chemicals, increased rate of using collected water, higher machine speed and etc., the level of contamination of felt and canvas is getting higher and higher these days. To eliminate this contamination well enough gives much impact on how efficiently we produce paper and

board.

Concerning felt cleaning, cleaning agents and detergents used for felt cleaning cause foaming in the process, poor sizing level and increased amount of water treatment cost. Because kinds of contamination are different depending on the machine type, the machine speed and the paper grade, the cleaning method must be changed accordingly.

The conventional ideal cleaning method consists of a cleaning shower, a high or a medium pressure shower, a wetting shower and a suction box or a squeeze roll. However, a high or a medium pressure shower causes fluffing and then abrasion on the felt surface leading to poor cleaning effect.

On the other hand, when dewatering with a squeeze roll, it can decrease air permeability of the felt due to the caliper reduction and clogging. It is extremely difficult to maintain the felt condition and to extend the felt life time with using these conventional cleaning methods. Furthermore, much showered water splashed around the shower equipment causes poor working environment. It can also generate rust on mechanical parts and can damage roll bearings.

In this situation, we have developed a cleaning system, "SHOWER ROLL" which has a cleaning method different from those of conventional ones to cope with the above mentioned issues and is environmentally friendly, too.

We hereby introduce mechanical characteristics of SHWER ROLL and our experiences of operations.

Resolving Web Breaks and Defects Fundamentally !

Drastic Chemical Solution of Deposit Problem by Process Cleaning

Eiji Koga

Sales and Marketing Dept., Nissin Kagaku Kenkyusho Co., Ltd.

The deposit in the papermaking process often has bad influence to machine operation, the pulp and paper productivity and the quality of the product. Therefore successive various measures are performed to restrain a deposit. In the papermaking process especially using the waste paper, it's difficult to restrain a deposit perfectly by a fluctuation of the wastepaper quality. There is a way to plan for a solution by strengthening the deposit control to such problem, but the problem as cost increase occurs newly. For the appropriate solution of deposit problem, it's important to clean periodically the papermaking process on the shutdown, and control deposit of a constant level as well. In the recent years' paper making process, the contents of the deposit in the process are changing by various technological introductions. So it's necessary to optimize process cleaning agent and the use method according to the change. Introduction of the most

appropriate process cleaning method makes operation become stable, and improve the productivity, and stabilize the quality, and you can reduce the cost.

Introduction of Liquid AKD for Alkaline Board Making System

Mark Kao and Stephane Menard

Solenis Water Technology

Masanobu Hatano

RIKENGREEN CO., LTD.

Alkaline sizing in paper board making system became the global trend and move into Asia Pacific recently, mainly due to more Calcium Carbonate in recycle waste paper which is not easy to control the system pH and higher cost from rosin size due to the labors cost increase. The other reasons were unexpected raw material supply and getting worse on fiber strength quality due to more recycle times and higher quality demand at paper end used or even lower basis weight required for cost saving.

In order to get good paper machines runnability and paper properties that several topics are discussed (i) alkaline sizing market trend in recycle board paper making (ii) reasons for alkaline board paper making (iii) solutions that can be implemented to alkaline board paper making system on sizing or (iv) balance of retention and drainage to keep paper machine runnability.

A good alkaline board making system are not only using alkaline fine paper making system as references but also need to consider the balance of retention & drainage on minimize the impact of strength properties due to formation changed.

Recent Technical Trends and Application for Rosin Sizes (II)

Takuya Kawamura, Ryuji Itose, Wakako Masuda, and Kenichiro Yokota

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

Harima Chemicals Group is the only one manufacturer of tall oil rosin in Japan, and we have our oversea manufacturing bases in 11 countries. By utilizing these advantages, we have been globally developing pine chemical business in various fields such as paper chemicals and printing ink resins.

With respect to the paper chemicals, a rosin size is one of the major paper chemicals in the world, and the rosin size has been applied with aluminum sulfate for wide ranges of

papermaking pH conditions to give desirable sizing property for paper and paperboard.

Recently, it is getting much interest and concern about food contact substances. In the United States, it is general for the paper chemicals including rosin size to comply with FDA (Food & Drug Administration) regulation, and rosin which is a major component of rosin size has been approved as one of the substances to safely use in paper and paperboard which contact with food. Considering FDA compliance for rosin dispersions, we needed to develop anionic polymer type emulsifier with FDA compliance since there was no anionic polymer approved by FDA as the emulsifier even though its quality was basically advanced.

In this report, the newly developed rosin dispersed sizes, an effective application method of this rosin dispersion based on the mechanism study for sizing performance and trial result at paper mill are introduced.

Automatic Core Cutter “with Metal Cap Inserter”

Naoaki Uesugi

Maruishi Co., Ltd.

Papermakers and converters strive to improve the quality, reliability, logistic, ergonomics, environmental sustainability and cost effectiveness. The new paper machines and converting lines get wider and faster for each new installation with maximum automation level. To stay on a global market is constant improvements and investment in new technology.

Maruishi has made a technical alliance with Sweden Core Link as to the core equipment since 1991 and manufactured in Japan. Core Link has technological innovations for the core equipment for dozens of years and tried to increase productivity and customized for a labor-saving machine and reduction of expenses to fit the customer's needs from their experience and delivered to several hundred companies in more than 50 countries.

I would like to explain about Automatic Core Cutter “with Metal Cap Inserter” which was delivered as the first machine manufactured in Japan.

Existing Folio Sheeter High Efficiency Improvement Program

Tayfun Ozbaki and Akihiko Koya

K.K.IRISU (C.ILLIES & CO., LTD.)

BW Papersystems, which includes: MarquipWardUnited, Will-Pemco, Kugler-Womako, and

Curioni, offers market-leading technology for folio, cut-size and digital sheeting and packaging machines, plus stationery, passport production and specialized paper converting applications.

Part of the BW Papersystems history is the Marquip Knife. Its history starts on the corrugator, and then was developed for use in the sheeter industry. Evolving through the years, across multiple industries has made the Marquip Knife the most advanced knife in the world. It provides clean, accurate cuts, with a speed curve that is unmatched; while creating sheets that are press ready. There are over 1,800 knives installed across the globe, of which 350 are on Sheeters. The knife has been installed at paper mills, paper convertors, commercial printers, folding carton plants and on corrugators.

Optimizing Steam Systems for the Paper Industry

Toshiki Takenaka and Katsuhiko Machino

Consulting Engineer

CES Center, TLV CO., LTD.

In recent years at paper mills, due to countermeasures against global warming and steep increases in the price of raw materials, efforts to conserve energy and reduce costs are becoming ever more imperative. Also, mills that been in operation for several dozen years are not rare, and increases in maintenance costs as well as production opportunity losses due to trouble are becoming issues.

Here we will introduce our “Steam System Optimization Program (SSOP)” which realizes improvements in steam conservation and stable operation of steam systems, typified by boilers and paper machines. SSOP is divided into 3 phases dealing with optimization of “Condensate Discharge Locations”, “Steam-using Applications”, and the “Entire Steam System (Energy Balance)”. In order to carry out these phases, there are two programs: a “condensate discharge location management program (BPSTM)” which is a system for maintaining optimum conditions by making visible and solving issues such as steam loss and problems caused by condensate from condensate discharge locations (steam traps and peripheral equipment); and a “comprehensive steam system analysis (CES Survey)”, in which a specialist diagnoses the site.

SSOP has been adopted by many plants in the petrochemical industry. BPSTM and individual application surveys have already been implemented in a number of paper mills and have received positive reviews. BPSTM has been adopted primarily by the utility department at these mills, and 3 years after introduction in some mills the steam trap failure rate has been reduced from 20% to about 9%, steam loss cut by 4,700 tons/year, and the problem of blocked steam

traps resolved. Also in a mill where the survey has been adopted, by reconsidering the recovery of steam discharged from coating machines, over 1.5 times more steam was recovered, resulting in an approximately 4% reduction in the steam consumption rate. Furthermore, the problems of water hammer and air temperature fluctuations in the paper machine air system were resolved by identifying their causes and drafting countermeasures.

Ideal Closed Condensate Recovery System for the Paper, Pulp, and Corrugated Cardboard Industries

— Heat Recovery System Utilizing Flash Steam under Both Pressurized and Vented-to-Atmosphere Conditions, and High-Efficiency Gas-Fired High-Pressure Once-Through Boiler with Air heater—

Takehiro Uwafuji, and Hiroyuki Hatanaka
Miura Co., Ltd.

MIURA as a leading manufacturer of once-through boilers has adopted “Total solution” as a slogan, promoting various eco-friendly proposals through industrial-water treatment devices and compressors using in-plant steam, and so on. This paper explains following technologies;

- Closed condensate recovery system which recover heat from flash steam under both pressurized and vented-to-atmosphere conditions
- Industry's highest gas-fired high-pressure once-through boiler with air heater, under the closed condensate recovery condition

Standardized and Automated Paper Quality Testing for Process Optimization and Control —L&W Autoline - Case Studies—

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

In all types of mature production, 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 goal is to produce a product within given specification at the lowest possible cost - quality testing and monitoring of the process is one way getting there.

In this speech, I would like to share some case studies, introducing design concept and capability of L&W Autoline as well as knowledge which has been obtained from installation

base of more than 400 systems all over the world.

The History of Technological Developments of the Paper Industry in Japan

Part 4: The Start of Pulp Production

Kiyoaki Iida

Following progress of paper machine, pulp making was also revolutionized in the 19th century. Alkaline cooking of rags and straw in a globe digester was perfected by the middle of the century. Then, wood was pulped with alkali in a stationary digester in America and ground wood pulp was produced in Germany in the 1860s. Sulfite process for wood pulping was also investigated at the each side of the Atlantic, and the basic design was completed by the end of the century. At the beginning of the 20th century, newsprint was manufactured with GP and SP in a large scale and KP, a little later, accomplished its system including the recovery plant.

The Meiji era was exactly the time pulping processes were evolving, and pioneers in Japan sensitively understood and followed the progresses.

First, rags were cooked with alkali. Paper manufactured by an imported machine with rag pulp could not compete to imported paper that was efficiently produced. The cost down was done by Heizaburo Ohokawa, who cooked rice straw with alkali, copying straw pulping in the U.S. He made newsprint in which straw pulp was 60% and the rest was rag pulp.

Having a news saying that SP was commercially produced in Europe, Ohokawa visited the mills and decided to produce SP by himself. After efforts for 5 years, he built a mill (Keta mill) in Kiso area. Though the mill was miserable at the start, he accumulated know-how, installed a GP plant and a paper machine, and finished an integrated mill based on wood. In ten years later, this model was repeated as Nakabe mill. The model was very significant in the history and was a base for further expansion to Hokkaido and then to Sakhalin .

Corporate Profile & Products Information (29)

Maruishi Co., Ltd.

In 1943, Mr. Taichi Ishikawa founded Maruishi from scratch to manufacture repair parts for the pulp and paper mills on the foot of Mt.Fuji, Japan. As a man of entrepreneurship, he didn't set limits for himself. He had a big dream – to start design and engineering work for his own products and serve clients' needs with the best knowledge. An excellent opportunity presented

itself in 1970 when Maruishi signed its first license agreement with Maschinenfabrik ANDRITZ, of Austria, to manufacture its patented Twin Wire Wet Wrap Machine. That was the beginning of Maruishi's global expansion, followed by more than a dozen of international technical alliances later on. Today Maruishi's machine technology covers nearly all paper machinery requirements, from wood handling, stock preparation, paper machine, coater, to modern finishing machines. Maruishi is committed to global technical exchanges and unlimited technological development for high-tech modern paper machinery. We grow together with our worldwide clients and technical partners. And like our founding father, Maruishi's global aspirations for technical challenges, are limitless.

—Peer Reviewed—

Thermomechanical Pulp Innovation for Energy Saving and High Brightness Paper Development

Takanori Miyanishi

JAPAN TAPPI

It is reported that Douglas-fir is not suitable for mechanical pulping. Extractives such as dehydroquercetin and quercetin contained in the heartwood of Douglas-fir are known to be deleterious by consuming costly bleaching chemicals with the result that the end product may be a pulp with lower brightness. The objective of this study was to improve bleachability of thermo-mechanical pulp (TMP) of Douglas-fir. The TMP interstage bleaching was selected as a model process, where hydrogen peroxide bleaching took place between the primary and the secondary refining. Two sets of experiments were carried out to evaluate pulp washing and chip pretreatment in various conditions. The first experiments showed that pulp washing with water after the primary refining prior to the interstage bleaching was effective in improving bleachability. The second experiments found that chip pretreatment with diethylenetriamine-pentaacetic acid (DTPA) or sodium hydroxide (NaOH) prior to the primary refining improved bleachability and saved 35-40% hydrogen peroxide in the interstage bleaching to achieve 55% ISO brightness. Precautions were taken to optimize the chip pretreatment conditions. The pretreatment efficiency depended on the initial pH of the chemical liquor and the optimal pH range was found to be around 11.5. DTPA or NaOH, which were added for the chip pretreatment, showed the same effect. The experimental results were successfully applied to the energy efficiency project in one of the largest TMP plants in North America.

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Wearable Device and IoT in the Workplace

Yoshihiro Hosokawa

Personal Product Planning Division, Ubiquitous Business Strategy Unit, FUJITSU LIMITED

The use of wearable and IoT device at site is expanding.

Nowadays, those devices are highly expected to be as work-style innovation at site even for those fields where ICT (Internet Communication Technology) has not been really introduced.

There is a trial calculation that 50 billion of IoT devices will exist on the earth by 2020 and it is expected that the market size will reach 200 trillion yen in 2020, used by various types of industries such as manufacturing, medical, finance and so on.

On the other hand, it is very hard to predict benefits to be taken by implementing wearable or IoT devices precisely.

Besides it is hard to judge what kind of device should be chosen for each site as there have been already various types of devices.

Current situation is that there are only few devices which fully satisfy needs of field site who would like to implement readily to have an effect.

For this talk, I'd like to explain the usability of wearable and IoT device by showing actual usage at customer's site as well as a verification of benefits and introduction of Fujitsu's wearable and IoT devices that are released in May 2015.

Novel Kappa Measurement Technologies

— A Breath of Fresh Air for Pulp Makers —

Akhlesh Mathur

BTG Instruments, Singapore

Masashi Hasegawa

BTG Division Spectris Co., Ltd.

Pulp being an intermediate and commodity is always under pressure to contain costs, meet quality specifications and has the right environmental profile, irrespective of where a mill is on

the cyclic profitability curve. Having sharper and smart eyes to the process not only allows pulp makers to optimize the unit operations but these sensors are providing continuous visibility to mill management and proven tools to tighten controls and take quick preventive actions before it is too late.

The whole Kraft fiberline process from cooking through to bleaching is designed to selectively remove lignin from wood chips to produce pulp that meets brightness and strength requirements and is produced in most cost efficient way. Traditionally, fiberline has been monitored & controlled using fiber kappa alone. Missing information on dissolved lignin has been one of the root causes of lack of implementation of fully automated process controls.

This paper focuses on new sensor technologies available today that measure lignin in various forms including dissolved lignin. Deployment of these sensors at key locations in fiberlines have demonstrated huge savings to mills in yield and chemical consumptions. These innovative measurement technologies have enabled optimum process control strategies for mills to operate and change gears quickly to remain on the sweet spot of optimum cost and productivity curves and that too with attractive payback. These smarter novel sensors are quickly gaining popularity among pulp makers as breath of fresh air and a differentiated approach to operate pulp mills today.

Introduction of Dirt Observation Device 「Open-K-DO」 at Fuji Mill

Singo Totsuka

Fuji Maintenance Control Department, Fuji Mill, Nippon Paper Unitec Industries Co., Ltd.

