

CONTENTS

Pulp

- 1 Report on 28th Pulping Seminar·····Pulp Technical Committee, JAPAN TAPPI
- 4 Life Cycle Assessment (LCA) Basic Method and Recent Trends·····Atsushi Inaba
- 12 Methods for Evaluating the Morphology of Cellulose Fibers at Each Size
—From Pulp Fiber to Nanofiber—·····Ryota Kose
- 17 Pulp Mill without Fossil Fuel
—Carbon free Lime Kiln—·····Keisuke Tanaka
- 21 Basics and Applications Cases of Model Predictive Control in Kraft Pulp Processes
·····Nozomu Wada
- 26 Kraft Pulp Process Inspection Service by Andritz·····Ryo Yoshida and Kanji Hagiwara
- 31 PulpEye Pulp Analyzer Delivers Mill Cost Savings and Process Performance
Improvements
—On-line Fiber Properties and Real Time Data Transformation Enabling Process
Performance and Product Quality Improvements—·····Katsuhiko Yokoyama
- 38 Valmet Cooking Process for Low Bulk Density Chips and Energy Savings in the
Cooking Process·····Yoshiro Nishihara
- 43 Pitch Control Agent for the Kraft Pulping Process·····Takuji Sodeyama
- 48 Current Situation and Future Prospects of Paper Recycling in Japan·····Shogo Hamano
- 54 The Latest Detrashing Technology with Intensa Series·····Satoshi Orido
- 60 Advanced Technology of Handling Recycle Papers with Wet-strength·····Jiro Urata
- 65 Initiatives for Carbon Neutral Society in the Use of Ammonia·····Kazuhiro Watanabe
- 70 Development and Evaluation of Cooking Accelerators That Contribute to
Building a Carbon-Neutral Industry
—Collaboration with the RISE Research Institutes of Sweden AB.—·····Takashi Tanaka,
Toshio Yamada, Mayumi Yasumoto, Lars Sundvall, Mats Westin and Robin Westin

Topics & Information

- 78 The Operating Experience of Kneader·····Yoshihiro Uotani
- 82 Realtime Prediction Model with using Single Point Morphology SPM-5500
—One of the hottest topics in P&P Industry=Visualization of Fiber Morphology—
·····Ryohei Watanabe, Hiromasa Matsuno, Nozomu Wada and Kukjin Yoon

Introduction of Research Laboratories (152)

- 90 School of Agriculture, Utsunomiya University
Department of Forest Science, Forest Products Laboratory
Graduate School of Regional Development and Creativity, Division of Engineering
and Agriculture, Graduate Program in Agricultural Biological Chemistry
Tokyo University of Agriculture and Technology, United Graduate School of
Agricultural Science, Department of Symbiotic Science of Environment and
Natural Resources, Major Chair of Science of Forest Resources and Ecomaterials

- 03 Committee report
- 89 Essay on Intellectual Property
- 92 Coffee break
- 93 Industry News (Domestic and International)
- 98 List of Patents issued and Laid-open Publication
- 105 Price list of Domestic Logs and Wood Chips by District
- 106 Other Monthly Statistics
- 108 News from the Association

Life Cycle Assessment (LCA) Basic Method and Recent Trends

Atsushi Inaba
President, Japan Life Cycle Assessment Facilitation Centre (LCAF)

Recently, the calculation of greenhouse gas (GHG) emissions of products and organizations using life cycle assessment (LCA) has paid attention in the direction to realize "carbon neutrality". The International Standards (ISO) for LCA of products (ISO 14040:2006 and ISO 14044:2006) are the method to assess diverse environmental impacts of products, but it has been refined with the publication of the ISO Carbon Footprint (CFP) (ISO 14067:2018), which assesses only the impacts of GHG emissions. In addition, there are ISOs for LCA and CFP for companies and other organizations. Furthermore, Scope 3 standard published by the GHG Protocol is used by many companies as a calculation method for CFP of organizations. This paper explains the basic method of LCA presented in ISO14040:2006 and ISO14044:2006 and the differences between these ISOs and ISO14067:2007 for CFP and other methods including Scope 3 standards for organizations.