At NPI Fuji mill, DIP plant which has two series 210 T/d has been operating and they use Omron online dirt counter (ASP-D400P) for quality management. Now we see things from every angle and make a plan for achieving higher efficiency. One of our plans was online dirt counter additional installation. However, Omron announced the product will be end of sales on May 2015. Hence, we made up our mind to focus on other maker not Omron due to end of sales, but we couldn't find adequate product in terms of pricewise and maintenance. So we asked our NPI engineering division Nippon paper Unitec (NUT) to develop dirt counter for raw materials process.

NUT had been discussed with Omron and ready for develop successor model by NUT itself. Developing has been started at DIP plant NPI Fuji mill since August 2014. After field test finished roughly 1 year, it's been operated online dirt observation device (Open-K-DO) in August 2015.

This report presents the outline of developing process which we introduced into Fuji mill DIP

plant.

Proposal for Reducing Usage of Freon Gas and Device Maintenance Man-hour

Shuichi Yuki

FA east section Tokyo Office, Apiste Co., Ltd.

Paper manufacturing process has distribution panel in order to control device and production line. Current advanced automatic production system needs to prevent electronic equipment from machine trouble and keep reliability of rejecting sudden stop and extending equipment life. In the case of considering causes in heat, it is widely known in paper manufacturing companies that FA cooler is effective to avoid troubles. As results, FA cooler is highly adopted in SD/ BM/ process device.

Electronic device trouble causes can be specified in “alteration and deformation” or “adhering contaminants”. “alteration and deformation” mostly occurs in result of chemical reaction. Electronic devices are delicate and easy to have troubles in temperature rise because chemical reaction speed is more quickly proceeding in high temperature. In relation between temperature and failure rate in control device, Arrhenius equation is well-known. When calculating relation based on Arrhenius equation between semiconductor temperature and failure acceleration, appendix1 shows failure rate 1 in 40. when Semiconductor is 60°C, its failure rate will be 10~30. also, when Semiconductor is 80°C, its failure rate will be 100~300.

Distribution panel countermeasure against heat is still a key technology for distribution panel design because fan, heat-exchanger, and air-conditioning duct are tried in various situation ever; however troubles still occurred by deficiency in cooling performance, cooling irregularity and dew condensation. FA cooler is now well-known to propose and give better solution for all above problems.

Existing FA cooler mostly use alternative Freon gas(ex. HFC134a) for cooling. Usage of alternative Freon gas FA cooler is being anxious to introduce in production line because of rising man-hour by Freon gas emission and reducing law instead of excellent effectiveness. At this time, Apiste proposes new FA cooler to keep good condition in production device and avoid using alternative Freon gas.

Papermaking 4.0 Concept of VOITH Paper

Ryozo Shimizu

Control System Engineering 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. Papermaking 4.0 is the sum of three main talents in a system of systems:

OnEfficiency SmartControls delivers sustainable performance. Papermaking 4.0 encompasses decentralized self-autonomous yet modular and integrated control solutions, distributed along the entire paper & board production process, enabling producers to easily drive their plant on THE key parameters to continuously achieve business objectives.

OnCare SmartMaintenance delivers intelligent reliability. The smart self-diagnostic capabilities and seamless connectivity of Papermaking 4.0 ready products facilitate the highest attainable plant availability at the lowest overall cost of maintenance through a high degree of predictive foresight, automated service and material management.

OnServ SmartService delivers immediate assistance. Around the clock capabilities and assistance deployed through remote, on-site and on-call arrangements, supporting our customers with data analytics, diagnostics and real-time process optimization, ensuring highest plant performance and availability.

The most important differentiating factors from tradition automation solutions are in the high degree of modularity, step by step approach and unison between both production & maintenance faculties. The value delivered by our solutions substantially exceeds the sum of value from the individual components, generated through our USP, our know-how embedded into these solutions.

Optimization of Pulp Production by Sustainable Optimization Modeling

Ken'ichi Kamada

Innovation Center, Marketing Headquarters, Yokogawa Electric Corporation

Total optimization becomes increasingly important with the growth of distributed energy supply that combines diverse energy sources such as renewable energy, cogeneration, and battery. In plants, optimizing the whole process/plant attracts attention rather than per-equipment optimization.

However, optimization requires mathematical models of every piece of equipment in the plant. Building models needs broad knowledge such as thermodynamics and chemical engineering on the process and equipment, statistical analysis, and mathematical programming. It is too costly to build all models by human engineers. Furthermore, both the number and the kinds of models increase when the coverage of optimization expands.

YOKOGAWA developed Data-Driven Plant Optimization Modeling (DDM) to solve this problem. It automatically formulates equipment models from historical data of operation. Using this technology, we can reduce the cost of initial model building and model maintenance.

We have started experiments of DDM in several processes in order to verify the cost reduction of the modeling and the accuracy of automatically created models. With a utility plant, for example, we archived the reduction of 80% of man-hour to create equipment models for the plant. This technology will be applicable to pulp production processes.

Case Study by Replacing QCS of a Paper Machine

Masahiro Takashimizu

Hachinohe Mill, Mitsubishi Paper Engineering Corporation

In June 2014, QCS of PM5 in Hachinohe mill, has been updated. At the planning stage, we intended to reduce the frequency of routine parts replacement/repair for the moisture meter sensor head placed in the high temperature environment around the size press, and intended to reduce the paper broke through the improvement of the basis weight cross direction control performance, as one of the benefits obtained through QCS update.

Few problems had been occurred and resolved. Major issues were the measurement value fluctuation of ash meter sensor just after automatic calibration and basis weight cross direction control. The excess profile variation was caused by the following two reasons. One was inexperience in new control algorism and the other was mismatch between existed actuator system and new QCS. After resolving these issues, we have succeeded to reduce the paper broke.

This paper introduces the issues and their solutions in detail occurred in the installation and start up.

Replacement Project of PM5 Rewinding Control System

Hiroyuki Sato

Niigata Mill, HOKUETSU KISHU PAPER CO., LTD.

Jagenberg 'Vari-step' winder in Niigata mill has been operated more than 27years to wind up mainly woodfree uncoated paper which is produced by PM5.

This winder is used two drum winding system and that drive adapts Fuji Electronics's DC motor control system. On the other hands, Jagenberg original system controls slitter position, core chuck position and rider roll nip pressure curve.

Currently, IHI Voith which inherits winder business from Jagenberg announces end of support of this winding system, so that we decided to replace this system to latest one. At this time, these replace project was the first case in Japan. In this report, we introduce the overview of this replace project and difference between new system and old one.

Scanning Measurement Reboot

— ZipLine —

Mikio Kojima

HPS P2 Sales Dept., Honeywell Japan Inc.

Honeywell's ZipLine measurement device combines Honeywell's proven sensor designs with a new, patented, flat sheet scanning system which is easier to install, and has a lower total cost of ownership than traditional scanner designs, while assuring product quality and higher yields for superior economic benefits.

Honeywell ZipLine is a self-contained scanning measurement device which provides high-speed measurement of flat sheets without the cost, size, and complexity of traditional O-frame scanners.

ZipLine is remarkable for what it doesn't have; rigid scanner beams, drive belts, carriage wheels, linear bearings, power track, compressed air, or water. Compared to a traditional scanner, ZipLine has 90% fewer parts, which, along with simplified installation and high performance measurements, contributes to a low cost of ownership and unparalleled value.

The Strength and Technology of State-of-the-Art LED Color Sensor

Takato Kishi

IA Platform Business Headquarters, Yokogawa Electric Corporation

For online color sensor in paper production line, conventional xenon flash lamps have been used as light source. Xenon flash lamps have some advantages on color measurement, because they have sufficient illumination and relatively flat spectrum from violet to red for accurate color measurement. However, on the other hand, the xenon flash lamps require seconds of time for charging high voltage that makes color measurement intermittent. And its spectrum contains ultraviolet ray which disturbs measurement on fluorescent sheet. To evaluate the effect of fluorescence, the conventional color sensors have optical filter mechanism to switch “UV-in” measurement and “UV-out” measurement. This means the two measurements are not obtained at the same spot of the sheet simultaneously. On the purpose of addressing the challenges, Yokogawa have developed a new online color sensor using LEDs as light source. The design and technology of controlling visible LED and UV LED separately enable continuous color measurement and reliable fluorescence measurement. Further, the LED controlling technology provides a function of rejecting ambient light coming into sensor gap.

Another issue is that color measurement may be influenced by the positional relationship between sensor and measurement plane because it is a kind of reflective sensor. Our new LED color sensor is equipped with an optical system designed to minimize characteristics of pass-line and pass-angle. In addition, it has a function of pass-line detection and compensation using IR LED (our patented technology). As a result, our sensor is insusceptible to deflections of pass-line and pass-angle.

The History of Technological Developments of the Paper Industry in Japan

Part 5: Integrated Mills and New Wood Resource Sites

Kiyoaki Iida

The integrated mill model, where paper was manufactured with pulp produced in-mill, was established using softwood in Kiso and Fuji areas, which the Meiji government sold as a new source of revenue. At the end of the 19th century, the integrated mills were constructed one after another mostly in Shizuoka area. Their plants mostly imported were in a larger and larger scale. A group of engineers, introduced as the second generation in the Part 3, worked actively and know how was accumulated in the industry. That made the next expansion possible.

As the demand grew and wood resource got scarce, mills were constructed in Hokkaido which reserved more forest. Tomakomai mill, Oji paper and Ebetsu mill, Fuji Paper were large enough to be competitive for imported paper so that their product replaced the imported.

The demand still kept growing at the rate of 10 % a year, forest in Sakhalin was interested in. Oji Paper, which took over geological survey by Mitsui & Co., and Fuji Paper built mills there.

Fuji Paper, of which CEO was Ohkawa, introduced kraft process and sold wrapping paper with good profit. In 1938, Sakhalin shared 40% of the total pulp production in Japan, and that of Hokkaido was 35%. In 1942, the pulp capacity in Sakhalin was 421 thousand tons per year and a half of the pulp produced there was brought back to the inland.

Corporate Profile & Products Information (30)

Honeywell Japan Inc.

We Honeywell Japan Inc., is Japanese subsidiary of Honeywell United States, it was established in 1982, which has subsequently led domestic affiliate companies to join into one Honeywell group. Honeywell products have been around in Japan for more than 60 years. Three SBG Honeywell's products being supplied in Japan are, Aero space, Automation and Control Solutions, Performance Materials and Technologies. As Honeywell group, it is home to 127,000 employees in 1250 offices and factories in 70 countries around the world.

We described further details of Honeywell Japan in Japanese below.

—Peer Reviewed—

Chemical Mapping of Cell Wall Components

Dan Aoki, Yasuyuki Matsushita and Kazuhiko Fukushima

Graduate School of Bioagricultural Sciences, Nagoya University

Time of flight secondary ion mass spectrometry (TOF-SIMS) is a rapidly developing technique that provides chemical information about the solid sample surface and does not need any pretreatments. The significant advantage of TOF-SIMS over other methods is the direct visualization of many organic/inorganic chemicals on the sample surface with submicron lateral resolution. Here, the applications of TOF-SIMS to wood science are reviewed.

Plant cell wall consists of three major polymers (cellulose, hemicellulose, and lignin) and many other inorganic and low-molecular-weight organic chemicals. Usually, the polymer components are detected as fragment ions in the TOF-SIMS measurement. The fragmentation behaviors of the polymers are essential to discuss the original structure so that the behavior is described. Especially, the behavior of lignin is described in detail. Subsequently, several results on the relative amounts and the chemical structure of the lignin in specific plant tissues are

discussed. A report using TOF-SIMS to discriminate the indistinguishable sapwood from heartwood in discolored ancient wood material is also introduced.

The recent advances in cryo-TOF-SIMS are described. Cryo-TOF-SIMS can deal with a frozen-hydrated sample and is a powerful approach to visualize water-soluble chemicals of nearly equal distribution in a living system. At last, results on pulp and paper chemistry using (cryo-)TOF-SIMS are described briefly.

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Introduction to Oji Papéis Especiais Ltda. in Brazil

Shinya Akimoto

Technology Department, Oji Imaging Media Co., Ltd.

Oji Papéis Especiais Ltda. (hereinafter called OPE) Piracicaba Mill was established in 1953, to produce paper by using the sugar cane bagasse pulp, and was acquired by Oji group in 2011, which had had the technology tie-up with OPE for 25 years and counting.

OPE is located in Piracicaba city in Brazil and has two paper machines and three coating machines. The company has supplied high quality coated paper in Brazil, and its capacity is 120,000 t/y. OPE has big share in Brazil, about 80% with thermal and carbonless paper.

In recent days, having been demand increase in Latin America, The mill is expecting to make the capacity investment.

Study about Recycling for UV Cured Prints

Takanori Otsuhata, Kazumasa Toyota, Chika Hirabaru, Moe Fukuoka and Shisei Goto
Nippon Paper Industries Co., Ltd.

In recent years, various kinds of ink and/or printing system have been developed to reduce energy consumption and the time for delivery as well as to get higher print quality. Several kinds of printing materials from recovered papers were chosen to evaluate their recyclability by using high density pulping and/or PFI mill treatment as a mimic of a mill kneader alternative. The dirt speckles of the de-inked pulp from UV cured, UV vanish over coated, and polystyrene over coated prints were much higher than those of conventional prints. Although high reactive UV cured prints brought fewer dirt counts than the conventional UV prints, they were also affected by printing conditions, especially the intensity of total irradiation of UV lamp for curing. The surfaces of print sample were investigated by using attenuated total reflection infrared spectroscopy (ATR-IR) method. As a result, the ATR-IR methods brought more precise classification for each sample in terms of their recyclability compared with conventional solvent detection method. Consequently, the ATR-IR method will be able to contribute more efficiently

to sort out recovered papers with poor recyclability in order to enhance quality control of de-inked pulp production in a mill. It is very important to collaborate with companies related to printing industries to facilitate recycling of recovered papers including UV cured prints.

Reduction Electricity Cost by Enhancing the Capacity of TMP Plant

Takeshi Sugimoto

Chuetsu Pulp & Paper Co., Ltd.

For remarkable rise of crude oil price, Chuetsu Pulp & Paper Futatsuka mill stopped an expensive dust coal boiler of the generation unit price in June 2010, and shifted to running only by a biomass boiler. As a result, the self-generation of electricity of Futatsuka mill is used up with facilities except thermomechanical pulp (TMP) plant. Thus, it was necessary to use purchase electricity for the operation of TMP plant which needed much electricity. For ability of storage and production capacity, Futatsuka mill couldn't but operate TMP plant in daytime since the unit price of purchase electricity was higher on weekdays.

In this report, we would like to introduce the case study that could increase the capacity of production as well as energy and cost saving significantly have achieved with making use of the equipment that has so far remained unused.

Energy Saving by Introduction of Thermocompressor to the Container Board Machine

Yuri Itoh

Yashio Mill, Rengo Co., Ltd.

Rengo Yashio mill has been engaged in saving energy with all of mill employees and this approach has gained a high reputation from many associations. This report describes approach and effect for installation of thermo compressor, surplus steam recovery system, as one of the energy conservation activities. Even though it was the first study and experience of thermo compressor operation with a paperboard machine of Rengo, we found a means to utilize it by making up the control system with minimum required equipment. Moreover, this system has been operated without any problems in manufacturing process and any additional energy consumption. Although this trial is not finished yet, the steam recovery system with thermo compressor can be very beneficial if the process condition is fitted to the system.

Energy Saving Performed by Remodeling Drainage System of No.4 Paper Machine

Hajime Endo

MPM OPERATION Co., Ltd.

Our No.4 paper machine operated at Hachinohe mill of Mitsubishi Paper Mills LTD was not really outstanding at steam saving as compared with other paper machines.