Methods for evaluating the morphology of cellulose fibers at each size -From pulp fiber to nanofiber-

Ryota Kose
Division of Natural Resources and Ecomaterials, Institute of Agriculture,
Tokyo University of Agriculture and Technology

The pulp & paper industry can produce fibers of various sizes and morphologies, ranging from pulp fiber to CNF. The effective utilization of all those cellulose fibers is an important issue for the pulp & paper industry, both economically and environmentally. Pulp fibers are hollow fibers with a wall structure. This wall structure is a laminated sheet structure consisting of oriented cellulose microfibrils with a width of about 3 nm. The process of refining pulp fibers to CNFs complicates the fiber morphology and improves the aggregation of the fibers. As a result, while pulp fibers can be recognized as a "single fiber" with both ends clearly observable, it is difficult to recognize fine fibers as a "single fiber". When there are fibers with different widths at a multiscale, not all fibers are captured in the image observed with a microscope at a constant magnification. At low magnification, pulp fibers can be observed, but not CNF. Conversely, at high magnification, CNFs can be observed, but the entire outline of the pulp fiber cannot be observed. To evaluate fiber morphology for such fiber groups, there are approaches to narrow down the evaluation target to only pulp fibers or CNFs, and or extract averaged information on the morphology and size of fiber groups by optical methods, etc.

Pulp mill without fossil fuel -Carbon free Lime kiln-

Keisuke Tanaka
Energy Group
Pulp & Energy Technology, Valmet KK

The pulp and paper industry in Japan have been working to reduce the use of the fossil fuel, however the Lime kiln still uses fuel oil to calcinate the lime mud. The overall kraft pulping process is explained in the beginning of this paper, specially how the lime kiln is involved.

Then two of most commonly used, technology to replace fossil fuel with biomass based heat sources for lime kiln at production level in recent days are introduced.

First technology is the wood power incineration which takes relatively clean wood, dry and grind them to control burning speed and efficacy, and inject to the kiln through burner in the form of powder. The second technology is the CFB gasification technology, which takes biomass, and partially burn them using less than theoretical amount of oxygen in the fluidized bed reactor to create combustible gas and at the same time, remove contamination along with ash.

Basics and Applications Cases of Model Predictive Control in Kraft Pulp Processes

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

Since later of 2010s, we are now going on a rapid growing stream of development of Factory automations as beyond of the last generation's digitalization. In this generation, the automation system can utilize big data with high frequent scanning and calculations which includes tons of information, such like process values, quality check results, production stocks, production plan, PID loop status and so on.

Voith's OnEfficiency solutions (BTG's MACS solutions has been integrated into it and renamed as OnEfficiency.pulp) provides predictive control based on the prediction models which considers much complicated multiple cross-correlations between each unit operations in Kraft Pulp Processes which can provided by the above background technologies.

In this paper, the basics of Model Predictive Control (MPC/APC) and application cases are introduced as which may be useful at pulp mill's pre-considering for implementation.

Kraft Pulp Process Inspection Service by Andritz

Ryo Yoshida
Capital Sales Group, Andritz K.K.
Kanji Hagiwara
Engineering department, Andritz K.K.

The pandemic of COVID-19 and Russian aggression in Ukraine have caused the cost of imported raw materials, energy, and transportation to skyrocket in a short period of time. In addition, as in the past, extreme weather conditions continue to occur every year, and even under these circumstances, there is still a strong demand for CO₂ emission reductions, and measures to reduce CO₂ emissions and actions against increasing energy costs at paper mills have become inevitable.

These factors will require a major change in the way kraft pulp mills have been thinking about operating cost management.

The kraft pulp process is an important one that produces the main energy for the mill, but it is also a process that consumes large amounts of energy, raw materials, and utilities. It is time to review the operation of this process from a different perspective, and to consider and implement measures to reduce costs.

Therefore, Andritz has started a service in Japan to study cost reductions, operational improvements, and CO₂ emission reductions by surveying the problems and cost reduction potential in the mills.

In this presentation, we will introduce overseas investment trends and explain our current kraft pulp process survey service.