A factor is difference of the steam consumption at the dryer part. And problems are lower efficiency of the steam equipment and differences of the operational condition, the mechanical drainage flow, and the drainage balance. We modified the drainage system as a solution of these problems in December 2013 and achieved big steam saving.

This report is described about the past problems, the modifying of drainage system, and the result of steam saving.

Efforts for the Practical Use of Cellulose Nanofibers

—The Development of Functional Additives—

Masayuki Kawasaki

Nippon Paper Industries Co., Ltd.

As a comprehensive biomass industry, Nippon Paper Industries Co., Ltd. tries to develop various new business areas making the most of woody biomass. As one of the new use of cellulose, we focus on production and development of various applications of cellulose nanofibers (CNF). We examine the use of CNF not only for functioned nanocomposite (with resin or rubber etc.) utilizing its high fiber strength and low thermal expansion, also for an optical film utilizing its high transparency and for a catalyst carrier or the absorbent utilizing its high surface area. Among those uses, because the use of CNF as functional additives such as thickener or dispersant is a similar use as existing carboxymethyl cellulose (CMC), early commercialization is expected. In this report, as the example of the effort for commercialization we present the development of CNF as functional additives. And the production method of CNF, the solidification technology for practical use and CNF's various characteristics as additives are reported.

Review of Biorefinery Work Based on the Production of Dissolving Pulp

Yosuke Uchida

Bioresource Development Center, Oji Holdings Corporation

As a part of biorefinery business of OJI group, we started commercial production of hardwood dissolving kraft pulp at Yonago mill since May 2014. At the same time, we also initiated verification tests for furfural production. In this report, the review of our biorefinery process and operating experiences are presented.

Preventive Measures against Insect Invasion by Improvement of Supply Air Balance at PM8

Yuichi Morita

Otake Mill, Nippon Paper Industries Co., Ltd.

The No.8 machine in Nippon Paper's Otake Mill produces paper of food use, so the presence of any insects in the paper can be directly linked to customers' complaints, and cause serious problems leading to the loss of customer trust. In recent years, various measures have been implemented to prevent insects invading the paper-machine room. This has reduced the number of complaints concerning insects being found in paper, but has not eliminated them entirely. Therefore, new measures were taken to improve of supply air balance, intended to prevent insects entering from outside. As a result, a significant reduction in insect defects was achieved.

This presentation will report the contents of the investigation that was carried out, and the results that were achieved.

Report on the Results of the Fiscal 2015 Follow-up Survey on "JPA's Action Plan for 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 Nippon Keidanren's call to the Japanese business community to organize "Keidanren's 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 “JPA's Action Plan for 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 2015 follow-up survey (actual results for fiscal 2014), fossil-energy derived CO₂ emissions in fiscal 2014 was 18.05 million tons, a 27.6% reduction compared to the fiscal 2005(24.91 million tons).This is attributed to each manufacturer's active efforts including energy saving and energy conversion from fossil energy to non-fossil energy such as biomass energy.

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

Nano-Cellulose Seminar Hosted by the Embassy of Canada in Japan

Takanori Miyanishi

JAPAN TAPPI

Nano-Cellulose Seminar hosted by the Embassy of Canada in Japan on January 26, 2016 attracted 100 participants and active discussion was made. A professor of University of British Columbia (UBC) and project managers of Alberta Innovates – Technology Futures (AITF) were invited from Canada to present Canada's role in nano-cellulose materials from basic science to commercialization. An excerpt of the seminar was reported in this paper.

Upgrading Paper Machines with Virtual Technology

Peter Fisera

Managing Director CF Procsim GmbH

Erik Bargfrieder

Geschäftsführer e.b. consulting & project management GmbH

The majority of all paper machines are rebuilt several times in order to increase production capacity. The "less important" parts such as recuperation, ventilation equilibrium, exhaust heat and sometimes steam and condensate system are not given particular preference. The original concept of energy efficiency has changed dramatically. Because of the complexity of relationships between efficiency, quality and production the energy optimization of a paper machine is not possible without profound analysis of the drying process! The mathematical description in the form of a virtual machine is the shortest and most efficient route to the destination in such tasks. Simulation is the only means by which planned capital investments to boost the drying performance of paper machines (to save energy or increase capacity) can be effectively proven in the pre-project phase. The technical design of planned upgrades is optimized and fine-tuned before the project start to rule out any unpleasant surprises later. The effectiveness of new equipment can be observed in the virtual paper machine using supplier guaranteed parameters. This brings massive and efficient support for all technical issues and reduces project risks significantly. Virtual technology brings higher project profits through lower project costs, optimized solutions and shorter start-up periods.

A Report on Tokyo Paper 2015, a Joint Conference of the 9th International Paper and Coating Chemistry Symposium & International Paper Physics Conference

Takanori Miyanishi
JAPAN TAPPI

Many scientists and engineers from overseas joined us for Tokyo Paper 2015, a joint conference of the 9th International Paper and Coating Chemistry Symposium and the International Paper Physics Conference, which took place in the University of Tokyo during October 29 to November 1 in 2015. The conference set the stage for their communication and discussion focusing on paper and coating chemistry, paper physics, the latest developments in bio-composites and nanocellulose materials, new papermaking technologies including stratified forming and foam forming, and computer process simulation. The conference provided an opportunity for future collaboration between the members in an in-depth investigation that could continue to transform the pulp and paper industries to stay viable and profitable.

The History of Technological Developments of the Paper Industry in Japan

Part 6: The Struggle of Washi Industry and Environmental Concern

Kiyoaki Iida

How was the washi industry in the Edo period? Based on old historical method, they used kozo (mulberry) and mitsumata (paper bush) as raw fiber, prepared pulp and made sheet by hand. Many domains (han) encouraged papermaking as it was an important business to their revenue. With substantial supply of paper, wood block printing flourished in everyday life.

As the Meiji era started, letter press printing and paper carton were introduced as a new way of life, and paper that fit to them, called yoshi, was imported. Washi unfortunately lost its printing-paper market. Then, washi countered the trend. In free spirit relieved from restriction of old domains, new developments, which Genta Yoshii was famous for as one of pioneers, were taken in like use of cylinder machine, new product exploitation and open cooperation. Washi maintained its output that was larger in money than yoshi until 1915, 40 years since the start of yoshi production in Japan. Typical new products were typewriter paper and Tengujo (very thin and uniform paper), and were exported abroad. The volume exported was 350 tons in 1913.

The output, however, decreased drastically after 1920. It was not competitive in price to yoshi, which was produced in a big machine with wood pulp. The washi industry is now producing products of highly functional quality.

—Peer Reviewed—

Current Situation of the Japanese Pulp and Paper Industry

—Special Lecture of Tokyo Paper 2015—

Takanori Miyanishi

JAPAN TAPPI

The manufacture of pulp and paper is one of the world's oldest industries. The significance of paper and paper products is obvious to everyone; no manufactured products play a more meaningful role in every area of human activities. The industry has developed through many technological innovations for centuries. Japan is an energy efficient country and the emission per GDP is very low among advanced economies. The carbon dioxide emission per unit of paper and paperboard production has been reduced significantly due to industries' numerous efforts including energy saving, conversion from fossil fuel to biomass residues and installation of energy efficient equipment. We aim to realize a green recyclable economy and nurture "urban forest." It is a part of the program to reduce fossil fuel consumption and carbon dioxide

emission in preventing global warming. By applying biotechnology to forest science, Suzano in Brazil will start commercial scale field tests of gene transformed Eucalyptus trees that grow fast or hold the traits of salt, frost or drought stress tolerances. In advanced economies, printing and publishing on-demand is the future of the industry and is one of the most important strategies that publishers need to embrace to grow in today's digital marketplace. In the United States, TAPPI Agenda 2020 Technology Alliance encourages the development of advanced manufacturing technologies that promise transformational impact on the paper and forest-based industries. In Europe, deep eutectic solvent was selected as the winning concept to lower carbon dioxide emissions. By dissolving wood and selectively extracting lignin, it could replace both chemical pulping and mechanical pulping. In Japan, the Nano Cellulose Forum was established for its rapid commercialization. It is all-Japan based consortium, for sharing information and enhancing cooperation among academies, industries and governments. Dr. Isogai et al. received Marx Warenberi Award for their research on TEMPO mediated cellulose nanofibers. By their method, the energy need can be reduced significantly and the cellulose produced this way can disperse homogeneously. It is a discovery that paves the way for nanocellulose being one key product of the future forest industry.

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Energy Saving Effect by Air Dryer Blow Nozzle Upgrade at PMN6 in Ishinomaki Mill

Hideyo Yamaguchi

Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

Ishinomaki Mill is one of the main mills of Nippon Paper Industries.

Its annual production amounts to 860,000 tons of paper from its 6 paper machines and 2 off-machine coaters. A pulverized coal boiler provides the main source of energy, with 2 black liquor recovery boilers and a biomass boiler also contributing to the energy supply.

We started operating the N6 paper machine (with on-machine coater) to reinforce our capacity in November 2007. The N6 paper machine is one of the largest capacity machines (1,005 tons per day) in Japan, and makes light-weight coated paper and A3 coated paper.

The speed of this paper machine is restricted by its drying capacity. A further problem is sheet breaks caused by lumps of dried coating color piling up in the air floating dryer. We installed a new blow nozzle in the air floating dryer in September 2014 to enhance drying capacity, and to avoid the lump pile-up by stabilizing web conveyance. As a result, we achieved a 20% energy saving through enhanced drying efficiency. However, it did not prevent lump pile-up enough. In this report I explain equipment details of air-dryer blow nozzle and operating experience with saving energy effect and dealing with sheet running.

Characterization of the New Polymer and Its Use for Low Pressure Boiler Water Treatment

Shintaro Mori

Kurita Water Industries Ltd.

A boiler had a problem with scales adhering internally. A scale remover has been required in addition to conventional chemical for boiler water treatment, but if excessive remover is added, the steel material in the boiler pipe may be damaged.

Kurita Water Industries has invented a multi-purpose chemical preventing scale and corrosion in boilers and removing scales. It has low in corrosivity against steel materials. It also comprises

products approved by the United States Food and Drug Administration (FDA). It may be proposed to customers seeking safer and more reassuring boiler water treatment chemicals, such as hospitals and food and beverage factories.

Approaches and Issues on Odor Problems

Eriko Tawara and Keiji Soma

Material Analysis Center, Innovation Promotion Division, Oji Holdings Corporation

We receive a lot of consultations about the group-wide odor problems and get requests for analyses of those. The contents include various things such as an official method analysis related to Offensive Odor Control Law and an investigation of off-flavor that occur in the products.

In this report, two topics about odor problems on which we have been working were described. One is concerned with the environmental odor that might affect the surroundings of the mill. The law regulates the odor generated from the mill or the workplace for the purpose of conservation of living environment and health protection of the people. The odorants regulations that measured in equipment, is being changed to odor index regulations using the human sense of smell. Since olfactory panel is required to have normal sense of smell, we have confirmed the normality by the olfactory test using five types of odorants. When the mill has odor problems, we should go there to carry out sensory evaluations and gas samplings. It was possible to help solve the problems by analyzing the samples in our lab to identify the odor-causing substances.

The other is an analysis of off-flavor generated from the products. We are often asked to analyze the tissue papers and the paperboards with unusual smell. We have been manufacturing paperboard and cardboard, have a particular attention to the complaints by the musty order (2,4,6-Trichloroanisole: 2,4,6-TCA and 2,4,6-bromoanisole: 2,4,6-TBA). The case analyzed in the past and the proactive measure were described. We carried out the sensory evaluation of products and sensed musty odor. The sources have been identified by the instrumental and process analysis. As a proactive measure, we have implemented the test for selecting sensitive panels of smell.

The Method of Curing Activated Sludge Treatment Process during Shutdown

Kenji Hayashi

Mushugen Industries Co., Ltd.

As one of the characteristics in the pulp and paper waste water treatment, we can point out that there are long no-load running terms due to “Shutdown” once or twice a year. Long no-load running terms put load-fluctuation stress on the activated sludge treatment process : main process of the pulp and paper waste water treatment, and cause deterioration of performance or degradation in the quality of activated sludge flocs, and may result in various troubles at the restart after Shutdown.

Expressly after the Lehman Shock, during the large-scale equipment work or adjusting the production, it tends to extend the term of Shutdown. Even the wastewater treatment facilities have actualized a trouble which have not been a problem before, when the restart after the shutdown. Therefore, it has become more important to support during the shutdown.

Mushugen Industries Co., Ltd. have cultivated the technique of curing activated sludge treatment in other industries, and we have promoted the application in the field of pulp and paper wastewater treatment.

In this paper, we describe an overview of the knowledge or results acquired by experience in it.

The Latest Wet-end Control Technology by New Type Retention Aid “REALIZER FX Series”

Kazutaka Kasuga, Koichi Tadaki and Hiroyuki Oishi
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We have been working on developing more efficient retention aid with new concept to replace the today’ s main Dual Addition System of Cationic retention aid and Anionic retention aid. As a result of the effort, “AXISZ System” was successfully brought to market, “AXISZ System” consists of “REALIZER A Series” /high-performance coagulant, good for minimizing the stain of paper making machine and “REALIZER R” Series/high-performance Cationic retention aid.

“AXISZ System” is very unique and is extremely different from competitive products design. Especially, in case of Cationic-single addition, “REALIZER-R300” achieved extremely better retention that resulted in expanding its application to coating machines and board paper machines. Since then, we kept working on the development of Cationic polymers good for single addition.

As was pointed out, closed system of water and increase of waste paper ratio have brought a

lot of pitch and ash. Consequently, there has been a trend that increased dosage of various kinds of chemicals for fillers. As for retention aid, there are cases that conventional dual addition system or cationic single addition cannot work well as before.

Under these circumstances, we newly developed “REALIZER FX Series” /Anionic retention aid and then, have been working on establishing the innovative retention system based on the Anionic retention aid. In this paper, we would like to show the instances of REALIZER FX System applications and dual addition system with new concept which is effective in stable fixation of various kinds of chemicals for filling in combination with “REALIZER A Series” .

The Latest Technological Trends of PAM Based Dry Strength Resins

Shigeki Nobukuni, Hideo Baraki and Koji Yoshitani

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Polyacrylamide based dry strength resins (PAM) are multifunctional chemicals which are widely used to enhance paper/paperboard strength, and to improve drainage, and retention of fiber, fine, and filler. In recent years, papermaking conditions have changed by greater use of recycled pulp, high amount of coated broke in furnish, higher loading of filler, increases in speed of paper machine and closed water system in paper mill. These trends results in the rising of pH values and electric conductivity of furnish and the increasing of dissolved and colloidal substances in papermaking systems, that disturb the absorption of papermaking additives to fiber and fine. Under these circumstances, the performance of conventional PAM has become unsatisfactory.

Recently we developed two types of new technology for PAM. One is the manufacturing process for highly branched and higher molecular weight PAM, and the other is introduction of novel absorption unit in PAM. In this report, we will explain the characteristics of our new PAMs as the latest technological trends of PAM.

New Generation of Functional Coating Binder Allows New Coating Properties Design and Higher Coat Efficiency

Jan-Luiken Hemmes

Business & Application Development Paper APAC, Kemira (Asia) Company Ltd.

Colin Liu

Surface Chemical APAC, Kemira (Asia) Company Ltd.

Tatsuya Ohnishi

Kemira Japan Co., Ltd.

The main functional role of a Paper coating binder is to bind the pigment particles, which make up for more than 85% of the dry weight of the formulation. In addition the binder affects the printability of the paper by helping the absorption and drying of the printing ink. Thus a range of coating binders has been developed over the years to cover the needs of coating pigments with different surface characteristics and fineness as well as work well for various printing processes. Approximately 50% of the coating costs can be attributed to the binder system, so one of the main driving forces in binder development has been to reduce the cost of the binder system. As starch as coating binder is significantly cheaper than latex it has become very common to use more and more starch in coating formulations. Especially in pre-coating and also top coating for matte and silk papers of lower quality adding more starch is a feasible option. Too much starch as binder, however, has also some disadvantages like lower binding strength, negative effect on gloss, fold cracking and mottling and results in lower coating solids, high shear viscosity and difficulties to run lower coat weights. The new patented Fennobind binder technology deviates in a significant and surprising way from well-established knowledge about synthetic binders. We will demonstrate in this paper the main deviations and give some ideas how it is possible to utilize these new findings to develop more cost effective formulations and show how papermakers can pass with this knowledge the current boundaries in order to create additional value.

“ANDROMEDA” Latest Technology for Tissue Converting Machine by FUTURA

Yasuhiro Takeyama

MATSUBO Corporation

FUTURA is a leading global technology company that creates and delivers converting solutions which allow producers to capture market share and gain significant competitive advantages worldwide. Some of FUTURA's unique and proven technologies are introduced in this article.

New Softness Evaluation Tissue Softness Analyzer TSA

Hiroyuki Miyaoka and Kunio Sasaki

Scientific Instruments Dept., Nihon Rufuto Co., Ltd.

One of the most important characteristics to determine whether a tissue is functional or not is the “softness”. The consumer can directly sense this parameter so that it influences the purchasing behavior decisively. However, the commonly used term “softness” is not correct. The words “handfeel” or “grip” or “haptics” respectively should be used as the softness is only one of several factors that influence the individual evaluation of tissue.

The individual perception of the handfeel is therefore mainly determined by the following characteristics: the actual fiber softness/fiber stiffness (which is determined by the fiber material itself, but also by added chemicals like softeners, wet strength agents or lotion); the surface and internal structure, which depend on the manufacturing technology and on the “creping” and “embossing”, if applicable; and the stiffness, which is mainly determined by the fiber material, the manufacturing technology and the used chemicals. Furthermore, the thickness, the grammage and the number of plies come into play. This makes clear that it is, similar to the evaluation of the taste of wine or whiskey, a very complex and extremely subjective and therefore unreliable parameter. This parameter is further influenced unconsciously by the color, the smell, printed patterns, the tester’s current mood and motivation, even the weather and the season as well as personal preferences.

The History of Technological Developments of the Paper Industry in Japan

Part 7: Summary and Discussion

Kiyoaki Iida

After the Meiji Restoration, printing (letter press) and packaging (carton and container) were introduced as a new life style, and paper for them, called “yoshi”, was imported. Then, the domestic paper industry was born to supply those kinds of paper. It, however, took thirty years for the industry to take off. Since then, the industry grew at the rate of 6-10 % a year, supported by the steady growth of GDP which was three percent a year, and replaced the imported products. I believe that the thirty years before the takeoff was the preparatory period for the technological development of the industry.

One fact contributing the takeoff was a group of engineers who graduated from Tokyo Higher Technical School (Tokyo Institute of Technology). They had chances of visiting abroad while young, and innovatively led mill constructions and operation thereafter.

Regarding building paper machines, Japan started by copying imported machines. Then,

Japanese iron works imitated newest technologies in imported ones, and finally supplied half a number of paper machines installed in Japan. Auxiliary equipment were also made by domestic suppliers.

The most important characteristics of the Japanese paper industry is to have had interest in wood pulp in its early age (10 years later than America) and to have built integrated pulp and paper mills. They started using softwood in Fuji and Kiso areas, and moved to Hokkaido and then to Sakhalin, and built mills big enough to be competitive like Tomakomai mill of Oji Paper Co.

It is believed that the high levels of culture and technology in the Edo period, one of which was high literacy rate, helped the growth of the Meiji era. People and goods in the Edo period, however, could not move so freely as in Europe of the Industrial Revolution. The Meiji era released this restriction and the technology began to develop dynamically along with cultural evolution. The paper contributed to this development as a mean of helping free movement of information and materials.

The 9th Public Meeting with Japan Patent Office Examiners

Takanori Miyanishi
JAPAN TAPPI

The 9th public meeting was held for the examiner of Japan Patent Office to explain recent developments of Japan patent policies and to hear experts' opinions of intellectual property departments of paper companies. The Patent Law has been revised, and it has become acceptable for employees and companies to discuss and decide on fair rewards for inventions beforehand. For the company, deciding on rational rewards through consultation means avoiding the management risk of being hit later with a huge claim by an in-house inventor. The Japan Supreme Court has given a new and unique ruling on the interpretation of product-by-process (PBP) claims. The Supreme Court held that for an invention of a product, even if a process to manufacture the product is stated in the claims, the technical scope of the invention and the gist of the invention should be determined and recognized as covering products that are identical in structure and feature to the products manufactured through the process described in a patent. The Supreme Court adopted the product identity theory.

Preparation, Characterization and Application of Organic Conducting Polymer-Silica Nanocomposite Particles

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We have prepared organic conducting nanocomposite particles which utilize polypyrrole/polyaniline as conducting parts and small silica particles as dispersants. The nanocomposite particles of polypyrrole/polyaniline and silica represent a potentially useful processable form of polypyrrole/polyaniline, a normally intractable conducting polymer. Transmission electron microscopy (TEM) studies confirm that the polypyrrole-silica/polyaniline-silica nanocomposite particles are made up of microaggregates of the original small silica particles, which give rise to a raspberry morphology. The particle diameter of the nanocomposites as measured by the TEM observation can be varied over the range 200 – 400 nm depending on the colloid synthesis conditions. We demonstrated that the polypyrrole-silica/polyaniline-silica nanocomposite particles can be utilized as display elements for electrophoretic display due to their high colloid stabilities. The electrical conductivities of polypyrrole-silica/polyaniline-silica nanocomposite particles are measured and the paper sheets coated with these nanocomposite particles have higher conductivities compared to a conventional paper sheet. The polypyrrole-silica/polyaniline-silica nanocomposite particles can be utilized as conductive paper sheets.

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ISO Standardization of Calculation Method of Carbon Dioxide Emission Intensity from Iron and Steel Production

Hiroyuki Tezuka

Energy Technology Committee, The Japan Iron and Steel Federation

Climate Change Policy Group, Technology Planning Dept., JFE Steel Corporation

As one of the CO₂ intensive industry, the Japanese steel industry addresses climate change in many ways and one of the good examples is the establishment of the common indicator for carbon dioxide emission intensity from iron and steel production; ISO14404. This paper presents the overview of ISO14404, the challenges and solutions in the standardization process as well as the future strategy of ISO14404.

The Operating Experience of the Vacuum Evaporator, Type of Vapor Recompression

Chiaki Aoyama

Niigata Mill, Hokuetsu Kishu Paper Co., Ltd.

We have been making large facility investment, emphasizing the environment load reduction system. Particularly in Niigata mill, we have improved CO₂ emission intensities by reduction of usage fuel oil and introduction of Gas Turbine Generation and Heat Recovery Boiler. In COP21 held in France at the end of last year, the international framework of the global warming measures become the historic agreement, and the importance of global warming measures and the energy-saving actions have been increasing all over the world.

For the purpose of 2 old facilities over 35 years update, environmental load reduction, the reinforcement of the black liquor concentration process, we planned the introduction of new vacuum evaporator, the name of H Train started the business operation since June 2015. We adopted method Vapor-Re-Compression-System (abbreviate it to VRC as follows) which compressed the steam by the re-compression fan again, and strengthened the black liquor concentration ability and steam reduction. The introduction of the VRC method in the black

liquor concentration facilities made by Sumiju Plant Engineering Co., Ltd. is the first in Japan.

After the operation of H Train, we have continued the stable pulp production. Energy consumption rates and CO₂ emission intensities of Niigata mill have been tending to reform. In this paper, we briefly describe the outline of the equipment and operating experience of the vacuume evaporator, type of vapor recompression.

Development and Application of Hyper Flat Drive System

Eijiro Nakashima

BANDO CHEMICAL INDUSTRIES, LTD.

H.F.D. (Hyper Flat Drive system) is one of new developing product for an energy serving power transmission system replaced from V-belt system which currently used V-belt transmission system in air conditioner, blower, and ventilate system so on at production plant and commercial facility.

Flat belt self, they have two weaknesses or disadvantage one is belt side tracking, other one is dropping the belt tension those weakness compensate by our new developing mechanical device, self-side tracking control and automatic belt tensioner device.

It was possible to achieve energy serving, long life time and maintenance free, As result of H.F.D could reach about 7% energy saving compared V-belt system and there times of life time. Other features are cleanness and quietness.

Hydrogen Energy Supply Systems Utilizing Renewable Energy

Hiroyuki Ota, Hirofumi Kurita, Takashi Nakagawa, Tatsuoki Kono, Fumiyuki Yamane
and Naoki Ohtaki

New Energy Solution Project, Toshiba Corporation

Some variety of hydrogen energy storage and supply system has been developed. The basic concept of those systems is to utilize hydrogen that is derived from renewable energy, aiming to provide carbon-free energy systems. Hydrogen-based autonomous energy supply system “H₂OneTM” has developed for a “Business Continuity Plan Model”, and has been under demonstration in Kawasaki-city. The other “H₂OneTM” equipped solid metal hydrate storage has constructed in a hotel as a “Resort Model”. And development of H₂EMSTM which has the function that predicts demand and supply of hydrogen is advanced as the system for the factory.

“Energy-Saving Method of the Satellite Type” by JBIC

Yasuhiko Shiota

JBIC : Japan Business Innovation Consulting Co., Ltd.

Energy-saving of the satellite type is a joint promotion project led by the head office. Project team called Satellite is a gathering of a few factories. Usually this project is composed of 3 factories (own factories or group company's factories) and the head office.

～The Satellite's merits～

1. A team of factory can be formed from a small number of members. (Each factory)
2. At the same time, in three factories together, they can put out results of energy-saving.
3. Communication between the head office and each factory can be actively maintained.
4. External wisdom is obtained (Headquarters technical department and each factory).
5. The principle of competition works.
6. Deep knowledge and information for the target process is required in order to share information, and to acquire skills.
7. It will form the structure which can continue in between the head office and factories.
8. It can plan the energy saving development of the head office-led model, and the profit contribution of all factories is obtained.

The Activity of Energy-Saving Produced Results in a Short Term

Ryosuke Kotani

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

Amid rising interests over renewable energy, Oji group has been positively progressing the utilization of biomass and hydroelectric power generation. Since paper manufacturing is an energy-intensive industry, the amount of purchasing energy such as LNG is still large. As recent rise in energy prices influencing severely over the profits of the industry, searching and practicing energy-saving matters that can be realized in short term are desired. Since setting up an aim of reducing 1.5% of energy consumption from the planned number based on the production plan and progressing energy - saving activities in every Oji FTEX mills, Nakatsu mill has limitedly settled a small team and worked on energy-saving during the second half of 2013 in order to produce results in a short term.

As a result, 19 actions have progressed in six months and succeeded in reducing 122 kL of energy per year measured in terms of crude oil. (corresponding to 0.45% reduction compared to the previous year)

This paper presents the activity of the “Energy-saving team”, two energy-saving acts (“Improvement of steam traps” and “Halting single compressor”) and “System of visualizing energy consumption rate” which was a practical tool to progress energy-saving activity in manufacturing sites.

State-of-the-art Recovery Process Technology by Andritz

—A Futuristic Pulp Mill with Integration of Fiberline and Recovery Processes—

Masato Tsuchitana, Daisuke Nagamine and Chiaki Kawakami
Andritz K.K.

Kraft pulp production mill system is an ideal process as all chemicals are recycled and energy is generated self-sufficiently or more than enough with the biomass fed to the mill. The kraft mill system is consisting of a number of processes in the pulp production line and the recovery island. Until end of 90's individual processes like cooking, washing, bleaching, evaporation, recovery boiler, recausticizing and lime kiln had been normally supplied by different process plant makers.

From the beginning of 21st century, large pulp production mills with more than 1 million tons/a were built in mainly South America that have required major plant makers to supply more comprehensive and combined processes on EPC basis. In order to meet the requirements and improve the total mill efficiency, Andritz has promoted R&D work and developed new technologies that improve energy saving, production efficiency, product quality, and increase energy generation plus minimizing emissions. These new technologies developed by Andritz are also useful for the existing mills.

LignoBoost

—Further Usage of Lignin from Your Kraft Pulp Mill—

Hiroshi Yamashita
Sales Group 2, Valmet K.K.

LignoBoost enables the kraft pulp mills to have flexible future possibilities about both

process and revenue.

The biorefinery has been focused on by several industries because the sustainable material is getting a key word to develop new processes. Lignin is one of the major compounds of woody material. Lignin has been used as a fuel for a recovery boiler for long years in kraft pulp mills. Today another possibility about lignin is now prevailing. Once lignin is extracted to the outside of recovery process of kraft pulp mills, the mills will get a new opportunity to sell lignin to the market. It could be replaced the fossil fuel with at a lime kiln or a power plant to save carbon dioxide emission. In addition, there is further attractive possibility about lignin which is expected to be a raw material for bio products such as bio plastic, binder, carbon fibers etc. Those kinds of bio products could be a new revenue for kraft pulp mills.

Commercial scale lignin extraction has just started in the US and Europe. It is expected that the speed of development of lignin-based product will be accelerated.

Development of the New Generation Latex that Has Excellent Picking Strength and Runnability for Paper Coating

Takuro Kawaguchi and Masaya Kamo

Latex Research Group, R&D Center, NIPPON A&L INC.

Latex is one of the most important components to control the qualities of coated paper. In the conventional latex, the optimization of quantities and distribution of adhesive component in the latex particles has been made to improve picking strength and runnability such as removability of dried coating color film. However further improvement of picking strength and runnability by the conventional way i.e., optimization of adhesive component, is difficult. Therefore, we developed new generation high performance latex that has further improved picking strength and runnability without depending on the adhesive component. The high performance latex has excellent picking strength and runnability. Especially its picking strength is 30% stronger than that of conventional one. In this paper, we discuss the mechanism of excellent picking strength of the high performance latex focusing on its film tensile strength and interaction with pigment. The tensile strength of the high performance latex film is increased significantly than that of conventional one, so its picking strength would be strong. Besides, in only calcium carbonate used coating color, the high performance latex shows excellent picking strength. It is considered that the high performance latex interacted strongly with calcium carbonate. In addition, the dried coating color film which containing the high performance latex could be easily removed with water. The high performance latex has a hydrophilic surface, so its film might be easily washed away.

—Peer Reviewed—

Development of an Excellent Depth Feeling Wallpaper Screen Based on a New Theory of an Optical Biomimetic Model of Human Skin

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^{*2} Course of Electro Photo Optics, Graduate School of Engineering, Tokai University

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When we consider viewing the surface of human skin, the skin gives us a sense of natural depth, while, in contrast, the surface of a plastic does not. It is sure that the feeling of natural depth from human skin does not come from binocular disparity, because we can easily sense the natural depth of the skin, even when using only one eye. In our research program, learning from the structure of human skin, we fabricated screens which consist of multilayers made of translucent sheets coated with TiO₂ nanoparticles. It seems that these screens appear to exhibit Mie scattering which has strong backward scattering relative to forward scattering. Therefore, analogous images can be projected on the screens behind the original images without losing their clearness. The feeling of natural depth from our screen can be considered to come from the multiply-observed images produced by phase differences due to the translucent multi layers and the reflection/diffusion differences of light depending on its wavelength. We also discuss the reflection/diffusion properties using color laser and black and color matrixes. Red ray can reflect many times between the multilayers and resolution of the red image become low. When insert a black matrix among the multilayers, the matrix control the optical properties, and the resolution can be improved. Additionally, in the case of our screens, as well as human skin, we can sense the feeling of depth with one eye. Our screens can be applied to wallpaper or projection screens for events, since they are simple, energy free, and applicable to large area.

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Successful Reduction of Energy Consumption Rate by 4% for 2 Consecutive Years and Future Efforts

Hironori Nishiura

OTSU PAPER BOARD CO., LTD.

Located on the coast of Lake Biwa in Otsu City in southern Shiga prefecture, Otsu Paper Board Co., Ltd. has been putting efforts to protect the environment first since it started operations in 1955, manufacturing and selling environmentally-friendly paperboard(container board). In January of 2004 it converted its fuel source of a power generation system from fuel oil C to city gas, while also adopting a gas turbine co-generation system, achieving a drastic reduction in environmental burden and energy used. However, with the undeniable upward trend in fuel costs influenced by geopolitical risks and a weak yen, measures to counter-act rising energy costs have recently become an urgent administrative issue. In the midst of this, the entire company came together to work on energy conservation, successfully achieving an energy consumption rate reduction of 4% for 2 consecutive years from 2013. In this paper, I will introduce the kind of point of view the company advanced its energy conservation from, citing examples of improvements.

Activities for Energy Saving in Ebetsu Mill

Kenichi Hayashi

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

EBETSU mill is working together for energy conservation aiming to “reduce 257L/h(2,100kL/year)in terms of crude oil” in 2015 to achieve environmental objectives for ISO14001 of the mill.

However, it is becoming increasingly harder to find new energy-saving projects and plans through capital investments.

Therefore, we have been conducting a sweeping review and improving of previous efforts, horizontal developments promoting in other mills in Oji group, and operating conditions of our

facilities for the pulp manufacturing and the paper making processes.

This report introduces several examples showing we have achieved major energy savings as a result of these efforts.

New Chemicals for Boiler Water Treatment from the Viewpoint of Energy Saving

Shintaro Mori

Kurita Water Industries Ltd.

Chemicals for boiler water treatment are evolved out of a long process of energy saving requirement. In this paper, two topics which we were concerned to the development are briefly described.

Low pressure boilers in which feed water are mainly softened water have a problem with mineral scales adhering internally. The scales adversely affect energy efficiency. A scale remover has been required in addition to conventional chemicals, but if excessive remover is added, the steel material in the boiler pipe may be damaged. Kurita Water Industries has invented a multi-purpose chemical preventing scale and corrosion in boilers and removing scales. It comprises products approved by the United States Food and Drug Administration (FDA) against customers seeking safer and more reassuring boiler water treatment chemicals, such as hospitals and food and beverage factories.

For High pressure boilers which have steam generators, oxygen scavengers, alkalizing amines and phosphate are used as a conventional treatment programs. In a treatment program based on film forming amines (FFAs), higher concentration cycles can be achieved, leading to lower amounts of blow down water and therefore to a significant reduction in energy losses. Recent lab studies with FFAs have shown that the coefficients of heat transmission from the heating tubes into the water phase are significantly higher than when phosphate treatment is used. As a consequence, lower energy losses can be expected. FFAs have been successfully used in real applications for decades in Europe.

Energy Saving in Waste Paper Stock Preparation

Mikio Takahashi

Akita Mill, Nippon Paper Industries Co., Ltd.

Our stock preparation system has two lines which are No.1 line used 100% JOCC and No.3

line used JOCC and mixed waste paper. Today, we produce about 80% of recycled pulp for liner board machine. No.3 line was installed in 1991. In this time, we have updated the pulper which is responsible for a part of the screening process. And then we are able to aggregate the screen system in order to reduce the power consumption.

Improving the Operation of a Continuous Digester Using Model Predictive Control and First Principle Soft Sensors

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Continuous cooking is a complex process by its nature. It consists of numerous process stages, with long residence times, and strong interdependencies between process stages and variables. Many of the essential process variables are difficult or impossible to measure, including the characteristics of the raw material and the state of delignification along the process line. It is possible that poorly designed and tuned local feedback control could even increase the variance in the quality variables in the pulping line.

This paper introduces Model Predictive Control (MPC) based continuous cooking APC solution which includes impregnation vessel and digester liquor and chip level controls, alkali to wood ratio controls and kappa number controls. Advanced predictive first principle based kappa number soft sensors are introduced and implemented into to quality control scheme. Reported results include increased stability of the cooking process, resulting over 35% reduction in the kappa variability coefficient, enabling a kappa target increase and significant cost savings.

ASA Sizing Technology Based on High Shear Homogenizer System

—Combining Chemistry, Equipment and Papermaking to Improve Sizing Performance—

Wahl Alexander

Paper, Kemira Chemie Ges.mb

Koichi Tanaka

Kemira Japan Co., Ltd.

As with most processes in the paper industry, ASA performance is dependent not only on the chemistry of the product but also relies on robust equipment to develop the full potential of performance of the additive and applications expertise to minimize the unwanted interactions and accentuate the positive effects. Kemira has designed and manufactured Fennosize AS 1-series ASA, to meet the sizing needs of the paper industry exclusively. We developed and patented the manufacturing process to make this molecule with as little residual olefin and oligomeric material as possible. A more robust emulsifying system was necessary to fully develop the sizing performance build into the products. On our way we were able to assess other key factors related to the papermaking process that would have a beneficial or negative effect on product performance. Finally, we applied our global sales, application, and R&D expertise making the Fennosize AS 1-series sizing program the best possible program for our customers. The details of the Chemistry, Application Knowledge and Service are discussed in detail in the following paper.

Start-up of New LinerBoard Machine

Yukio Gyonouchi

VOITH IHI Paper Technology

Marusan Paper PM8, the new linerboard machine started its operation in Dec, 2014, supplied by VOITH IHI Paper Technology. This project is a full turnkey basis including engineering, procurements, construction works, and commissioning, and the scope of delivery are the paper machine, approach flow system, broke handling system, fiber recovery system, finishing machine, field instrumentation, control system such as MCS, DCS, QCS, drive system as well as control system for paper properties in cross direction, additionally all the auxiliary facilities including the overhead crane. In the construction period, temporary storage or space for transport was very limited due to the mill location also due to overlapping the disaster reconstruction projects in the vicinity, and this occurs changes the traffic every day. Therefore the transport unloading and installation work were always in on-time, which is aimed at the delivery and installation timing in accordance with the progress of construction work. Risk management of the installation/construction period delay and safety management was carried out by our construction work on the basis of a number of experiences and references of the past.

The project management of IHI and VOITH IHI ensured the quality, the delivery time, and the thoroughness and the safety, furthermore the success of the scheduled start-up. This paper introduces the outline of project including installation and start-up phase, as well as the specification of PM8.

A New Concept of Wire and Press Section Deposit Control under Deteriorating Furnish Condition

—Discharge Deposit from Paper Machines by Reducing Its Stickiness—

Tomonori Muroya

Chemicals Development Team, Maintech Paper Tech Co., Ltd.

As the recycled pulp in the furnish is increased, the amount and kinds of adhesive deposit is also increased in the system. Particularly, the adhesive deposits lead to serious problems in paper-making machine which cause sheet breaks or defects in a finished paper.

This report introduces the details of a New Concept “Pitch guard” developed by our company, and examples applied in the paper machines are also presented.

Analysis of Distributions of the Paper Chemicals on Paper(IV)

—Visualization Analysis of Polyion Complex Formed by Paper Strengthening Agent and Application for Development—

Kensuke Yutani and Norihito Higashitani

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

In recent years, there is a growing demand for paper chemicals to show higher performance for the following reasons. Firstly, pulp fiber quality is becoming worse due to an increasing recycling rate of used paper. Secondly, as the consumption of fresh water being restricted, the electrical conductivity (EC) of water becomes higher in paper making process. We aim to develop new paper chemicals, which is optimized for the above change of the wet-end condition.

Visualization analysis of Polyion complex (PIC), which is formed by Amphoteric Polyacrylamide (PAM) based paper strengthening agents, has been investigated by Scanning Probe Microscope (SPM). Using an advanced SPM measurement, clear image of PIC which

retains on the pulp fiber in aqueous solution was achieved. It was also found that fixation state and floc size of PIC was dependent upon wet-end condition. The increase of EC prevents PIC formation and thus decreasing PIC size. Therefore we have designed a novel paper strengthening agent, which can make larger size of PIC under high conductivity. This new agent gave higher dry-strength of paper than conventional one.

From the Researches Presented at 18th International Symposium on Wood, Fiber, Pulping Chemistry (ISWFPC)

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¹⁾ Graduate School of Agricultural and Life Sciences, The University of Tokyo

²⁾ Graduate School of Life and Environmental Sciences, University of Tsukuba

The 18th International Symposium on Wood, Fiber and Pulping Chemistry was held at BOKU university (Vienna, Austria) in September, 2015. Totally about 220 researches were presented (oral 90, poster 130). Presented researches covered wide range of chemistry related to wood - lignin, nanofiber, biorefinery, bioenergy, biomaterial, pulping, bleaching, cellulose, paper, and others. In this article, 86 presentations will be briefly reviewed.

—Peer Reviewed—

Peroxymonosulfuric Acid Treatment as an Alternative to Ozone for Totally Chlorine-free and Elementary Chlorine-free Bleaching of Hardwoods Prehydrolysis-kraft Pulp

Andri Taufick Rizaluddin, Ayyoub Salaghi and Hiroshi Ohi

Graduate School of Life and Environmental Sciences, University of Tsukuba

Keiichi Nakamata

Technical and Development Division, Hokuetsu Kishu Paper Co., Ltd.

This study is focused on improving totally chlorine-free (TCF) and elementary chlorine-free (ECF) bleaching by using peroxymonosulfuric acid (P_{sa}) instead of ozone (Z). Bleaching was conducted by a combination of oxygen (O) with P_{sa} , followed by alkali extraction with hydrogen peroxide (E_p) and chlorine dioxide (D) stages in accordance with proposed sequences $O-P_{sa}-E_p-P_{sa}-E_p$ and $O-P_{sa}-E_p-D$. Increments in pulp consistency during the O stage and an addition of $MgSO_4$ during the E_p stage were performed to improve pulp brightness and viscosity.

The O-P_{sa}-E_p-P_{sa}-E_p sequence was compared with the O-P_{sa}-Z-E_p sequence, and 87.3-88.3% ISO brightness was achieved by TCF bleaching corresponding to the O-P_{sa}-E_p-P_{sa}-E_p sequence. However, the viscosity obtained after the final stage of the TCF bleaching was 5.1-6.0 cP, while the O-P_{sa}-Z-E_p sequence resulted in an 83.1% ISO brightness and viscosity of 5.4 cP. It was difficult to reach brightness above 88% ISO with viscosities greater than 6.2 cP, which are the minimum standard levels for dissolving pulp, using the TCF bleaching sequence. Further studies with better qualities of raw materials are required to investigate this possibility. Meanwhile, brightness 88.1% ISO and viscosity 7.3 cP were achieved by the ECF bleaching corresponding to the O-P_{sa}-E_p-D sequence with only a 0.5% ClO₂ dosage, which suggests a potential reduction in the usage of chlorine-containing chemicals during the ECF bleaching.

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Basic Principles of Wood Chemistry and Proposal for Future Research

Gyosuke Meshitsuka

Professor Emeritus, The University of Tokyo

In this paper, the basic principles of wood chemistry were briefly described with some proposals for the future research. Wood chemistry basically deals with a part of living tree as wood samples, not with wood chips of the raw material of the industry. It is important to note that each tree may have different characteristics dependent on the environmental conditions, in which the tree has grown up, even in the same species. This is one of the reasons why the most careful sample preparation is needed for the reliable discussion.

As far as the topics for the future research of wood chemistry, bio-ethanol production from softwood chips, advanced utilization of lignin, and new chemical pulping method were raised.

History of Continuous Cooking Technology and State-of-the-Art Development by Andritz

Kanji Hagiwara

Andritz K.K.

Kamyr continuous digester was invented and developed by Johan Richter during 1940's. The first commercial digester was started up in Fengersfors in Sweden in 1950, of which capacity was only 50 tons/day. In 1953, the first continuous digester in Japan started up at Oji Paper Kasugai mill. Then, more than 50 digesters have been installed in Japan and probably more than 500 digesters are introduced globally to date. The original technology concept invented by Johan Richter has been further evolved continuously. Today the single vessel digester system has been developed capable of producing more than 5000 tons a day. This paper summarizes major development history of continuous cooking system.

Development of Continuous Digester, Washing and Bleaching Equipment

Yan Ju

Pulp and Energy Projects, Valmet K.K.

The technologies for making kraft pulp were progressed together with development of the continuous digester, the washing machines, and the equipment for bleaching plant, etc.. The latest kraft pulping plant for hardwood which developed by Valmet normally contents COMPACT COOKING™ system, a number of TwinRoll™ presses as washing machine, an extend oxygen delignification system (OxyTrac™), and a high consistency ozone bleaching system (ZeTrac™) etc.. On the other hand, most of the kraft pulping plants in Japan were built before 1990. It is a great challenge to increase the efficiency of these mills in order to be competitive to the latest kraft pulping plant. And it is a good way to take the latest technologies or the concept into the existing plant in order to optimize the system further.

Introduction of Advanced Process Control (APC) on the Kraft Pulp Bleaching Process

Mitsuru Takatsuji

Akita Mill, Nippon Paper Industries Co., Ltd.

At Akita mill, fuel cost reduction in the kiln process has been achieved by use of oil cokes that started in 2013, there is more room for the energy saving because the operation of the kiln still depends on the experience of the operator. Also in the bleaching process, there is room for chemical saving because the process is always operated conservatively to keep the final brightness in the upper part of target range. For the above reasons, we introduced process optimization system to both the kiln and bleaching process in expectations of steady operation and cost reduction. Now, we are working on an early realization of the process improvement.

In this report, the background of the introduction of the system and future effort are explained. Although this system has many installation records overseas, it is first installation in Japan.

Current Situation and Problem of Japanese-Style Paper Recycling

Shigenori Kimura

Paper Recycling Promotion Center

In this article Japan's current situations of collection, distribution, and utilization of the recovered paper as well as the system and characteristics of Japanese-style paper recycling are

introduced. The high utilization rate of recovered paper in Japan has been supported by this Japanese-style paper recycling, that is the securement of cheap and high quality recovered paper.

Next the influence of the consumption decrease in the newsprint and the printing and communication paper in progress and globalization of the recovered paper to the supply-demand balance in the world and Japan is analyzed. Then problems and corresponding direction (reinforcement for recycling) of the utilization of the recovered paper in each product category are reviewed.

DIP Technologies for Lower Grade Raw Material

Nobuhiko Okumura

Technical Department, AIKAWA Iron Works Co., Ltd.

Recently, the positive signs are little by little seen in the domestic economy. However, because of the consideration of the environmental protection and the influence of well-developed digital devices, paper consumption has been kept still with a lower level. Furthermore, exporting of the recycled paper to China has kept still a higher level, even though the Chinese economy development shows a slowdown. With this background, it becomes more and more difficult to get the better quality recycled paper in the domestic market. On the other hand, in order to adapt the lower basis weight production as well as the higher speed paper machine, the quality standard of the DIP line can be more demanding.

Under these circumstances, the domestic paper manufacturing field now needs more and more the suitable technologies and facilities that can improve the quality with the minimum energy consumption, keeping the reasonable yield with using the lower grade recycled paper. In this section, we would like to introduce the basic technologies and the latest challenges for major equipment of DIP line.

Development of “Catalyzer Type De-Inking Agent”

—Development of the De-Inking Agent for UV Curable Inks—

Takashi Tanaka, Takeshi Yoshida and Haruhiko Toyohara

R&D Department, Specialty Chemicals Division, NICCA CHEMICAL CO., LTD.

Recycling of waste paper is an important issue for environmental protection. As the paper

industry is committed to improve the utilization rate of waste paper, more and more the recovery of pulp from low grade waste paper is required to consider.

In comparison with normal printing inks, UV curable inks give strong fixed film which is hard to miniaturize in the de-inking process even at higher process temperature due to its high melting point. As a result, UV curable inks are hardly removed during flotation process because the ink particles are unable to floated by adsorbing on bubbles. Therefore the paper industry is facing serious quality problems of de-inking papers like big residual ink spots.

To avoid such unfavorable problems, printed materials with UV curable inks is contraindicated at waste paper recycling plants who are struggling to conduct the selection of waste paper. In such situation, the development of more powerful and superior de-inking agent and de-inking process for UV curable inks printed waste paper has been demanded. Therefore we have developed the world first “Catalyzer type de-inking agent” by which UV curable inks can be decomposed and miniaturized, by adopting new approach to combine surface science and catalysis science.

Basic Technologies of Pitch Control and New Developments

—NISSIN-Pitch Control Method—

Hidekazu Tada

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

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

The pitch included in the wastepaper will be adhered at various papermaking process, and the deposit causes web-breaks and defects. Therefore taking measures to the pitch in the pulping process is one of the methods to resolve a pitch problem fundamentally.

This report describes an important factor of pitch troubleshooting and introduces the primary and the newest pitch control technology.

Basic Lecture and Recent Development of Scale Control Technologies in Pulp Making Process

Takao Noguchi

Technical Group , Yokkaichi Laboratory , Chemical Business DIV. , Hakuto Co., Ltd.

Slightly soluble deposits called “SCALE” are experienced in pulp and paper industry which use plenty of water. Although this “SCALE” problem occurs in every process, “SCALE” is especially easy to form in kraft pulp making process due to its water quality, pH, and temperature.

If “SCALE” foams in process, it affects bad influences like bad heating performance in digester and bad washing performance in washer. Therefore, “SCALE CONTROL” is very important issue.

In this paper, we show the characteristics of scale deposits, the mechanism of their formation, and scale control technologies.

In addition, we introduce the next generation digester scale control agents “DEPONAX P-78” .

Biomass Researches in the FFPRI

Tsutomu Ikeda

Wood Chemistry Laboratory, Forestry and forest products research institute (FFPRI)

In this seminar, recent project studies on the biorefinery are mentioned. Cellulose nanofiber (CNF) is one of the hottest studies in biorefinary. CNF and lignin bench scale plant were constructed in FFPRI respectively. CNF from woody biomass is produced using alkali cooking technology followed by physical and enzymatic treatment. Lignin from sugi is produced by new technology. The lignin can be used in fabrication of nanocomposite films, sealing materials and automotive components.

Possibilities and Limits of Wood Resources as Energy Sources

Keiichi Nakamata

Environmental Management Dept., Hokuetsu Kishu Paper Co., Ltd.

The biomass power plants based on the FIT (Feed-in Tariffs) system are under operation and many projects are scheduled to start operation in Japan. Although this has the power to revitalization of the Japanese forestry business, overemphasis of the fuel use might inhibit the sound growth of the forest industry. For the fuel utilization of wood resources, it should be

considered that the amount of usable woods, the efficiency of the power generation, and working conditions of forest workers.

Operational Experience by Modifying Kraft Pulp Production

Kenji Matsushima

Kraft Pulp Div., Mishima Mill, Daio Paper Corporation

Fiber lines in Mishima mill have been modified and extended step by step along with new installations of paper machines. The total energy cost was pushed up due to increased number of equipment and distance of pulp traffic line.

Two of softwood fiber lines were unified to one. Hardwood fiber line was also retrofitted to get more production and to reduce energy. We decided to modify our softwood fiber line to get more production and energy efficiency improvement, making the most of equipment that had been idle after the retrofit of hardwood fiber line to reduce capital investment. After this modification, the production has been increased from 650 t/day to 950 t/day, which is the highest in Japan.

Our concept of the modification of new softwood fiber line was as follows;

- Operational improvement by modifying the existing cooking system
- Improvement of energy efficiency by enhancing the much more heat recovery
- Reduction of bleaching chemicals by the improvement of washing performance
- Upsizing the equipment by using larger one that had been idle

To increase the production rate, continuous digester has been modified to the Compact Cooking G1TM, which could accelerate the downflow of the chip column in the digester, and the capacity of screening and bleaching process has been upgraded.

We stabilized the operation by adjusting multi charges feeding ratio of white liquor, liquor-to-wood ratio and chip compaction in digester.

Practices for Specific Energy Reduction in TMP Process

Masaru Shinya

Tomakomai Mill, Oji Paper Co., Ltd.

In 1970's the strength on newsprint paper manufactured in Tomakomai mill, Oji Paper Co., Ltd. depended mainly on mechanical pulp such as TMP (thermo-mechanical pulp) .

TMP contributed greatly to lighter grade of newsprint paper through established production system; however, the required pulp quality as well as production ratio has become less dependent on TMP after KP plant started and the production of DIP(deinked pulp) has been increasing along with the rise in environmental awareness.

Once oil-saving production system was implemented in 2008 at Tomakomai due to higher fuel price, we needed to improve operating conditions such as refining system or new type of refiner plates to reduce energy cost in TMP accompanied with high energy consumption.

In a series of several practices, we have continued to optimize conditions and introduce new technology while carefully considering required pulp quality, and finally achieved 30% specific energy reduction in the refiner process of TMP production.

—Peer Reviewed—

Characterization of Compressive Strength for Containerboard Using Short-Span Test

Hironobu Hirano and Takao Kobayashi

Pulp and Paper Innovation Center, Oji Holdings Corporation

Recent decrease in basis weight of containerboard raises some quality problems, one of which is decrease in ring crush compressive strength in spite of adding enough dry strength additives. As a result, this can lead to an error in calculating box compressive strength using Kellicutt's equation. In this paper, short-span test, which is widely recognized as the superior compression test to ring crush test, is reviewed from the analytical point of view as follows.

FEM simulation showed that ring crush compressive strength decreases with lower thickness due to buckling of the specimen, and that when thickness is extremely low, significant strength loss is caused by the buckling mode change.

Correlation between box and containerboard compressive strength suggested that short-span compressive strength could estimate the box compressive strength with more accuracy.

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The Effects of Dryer Fabrics for Paper Drying

Ryouji Kawano

Shikishima Canvas Co., Ltd.

Dryer section is a part consuming the highest energy in the paper machine. In these days, it is required in dryer section to reduce steam consumption with increasing thermal efficiency ratio and also electric energy consumption for driving cylinder dryer and blower fan in the environment and cost point of view. The main task of dryer fabric is to promote paper drying by pressing wet paper with cylinder dryers heated by steam; that is to say, we can say that dryer fabric is quite important tool which is directly related to energy efficiency of paper machine. Therefore, it is very important to understand the relationship between paper drying section, the change of dryer section history, dryer fabrics and its mechanism on paper drying process.

Dryer fabric composed by cotton has been used in dryer section until 1970's, and, afterwards the raw materials was changed from cotton to synthetic fiber. By using the synthetic dryer fabric, we could be provided a better dryness significantly. Because it became possible to have a higher fabric tension load by synthetic fiber. Additionally, synthetic dryer fabric has a higher air-permeability character which can bring a better ventilation of air-moist in dryer pocket, and it also promotes a better evaporation from wet paper.

However unknown factors are still existing in relation between drying efficiently and dryer fabric. Therefore we are trying to figure it out what the interactive relationship between drying efficiency and the fabric surface,-internal weaving structure is. Anyway, we will continue researching them intensively and in near future, we would like to contribute on the development of paper industry.

Energy Saving in the Steam & Condensate System

Hitoshi Terashima

Motoyama Shinkoh Co., Ltd.

Compared to the original operating conditions for a paper machine, almost all current

operating conditions, such as paper weight and speed, have changed.

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

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

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

The Case of Energy Saving by Installing Exhaust Heat Recovery System at the Dryer Hood

Yoshinobu Kudo

Osaka Mill, Oji Materia Co., Ltd.

The dryer section accounts for a high percentage of energy consumption in papermaking process, therefore energy saving at the dryer section is one of the crucial issues in the paper mill.

The dryer hood system in Osaka PM2 has some problems such as low efficiency of the air supply/exhaust equipment, air leak and heat loss, insufficient intake and exhaust flow ratio, low dew point.

In addition, we have a problem with significant energy loss by hot exhaust air from dryer hood.

This paper reports the outline of modification of the dryer hood system by installing the heat recovery system and describes the reduction of steam consumption after we installed and optimized it based on process investigations.

Doctor Systems & Canvas Cleaner

— Case Studies of Deposit Removal Facilities on Dry Part —

Chihiro Murayama

Technical Sales Department, AIKAWA Iron Works Co., Ltd.

By recent badly quality of recycling paper, the difficulties of impurity removal at paper stock preparation stages are underscored year by year. As the result, the fine impurities reached to

paper machine side are increasing, they have chances to deposit everywhere, and bring dirt troubles. Because cleaning up the deposit by hands requires long time and hard tasks with the paper productivity drastic reduction, its improvement would be one of the most important subjects for paper making. We introduce our newest profitable doctors and cleaners for paper machines to improve this big problem.

Solution for Sheet Breaks and Paper Defects Using “ Dry part Passivation Technology ”

Daisuke Kobayashi

Sales Engineering Division, Maintech Co., Ltd.

In recent years, a paper recycling rate in Japan marked 64% in 2015, in response to a higher interest in a recycling society and environmental sustainability. By reuse of old papers, adhesive substances derived from adhesive tapes and labels contained in old papers stick to a paper machine, which causes sheet breaks and defects, and it finally lowers production efficiency. Especially in a making of linerboard and corrugating medium which use more than 90% recycled paper, sticky deposits problem in a dryer part becomes remarkably serious, and which is the most common cause of sheet breaks and paper defects.

Trends and Recent Technologies of Sizer and Dryer Sections

Toru Takahashi

Paper Projects, Valmet K.K.

In this paper, the author briefly describes the developments of sizer and dryer parts of paper machine.

First, the technical development of sizers is described, starting with pond sizers, then followed by gate-roll sizers and ending up with rod-metering sizers and spray sizer. As the sizer-related effective equipments, FoilForce1 which enables to execute successful tail threading quickly without any mistake, and iRoll which enables to measure nip load profile and rod load profile in real time during operation, are introduced.

Second, the technical development of dryers are described. At present, single tier type can be seen in high speed papermachines. Runnability improvement systems such as HiRun blow boxes are required to achieve stable operation at high machine efficiency with reduced draw and good paper qualities. An innovative dryer, OptiDry impingement dryer is also introduced,

which makes it possible to evaporate water with high efficiency by direct impingement of heated air against the web.

Operation Experience of PM8

— New Liner Machine —

Masayuki Masuyama

MARUSAN PAPER MFG. CO., LTD.

Marusan Paper PM 8 started the trial operation from December 26, 2014, and has produced commercial paper since January 26, 2015. In February of the year, we achieve 500 t/day. Currently extracts various problem towards the stable operation, it is the stage which is carried out operation while solved.

PM 8, corresponding to the thin of containerboard growing from the environmental aspects of the needs was built the quality, productivity and cost competitiveness in the concept, was built as a round paper machine PM 6 of S&B.

In this paper, we describe paper machine equipment overview, and the elapsed operating experience about 1.5 years from the start of the commercial operations.

Energy Saving by Introduction of GHC 2 Rotor in OCC Process

Takanori Idogawa

Yodogawa Mill, Rengo Co., Ltd.

Rengo has formulated the “Eco Challenge 020” which has been set internal action plan for environmental impact reduction. We set up medium-term target in 2020 of reduction in CO₂ emissions by 32% compared with 1990 and have worked for the achievement of it.

This report shows our energy conservation experience in Yodogawa mill with GHC 2 rotor, the latest energy-saving design in Aikawa, in OCC coarse screening process.

— Peer Reviewed —

Development of New BM Sensor System without Radiation

Shinichi Nagata, Hidetada Sawamoto, Toshie Sakamaki and Takako Morikawa
Pulp and Paper Innovation Center, Oji Holdings Corporation

In paper industries, the measurement of basis weight and moisture ratio of the paper sheets is very important for not only quality control but also trading on commercial. Typical BM sensor systems have been using the infrared for the moisture ratio and the radiation for the basis weight for about 40 years. But it is said that the radiation has bad influence on human body. On the other hand, we had developed an on-line fiber orientation sensor system and an on-line moisture sensor system using microwaves. The fiber orientation sensor is based on the anisotropy of dielectric constant of the paper sheet and the moisture sensor is based on the dielectric loss of the paper sheet. When we were developing the fiber orientation sensor, we notified that it might be able to measure not only the fiber orientation but also the basis weight from the resonant frequency shift based on the dielectric constant of the paper sheet. So we started to examine the possibility of BM measurement of our sensor head. As a result, we found the unique method for measuring the basis weight and the moisture ratio by combining the fiber orientation sensor technology and the moisture sensor technology. As we examined the capability of the new method for BM measurement by using the prototype on an actual machine with comparing the typical BM sensor system, we would like to report the results and the measurement principle.

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Latest Technology of Polyurethane Cover "High-Top Roll" for Applicator Rolls

Hiroya Shimazaki
YAMAUCHI CORP.

One of our products, High Top Roll, which is polyurethane roll cover, has been used for press rolls, suction rolls and applicator rolls since it was first developed in 1963 and keeping the top market share in the domestic market.

We also introduced High Top SD series in 2010, which is specialized for applicator rolls and more than 200 rolls have been delivered so far.

Furthermore, we have developed as an innovator High Top L series in 2015, which implemented completely new cover structure thanks to our original hybrid bonding system, and it has enabled to eliminate the under layer which has been considered essential not only for polyurethane, but also for any kind of roll covers. We also confirmed that High Top L series is effective against blister- delamination which could not be solved by the conventional polyurethane covers.

In this report, we introduce the technical overview of L series and the superiority as the applicator roll cover.

The Changing and Recent Development of Surface Treating Chemicals

Masaki Watanabe
PAPER CHEMICALS RESEARCH & DEVELOPMENT H.Q., ARAKAWA CHEMICAL INDUSTRIES, LTD.

Paper chemicals, which can help provide stable paper products with a reasonable price, have become more desired in paper industry. Besides, along with the diversifying paper printing techniques, a sufficient paper quality has become significant to meet the highly developed printing techniques. In this report, surface sizing agents and surface strengthen agents of paper have been mainly described.

Concerning Surface sizes, a brief changing in development, which dates back from water

soluble type agent that is styrene-maleic acid copolymer to emulsion type agents, has been introduced. In addition, a newly developed emulsion type surface sizing agent with a special type of surfactant is explained. It can well disperse into paper sheet when coated onto the surface.

About surface strengthen agent, starch solution has been mainly used, while polyvinylalcohol (PVA) and polyacrylamide (PAM) can still occupy a share. However, the demand of thinner paperboard grows, thus the low strength problem has emerged in recent paper industry. A newly developed PAM-type surface strengthen agent with high water-soluble moieties, which can easily immerge into paper sheet, is described in this report.

History and Trends for Calendering and Reeling Technology

Eiji Ando

Coating and finishing Eng. Dept., Voith IHI paper Technology Co., Ltd.

The calendering process is to make a certain density of the paper web by means of press rolls, as a result, the web gets smoothness, gloss and required thickness. There were simply divided into two kinds in different calendaring methods, but nowadays both calenders are harmonized or more subdivided with new technologies. After the calendering process, the paper web is finally wound up on the tambour reel in order to proceed further processes like coating, slitting to small rolls and cutting to sheets. It requires preventing a damage of surface quality and reliable turn-up function. The article describes history, requirements, and some epoch-making topics for the development of each process. There are some interesting innovations, however, predecessor ideas are still attracted and also reminded.

Advanced Technology of Web Inspection System

Satoshi Suzuki

SurfaceVision, AMETEK Co., Ltd.

AMETEK SurfaceVision, former COGNEX Surface Inspection System Division, developed “SmartView 7.2 Color” inspection system which allows users to see “color defect image” and to classify defects by “color defect features”. I would like to introduce new inspection technologies with color camera and 2 scalable technologies, “Line synchronization” (accurate data tracking between upstream and downstream) and “SmartSystem” (monitoring cameras linking to

inspection system for root-cause analysis).

Technology and Vision of QCS

Ken-ichiro Wada

IA Platform Business Headquarters, Yokogawa Electric Corporation

A scanner equipped with basis weight sensor and moisture rate sensor was developed in the USA in 1960s. For the Japanese market, Yokogawa has developed it in 1969. It has been introduced to many paper mills for more than half a century.

Here we review firstly the basic technology of QCS, particularly focusing on the devisal for the purpose of on-line measurement. As an example, the technology used for LED color sensor will be reviewed. Secondly, we review how profile data is processed. In closing, we envision future possibility of QCS.

Operating Experience of Replacing Inspection and Slit Aiding Systems on PM1 and PM3

Chiharu Fukuda

Hokkaido Mill, Asahikawa Factory, Nippon Paper Industries Co., Ltd.

Since quality improvement and complaint reduction are of constant concern to workers in the manufacturing industries, we strive every day to provide good products for customers.

The previous inspection Systems on PM1 and PM3 in Nippon Paper Industries' Iwanuma Mill were installed in 1997 and offered inspection only by transmitted light. However, as customers became more concerned about defects, it became more and more necessary to have the ability to detect weak contrast defects or surface located defects.

In order to measure this type of defect, we replaced the previous inspection systems with new one which has both transmitted and reflected light inspections in 2013 and 2015. In addition, we also installed Slit Aiding Systems which convert the defect location information from parent roll to finished roll. Immediately after the replacements, there were few occasions where we were unable to distinguish between holes and transparently unevenness, or to inspect wrinkling.

As a result, the inspection systems became excellent tools not only for judging acceptability of products, but also for finding operational problems.

Stabilization of Coating and Improvement of Roll Maintenance by Rubber Cover for Applicator Roll

Shigetada Kadomatsu

MEIJI RUBBER & CHEMICAL CO., LTD.

We, Meiji Rubber & Chemical Co., Ltd. established in 1900, have been supplying rubber covering materials for Pulp & Paper industry for 115 years. We are dealing a variety of materials and developing the optimum cover rubbers for each section of paper machines based on the years of experience.

In recent years, due to the diversification of coating & sizing liquid and high speed machine operation, the requirement of quality stabilization for Applicator rolls cover is becoming harder.

Our material “ Super Polyforte” is a polyurethane material containing the special polymer, have been adopted in many Applicator rolls and Smoothing press rolls, etc. since starting sales in 1999.

Now we would like to introduce references of Super Polyforte, particularly focusing on Applicator rolls in the several paper mills which have achieved stabilization of coating and longer replacement cycle of rolls.

Fully Sprit Seal for Accurate Rotation

—Application to the Vertical Rotating Equipment—

Takashi Kamizono

Engineering Dept., John Crane Japan, Inc.

Adoption of the mechanical seal has been progressing for sealing system of rotating equipment in the pulp and paper industry. However, the applications of the mechanical seal are limited to the black liquor or coating collar of pumps or screens.

For the most cases, end users are using gland packing for horizontal and vertical agitators with axial runout and vibration that are troublesome to the maintenance persons.

In order to reduce energy conservation and maintenance costs and to provide safety and stability for the daily operation, we have over the past two years introduced the fully split mechanical seal that is based on our own design with rubber bellows for horizontal agitator with vibration problems.

Today, we would like to introduce our extensive experience of application for vertical pulper that is running under the severer conditions. For that, we propose an optimal solution using our

fully split mechanical seal for the equipment with axial runout and vibration.

Some Preventive Methods against Erosive Wear in Fluidized Bed Boiler

Tadashi Kimura and Yoichi Shiraishi

Engineering Department, Welding Alloys Japan LTD.

In the power industry, it has been demanded and expected to cope with the energy resources issues and global environmental problems. Under these expectations, biomass power generation using wood fuel with a CO₂ reduction effect has been increased as the effective use of resources. Biomass boilers are burned by flowing the fuel and the medium in a high temperature environment, especially circulating fluidized bed boiler. The advantage of this boiler is that impact on the global environment is low. It should be considered that economic problems remain because the erosion wear of the material that is used in the furnace and that repair costs many occur at the earliest.

This paper discusses about high-temp erosion wear of water-cooled panel and air nozzle in the boiler furnace (fluidization nozzle) through the test by overlay welding and thermal spraying to find out proper measures against surface wear. Main results obtained herein through the erosion test are as follows.

a. As for water-cooled boiler panel of pressure boundary heated to about 400°C , Ni-base material like Alloy 625 is one of the candidate material which has good property in weldability , thermal expansion co-efficient etc.

b. As for air nozzle heated to about 800°C , Co-base material like Stellite No.12 maintaining high hardness until high temperature seems to be one of candidate material onto the air nozzle. These material will be hereafter tested including addition of ceramics like Cr₃C₂.

c. In the erosion wear, scratching (microplowing) seems to be dominant phenomena for ductile material.

On the other hand, spalling also seems to be dominant one for brittle material.

Wet End Improvement Method by Correlation Analysis between Water Quality and Machine Operation by S.sensing

Hiroki Katsura, Takashi Saigusa, Katsuhiko Hidaka, Kaname Harada and Shinichi Kurihara
Kurita Water Industries Ltd.

Recent environment around paper industry has been changing, especially in regard to increasing paper recycle rate. It causes in fluctuation of furnish quality, that influence on machine running stability and paper product quality. In such a complicated situation, we focus on “water” used a lot in paper-making process to improve productivity. We report our new technology, “ S.sensing system” to achieve it by stabilizing water quality. S. sensing system has three functions: monitoring, analysis and control.

First, we monitor water qualities and accumulate machine running & paper quality information from customer.

Second, we analyze the correlation among them. Third, we control water quality and achieve improvement on machine running stability and paper product quality. In this report, we introduce the case study that defects on paper reduced by analysis correlation between water quality & defect causes then controlling water with S. sensing system.

Novel Dissolved Lignin Carryover Measurement in O₂ and D₀ Stages Brings Opportunities for Significant Improvements in Fiberline Operations

Niclas Andersson, Akhlesh Mathur, Caroline Wilke, Ulf Germgård and Masashi Hasegawa
BTG Division Spectris, Co., Ltd.

Conventional fiberline control is solely based on the lignin content of the pulp fibers expressed as kappa number combined with brightness measurement in the bleaching stages. The kappa number is measured using a traditional multipoint analyzer with several sample locations sharing the limited capacity of one central analyzer thus resulting in low update rate and lack of redundancy. Some mills still only use manual sampling and laboratory kappa measurement which inevitably means very low update rate and typically also poor repeatability. While the fiber lignin content and brightness indeed are critical parameters for the unit operations’ control, it has been shown that the dissolved lignin in liquor phase, often referred to as black liquor carryover, plays a key role due to its impact on the occurring reactions. This carryover measurement has been a critical missing link in having a fully automated optimum fiberline process control.

This study presents results from evaluations of two new sensors for capturing the dissolved lignin carryover in the pulp stock, to properly account for its impact in oxygen delignification and chlorine dioxide stages. Mill data is combined with laboratory data which confirms the benefits of these novel control concepts, employing the new sensor tools.

Recent research and mill studies have revealed that if appropriately implemented, these new measurement and control capabilities bring significant improvement potential in fiberline

operations, in terms of optimizing pulp yield and quality, production rate, and consumption of bleaching chemicals.

—Peer Reviewed—

Improvement of Air Filters by Nanocelluloses

Junji Nemoto

Central Research Laboratory, Hokuetsu-Kishu paper Co. Ltd.,
Graduate School of Agricultural and Life Sciences, The University of Tokyo
Toshihiko Soyama

Central Research Laboratory, Hokuetsu-Kishu paper Co. Ltd.,
Tsuguyuki Saito and Akira Isogai
Graduate School of Agricultural and Life Sciences, The University of Tokyo

Freeze-drying of 2,2,6,6-tetramethylpiperidine-1-oxyl(TEMPO)-oxidized cellulose nanofibril (TOCN) dispersions in water/ tert-butyl alcohol (TBA) mixtures was applied to prepare TOCN/glass fiber composite air filters. The influence of TOCN content in the filters, exposing conditions of the filters to humid air and the amount of particle loading on the filter properties were investigated. The TOCN content in the composite filters was controlled from 0 to 0.126% by controlling the amount of the TOCN/water/TBA mixture sprayed to the base glass filter. When the TOCN content was 0.081%, the filter quality factor showed the highest value. At the TOCN content higher than this value, densely packed TOCN networks rather formed and prevented the efficient capture of oil-aerosols used as model particles. After exposing the TOCN-containing composite filters to high humidity conditions, the pressure drop decreased and the particle penetration ratio increased. The original porous networks mostly remained and the high quality factors were maintained even after exposing the filters under humid conditions, while scanning electron microscopy images indicated that some TOCN networks shrank. The durability of the TOCN-containing composite filters was evaluated by continuous loading of oil-aerosol particles for 3 h. When the air filter had high TOCN contents, the pressure drop slightly decreased, because the TOCN networks were aggregated with the particles. However, no TOCNs were removed from the filters even by the air flow with growth of particle agglomerates. Thus, the porous networks of TOCNs had sufficient durability against particle loading. Although there are several problems in practical applications of nanocellulose to air filters, the unique properties of the TOCNs such as the extremely small fiber diameters, high aspect ratios and tough network structures are advantageous in preparing new air filters with high performance.

—Peer Reviewed—

Technological Transition of Web Inspection System

Tadashi Tomomura

Inspection System Business Promotion Division, Industrial Automation Business Company,
OMRON Corporation

Web Inspection System has carved a history of about 50 years in Japan. Once the except for the inspection of special paper, WIS which has not been considered less important than the instrumentation, such as QCS, became indispensable important system to making paper now. The manufacturer of new entrants to WIS increase, manufacturer to sell currently in Japan, was about more than 10 companies. There are some strong demands for the quality of the user, the result of competition between WIS manufacturers, performance and function became very well. I will introduce the evolution of WIS technology.

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The New Sticky Removal Agent on the Deinking Pulp Process

Chigusa Taguchi and Satoshi Wada
Kurita Water Industries LTD.

Old newspapers and old magazines are recently used as raw material in the paper mill. These papers contain stickies which are adhesive materials and cause operation trouble such as paper defects, sheet break and a hickey in a printed article. Stickies are fixed to fiber by coagulant for reducing these troubles. However, in some cases, coagulant causes a failure of dirt. Therefore, the technology to remove stickies from paper process is desired. We made clear that the modified nonionic polymer containing hydrophobic group has high performance to remove stickies on the flotation processes.

Polymer Flocculant for the Dewatering of Papermaking Wastewater which Contains the Anionic Trash Materials

Ken Takeda, Kiyomi Okuzawa and Takafumi Inaba
MT AquaPolymer, Inc.

Recently high usage of recycle fiber such as the deinked pulp (DIP) causes the dewatering conditions of wastewater to have been getting worse.

It contains the anion trash materials that causes pitch trouble not only on papermaking process but on wastewater treatment. The cationic polymer flocculants are used for the dewatering of wastewater treatment. But, the operation control of dewatering process cannot be worked well by a containing the sludge from DIP process because of the blockade of the cationic group by the anion trash materials and fine filler.

This paper presents the new combination with the two rheological different polymers indicates the high ability of flocculation for papermaking wastewater contains the anion trash materials.

Numerical Evaluation of Paper Texture

Hideya Naitoh, Kazuo Nishikawa, Yuji Kurenuma and Yusuke Sakai
Tokushu Tokai Paper Co., Ltd.

Hand feeling is one of the most important features of paper, but is often evaluated by sensory qualitative test. In this study, the quantitative measurement of hand feeling, especially ease of flipping pages which is thought to be difficult to evaluate numerically, is investigated.

The use of wearable contact force sensor reveals that ease of flipping pages can be briefly quantified, and furthermore implies that it is possible to measure the delicate difference of sense at the unconscious level.

The Latest Detrashing Technology by IntensaMaXX™

Masamori Tanaka and Takanori Goto
Voith IHI Paper Technology Co., Ltd.

For the latest detrashing system of pulping stage, more effective machine is required because the contaminants ratio of raw material is getting increase recently. The IntensaMaXX™ is the new detrashing machine which fulfills the request for better detrashing operation. The rotor and screen plate are located at the top of the tank, and this layout prevents wearing and jamming by heavy contaminants. The rotor axis is located as eccentric against the center axis of the vat. This layout prevents strong centrifugal flow and also growth of long contaminants. The piping layout is also considered for the better reject removal. At the actual operation, IntensaMaXX™ is saving much power consumption and the cost of wearing parts as well. At the same time, the machine can be operated without any trouble for long time.

New Andritz FiberSolve™ Pulper Rotor Technology

— Reduce Specific Energy Consumption in Under Machine and Tub Pulpers —

Yosuke Takeshita and Taku Sato
Andritz K.K.

Andritz has developed FiberSolve™ Pulper Rotor Technology designed to reduce specific energy consumption for retrofit applications in Under Machine, and Tub pulpers.

Computational Fluid Dynamic studies were performed to develop a rotor design capable of improving pulper efficiency. By increasing the pumping effect of our rotor design, versus the older attrition/cutting designs, Andritz has been able to successfully retrofit a wide variety of pulpers to increase capacity and reduce energy with no change to existing drive.

Nuisance Insects, Especially Chironomid Midges, Attracted to White and Colored LED Lamps

Goro Kimura

Technical Research Laboratory, Ikari Shodoku Co., Ltd.

Toshihiro Kusama

Technical Development Division, Ikari Shodoku Co., Ltd.

Junichi Enokida

Wide Area Business Division, Ikari Shodoku Co., Ltd.

Black fluorescent lamps are one of the most effective lamps for light traps. Aquatic insects, such as Trichoptera, Diptera (especially Chironomidae) and Ephemeroptera (especially Caenidae), are known to be attracted by ultraviolet (UV) light (Positive phototaxis). However, there was no significant difference between the attracted number of adult chironomids with a white fluorescent lamp (including UV) and a white LED lamp (not including UV) during the our previous study. In the present study, we attempted to clarify the attractive effect of wavelength on the adult chironomids in the field. The effects of four different light wavelengths were studied using an UV + blue LED lamp, an UV + green LED lamp, an UV+green+blue, and an UV+white LED lamp. An UV+green+blue lamp attracted the highest number of specimens, followed by an UV + green LED lamp. We also collected adult chironomids using light traps with non-attractive lamps, such as a yellow LED lamps (not including UV), a green LED lamp (not including UV), and a white LED lamp (not including UV). A yellow LED lamp attracted the lowest number specimens, followed by a green LED lamp. These results suggest adult chironomids were attracted to both the UV and the visible lights, especially green.

Case Study of the Latest Renovation Project for Grade Change

Jun Kobayashi

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

We, Kobayashi Engineering Works, Ltd. has many experiences and records of plant construction in Japan as well as overseas markets extending our utmost respond to client needs since our company was founded.

As the result, we received orders for relocating project at Wang-Sala mill PM9 in 2005 and renovation for product increase of PM9 in 2012. Moreover, a new order of rebuild project at Ban Pong mill PM17 in 2013 from SKIC (Siam Kraft Industry Co., Ltd.), one of the group of leading paper manufacturing company, SCG (Siam Cement Group) in the Kingdom of Thailand.

These repeat orders are the proof that show the client and Kobayashi as the machine supplier have good collaborating relationship and creates great advantages for SKIC.

This report introduces PM17 fourdrinier 3-layer paper machine and large-scale renovation for entire machine changing the grade from corrugating medium to gypsum linerboard, and presents the progress of machine start-up.

Effective Use of Technology Resources

Yasuhiko Shiota

Japan Business Innovation Consulting Co., Ltd.

The program of “Effective use of technology resources” is called “**Technology **Resources **Management Program**” . “**TRM**” for short.****

“TRM” is management program that builds structure of Effective use of technology resources.

They are used for orientation, such as the product development, the technology development, the stabilization of the production and so on.

That activity will be developed at four points of view.

1. Stocktaking and definition of some technique (the skill) that the company holds
2. Mechanism analysis and value evaluation of the technique and skills that were investigated
3. Making of the technical data and making of the technical strategic scenario
4. Technical succession and TRM's structure construction.

ACA Permi Online Porosity Analyzer for Optimization of Paper Production Process and Caliper Control by ACA RoQ Roll Hardness Profiler

Jyrki Laari

ACA SYSTEMS OY
Tsutae Kumagai
Shin Nihon Coporation

The PERMI, being a fast and reliable on-line porosity analyzer from ACA Systems Oy, helps papermakers to rapidly adjust all grades to specification and carry out fast paper grade changes.

Paper quality variations in the machine direction can be reduced with greater ease when a fast real paper quality measurement is available.

The refining of chemical pulp can be optimized for each paper grade in spite of quality changes in the incoming pulp.

Caliper variations are far too small to be picked up by online scanners or test labs.

Hardness profile is an excellent indicator of paper material being level enough to be wound up.

The main advantages of ACA RoQ roll hardness profile measurement are that the test can be carried out quickly, and that it can identify problematic rolls, which will potentially cause runnability issues.

About Energy Conservation Examples of Initiatives Manufacturing

Yoshitada Jyoukou
Takaoka Mill-Futatsuka, Chuetsu Pulp & Paper Co., Ltd.

In order to prevent global warming which is caused by the CO₂ is a greenhouse gas, while take measures on a global scale, responsibility is increasingly against the corporate environment. Energy saving in the pulp and paper industry, resource saving, and is being promoted efforts to reduce CO₂emissions. In addition, cost reduction by energy saving in terms of production has become a major issue, it is still the situation that must be stacked to further effort.

In our production department established the Energy Conservation Committee in 1990, it has been focused on day-to-day energy-saving activities. While large-scale capital investment has decreased, improvement by large-scale equipment modification is not expected, it is only no status quo will build up a small energy saving.

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

—Peer Reviewed—

Study about the Evaluation Method of Gloss Unevenness

Kazuhiko Ishizuka and Yusuke Kondo

NPi Research Laboratory, Nippon Paper Industries Co., Ltd.

Kazuya Takahashi

Hokkaido Mill, Nippon Paper Industries Co., Ltd.

The system consisting of a line light source, a line scan camera, and a movable stage was used to evaluate the gloss unevenness of coated paperboards. The pattern of gloss obtained from the images was matched with the gloss unevenness obtained by visual test. By frequency analysis of the images, the amplitude at the specific frequency (wavelength was around 6 mm) had strong correlation with the gloss unevenness of visual test. It indicates that this system is available for evaluating gloss unevenness and analyzing its cause. Also, by the result from paper formation measurement, the major cause of gloss unevenness was the uneven formation of base paper. Furthermore, the sheet formation of the surface layer of the coated board had much more influence to the gloss unevenness than that of the middle layer.

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Treatment of Recalcitrant Organic Matter in Wastewater

Kenta Furusho

NIPPON STEEL&SUMIKIN Eco-tech Corporation

Conventional activated sludge process is biological treatment and BOD resolution will be done. But it's difficult to take COD of trouble resolvability apart and process it.

We have developed remarkable activator of a microorganism. This activator of a microorganism, remains COD is reduced and the ability of the activated sludge processing is improved.

The Technique of Curing Activated Sludge Treatment System and Odor Control during Shutdown

Kenji Hayashi

Mushugen Industries Co., Ltd.

To avoid any troubles in the pulp and paper wastewater treatment at the restart after “Shutdown”, it is necessary to restrain the decline in performance of the activated sludge treatment process : main process of the pulp and wastewater treatment, against extream load-fluctuation stress during “Shutdown”. So we have suggested the original program of curing activated sludge process during “Shutdown” for many factories.

As the schedule of “Shutdown” varies each time, we have to not just remake the program but correct it according to the actual transition of the load or condition of the activated sludge treatment process.

In this paper, we describe the technique of scheduling, simple confirmation way for the actual transition of the activated sludge treatment process, lead operation to a correct direction, and odor control during “Shutdown”.

Advanced Treatments of Waste Waters with Microbubbles of Ozone and Air

Yasuo Onari

Mie Prefecture Industrial Research Institute

Different from the characteristics of millimeter size bubbles, microbubbles bear minus charge in those gas-liquid surface region, greater surface area and slow floatation speed in water. Microbubbles smaller than about 10 micron are also known to shrink easily by any physical shock to result bubble crash and hydroxyl radicals production. From these characteristics, microbubbles of ozone and air are expected to have high potential for removal agents of water contaminants such as hydrophobic materials and plus charged pollutants represented by proteins and microorganisms.

In this paper, by taking into account the retrofitting abilities of microbubbles, water treatments with ozone oxidations by using millimeter size bubbles were mentioned.

Waste water treatments of a fish food factory by using air and ozone microbubbles were examined and resulted good removal efficiencies of its pollutants. For biological filtration treatment of urine by using a soil bed permeation system, air microbubbles were shown to be a good support for aerobic condition keeping of the system and taking a new lease of the life of the the system.

Reduction of Water Usage at Niigata Mill —Toward Our Minimum Impact Mills—

Takenobu Danno

Technical & Development Dept., HOKUETSU KISHU PAPER CO., LTD.

Hokuetsu Kishu Paper Co., Ltd (HKP) has set an approach of “Minimum Impact” to minimize all impacts on the environment. HKP has carried out much efforts of CO₂ emission reduction against global warming, air pollution and water pollution in order to establish our minimum impact mills. Particularly, HKP has been actively carried out a variety of initiatives and capital investment in Niigata mill, which is the largest mill in HKP.

We have the same approach for water-saving. Although the City of Niigata has much of water resources, the amount of our water intake is limited and we have carried out various efforts of water-saving as we expand a production capacity. In this paper, certain efforts of our water-saving at the time of constructing No. 9 paper machine are described.

Basic and the Case Study of Low-Frequency Noise Countermeasure in a Factory

— Listen and Feel How We Can Resolve the Noise Problem —

Masahiko Aoki

Acoustic Solution Division, Nihon Onkyo Engineering Co., Ltd.

There are a lot of possibilities to provide the countermeasures for the noise problems in plant. Actually we have been seeing many cases, some of them are well-examined and effective, but some of them are very difficult to expect suitable noise reduction. In this presentation, we would like to introduce both effective and non-effective countermeasures.

And actual recorded and simulated noises are presented for helping to understand these differences. Also, examples for solving low-frequency noise are presented.

Actual Example of Vibration Trouble —Search the Invisible Cause of Vibration Trouble

Akihiko Miyazaki

Solution Engineering Department, Engineering Division, Tokkyokiki Corporation

At this seminar, we showed vibration control technology and the counter measures at actual sites in the customers. They are only parts of a lot of our experiences by the works at the sites.

However, we expect you may be able to take the right action at the first stage of the trouble and make an appropriate decision when you face to the trouble by knowing such our experiences.

As a result, you may reach the cause without detail investigation if the case is similar to it that you learned, and you may be able to solve the problem without unnecessary works. It will be a pleasure that our experiences help to solve your trouble.

Minamata Convention and Control of Mercury Air Emissions

Tomonori Tamura

Ministry of the Environment Government of Japan

In order to ensure accurate and smooth implementation of the Minamata Convention on mercury, both "Act for the Partial Amended Air Pollution Control Law" (Law No. 41, on June

19, 2015), and "Ordinance for the Partial Amended Enforcement Order of the Air Pollution Control Law " (No. 379, on, November 11, 2015) were promulgated in the same year.

Furthermore, the discussion of specific emission standard value of each type and scale for the mercury emissions facility, and its measurement method was carried out, and the primary report for the implementation of mercury air emissions measures was compiled, based on Minamata Convention on the mercury in the Central Environment Council on June 14, 2016 as well.

Effluent Management with Bioassay —from a Perspective of the Test Facility—

Atsushi Sawai

IDEA Consultants, Inc.

Introduction of new effluent management procedure have been discussed at the committee of Ministry of the Environment, Japan from 2010. The existence of the effluent management with bioassay will be discussed in 2016, with the participation of newly selected committee member from industry. Introduction of new effluent management is considered as voluntary management system. The bioassay is considered three toxicity tests which are fish embryo larvae short term toxicity test, daphnia reproduction test and algae growth inhibition test. Some major company voluntarily addressed new effluent management with bioassay as part of activities for a conservation of biodiversity. Major issue facing test facilities are raising management of test animals, the cost of bioassay and accuracy management of bioassay.

New Indexes of Bottom DO and Coastal Transparency

Rina Miyake

Ministry of the Environment

It has passed more than 40 years since establishment of living environmental items of Environmental Quality Standards for Water Pollution (EQSWP) depending on the Environmental Basic Law. In the water environment situation changes, it is difficult for people to realize the conservation status of the water environment from achievement status of EQSWP, and there are still such issues as oxygen-deficient water mass and decrease in seaweed bed and tidal flat. In this regard, The Central Environment Council has decided that the bottom dissolved oxygen as a new living environment item of EQSWP and coastal transparency as a regional goal. The details of these new indexes are described.

Introduction to Environmental Law: “Water Pollution Control Law” and “Waste Management and Public Cleaning Law” — For Preventing Violation of the Laws —

Yoshihiro Kemmoku
Kemmoku Ecosupport

In this paper two Environmental Laws were briefly described.

1. Water Pollution Control Law

Factories and establishments(businesses) are required to submit a report when they intend to install a Specified Facility. Businesses shall carefully measure the pollution level of the effluents and identify the state of the discharging areas, for example, the quantity of the effluents such as harmful substances and other pollution indicators including BOD/COD. The legal effluent standards shall be obeyed by proper waste water treatment. However there are still violations including forgery of measured data and erroneous notification.

The businesses shall submit a report when they intend to install a facility using or storing harmful substances and they must prevent groundwater pollution. Further they are required to periodically check the floor, piping, waterways of the facility, in order to prevent groundwater pollution. We must recognize that the clean-up measures to improve the quality of the groundwater takes very long time.

2. Waste Management and Public Cleaning Law

This law regulates waste generators (businesses) through the control of waste management which includes waste sorting, storage, collection, transport, recycling, and disposal. The businesses shall be required to manage of their industrial waste appropriately by themselves even if they are to commission anyone else to transport or dispose etc. of their industrial waste. And they shall endeavor to take the necessary measures and action for proper management of the said industrial waste in the whole process from its generation to final disposal and recycling. For example, followings are some of the effective measures for waste management; to do on-site survey of the contractor's intermediate treatment and final disposal facilities in order to confirm their actual operation(obeying the law or not), and when the issuer (businesses) receives a returned copy of the control manifest from contractors they(businesses) must confirm that the transportation or the disposal has properly completed by confirming the said copy. However there are still many violations of the regulations and illegal waste dumping.

Penalty Arising from the Violation of Waste Management and Public Cleaning Act

—Recent Case Study and Future Amendment of the Act—

Izumi Sato

Attorney at law

Waste Management and Public Cleaning Act was enacted in 1970, which was amended several times in order to prevent illegal dumping and to improve the standard of waste management. Today, a company which violates the act faces severe criminal and administrative penalty. In 2016, a news of food waste scandal was widely spread and the Ministry of Environment warned that the company who generate the waste shall be more responsible to confirm the status of waste disposal. The next amendment of the act is now under discussion.

Local Government-led Renewable Energy of Nakanojo

—Local Production for Local Consumption of Urban Development and the Power of Renewable Energy—

Masao Yamamoto

Nakanojo-Denryoku General Foundation

In Gunma Prefecture Nakanojo, the first time in the country as a local government initiative in August 2013, they founded the corporation “ Nakanojo-Denryoku General Foundation” to perform a power producer and supplier. “Nakanojo-Denryoku”, purchase power from the three places of the solar power plant Nakanojo to management, such as office and school, is supplied to the town of public facilities. In addition, to start the sales of power to the town of households from July. These, as a resource for renewable energy in the region of Nakanojo, raised the power from there, doing the embodying efforts to “local production for local consumption of power” continue to supply the region.

Basics of Ozone Bleaching

Part 1 : Properties of Ozone and Bleaching Conditions

Takanori Miyanishi, JAPAN TAPPI

Ozone bleaching began on an industrial scale in 1992 in connection with increasing environmental pressure and customers’ demand for Elemental Chlorine Free (ECF) and Total

Chlorine Free (TCF) bleached pulps. Ozone bleaching did not immediately reach its optimal efficiency from a technical viewpoint, but had to face several issues during its early years. By improving mixing technology, better understanding ozone chemistry on pulp components and tuning the whole process, ozone bleaching sequences made it possible to produce a pulp quality similar to or better than conventional ECF would do. They mark a clear milestone in the development of environmentally sound bleaching methods. Today the choice of ozone may still be motivated by ecological requirements but it is mostly justified by the economical savings resulting from chemical cost reduction. They allow combining high brightness and strength with cost efficiency. Ozone bleaching is conducted either at medium or high pulp consistency, depending on ozone bleaching process suppliers. The choice of one process over another depends on a number of factors-including investment costs, carry-over load, bleaching filtrates recirculation and bleach plant temperature profile and others.

—Peer Reviewed—

Evaluation of Salt Tolerance in Candidate Elite *Eucalyptus globulus* Conal Plants and Field Test

Yuji Fujii, Kenichiro Suyama, Kazunori Hayashi, Toshiaki Tanabe and Akiyoshi Kawaoka

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Twenty three elite tree candidates that had been selected for their superior growth rate (1.5 times or more greater timber volume relative to maximum girth of tree) 5 years after being planted in a *Eucalyptus globulus* afforested area in Western Australia were cloned using a tissue culture technique. Three trees (Clone A-C) were then selected for shoot proliferation and high rooting ability. To examine their salinity tolerance, 8-month-old cloned seedlings were then treated with a 100 mM saline solution or water for 4 weeks. A comparison of the growth rate of the cloned seedlings indicated that Clone A grew the most with the saline-treatment. Based on the measurement results of chlorophyll fluorescence and stem water potential, it is conceivable that the tolerance mechanism was involved in response to water stress. Next, field tests were conducted by planting the 3 elite tree clone seedlings and commercial seedlings. In comparing timber volumes with trees grown from commercial seedlings at 8.5 years of age, Clone A was found to be 1.64 times larger, while Clones B and C were approximately the same. Based on the fact that saline water existed at the test site, it was inferred that there was a connection between the salinity tolerance mechanism that was recognized in the cloned seedlings and the high

growth rate.