PulpEye Pulp Analyzer Delivers Mill Cost Savings and Process Performance Improvements

-On-line fiber properties and real time data transformation enabling process performance and product quality improvements-

Katsuhiko Yokoyama

MATSUBO Corporation, Group 2 Industrial Machinery Dept.3

The state of the art for in-line real time fiber properties measurement and analysis is the PulpEye™ which, coupled with Pulp on Target, delivers real time fiber and pulp quality information which can be used to confirm the stability of products or, if deviations are detected, for process troubleshooting. This article will introduce the PulpEye™, the novel modules which deliver unique fiber quality distribution data and how significant process improvements and costs savings can be achieved through the use of multivariate statistical software ExtractEye™.

Valmet cooking process for low bulk density chips and Energy savings in the cooking process

Yoshiro Nishihara

Pulp & Energy, Services business Line, Valmet K.K.

In recent years, the increase of mega-sized pulp mills and changes in chip quality have become increasingly evident. When using conventional cooking processes, it is difficult to maintain stable operation and cooking yield due to insufficient chip pre-treatment and the deteriorating environment in the mill.

Moreover, in the industrial sector, including the pulp and paper industry, energy saving and reduction of CO₂ emissions, including conversion to renewable fuel from fossil fuels, are the most significant challenges for sustainable development in the future. In the pulp and paper industry in Japan, energy saving of pulp and paper mills is explored to meet the 2030 CO₂ emissions reduction target.

The introduction of the Valmet Continuous Cooking™ with Valmet ImpBin™ - atmospheric pressure impregnation vessel- and the conversion of an existing 1-vessel digester to a Valmet OptiCook™ are typical examples of energy saving in pulp mills. The low temperature and adequate retention time of impregnation allows for low reject and high yield in cooking, while the stability of the chip column provides excellent operational stability. In addition, the low reject rate by good impregnation is very suitable for production of pulps with high kappa number.

Both modifications will also contribute to energy savings. Improvements in chip pre-treatment and impregnation are expected to save steam, and improvements in the cooking process are expected to reduce the amount of chemicals used in the following fiber line.

Pitch Control Agent for the Kraft Pulping Process

Takuji Sodeyama

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

Pitch reduces the productivity of the Kraft pulping process by lowering pulp quality and shortening equipment lifespan. The pitch in the process exists as colloids that mainly consist of wood-derived resin acids. It becomes unstable and builds up deposits when the concentration of resins in the system increases or the water pH decreases. A conventional and primary strategy to prevent pitch problems is to improve the pulp washing process with equipment and adding talc to deactivate pitch, but these methods are not always sufficient to prevent the problems. In such cases, adding a pitch control agent to the pitch controlling system is an effective solution to eliminate residual pitch.

We have developed a pitch control agent, the "AS series", which disperses pitch as stable fine particles and retains them on the fiber surface without any adverse effects on pulp qualities. The pitch is stabilized by the AS series and discharged from the Kraft pulping process with the pulp.

This paper describes pitch problems in the Kraft pulping process and paper manufacturing process, as well as solutions using pitch control agents, including the AS series.

Current Situation and Future Prospects of Paper Recycling in Japan

Shogo Hamano
Paper Recycling Promotion Center

Demand for paper and paperboard fell sharply in 2020 because of the temporary closure and remote working as well as a decline in inbound tourists as a result of the spread of Covid-19. It showed a slight recovery in 2021 and 2022 as economic activity picked up.

Amid these demand trends, a look at recovered paper collection by type shows that the volume of old corrugated containers collected decreased slightly in 2022. Nevertheless, since the production and consumption of containerboard are steady, the recovery is expected to be slight increase or flat for some time to come.

The volume of old newspapers collected has been declining year by year due to the digitization of newspapers and a decrease in inserts and so on. Under Covid-19 pandemic the issuance of inserts further decreases, then the amount of old newspapers collection is likely to continue to decline. Paper manufacturers' procurement of old newspapers will become more difficult, and they may need to consider alternative raw materials in the future.

The volume of old magazines collected is decreasing due to the digitization of magazines, but the decline is slower than that of old newspapers because of the progress in the collection of Sorted residential old paper and paperboard. However, if the collection of those papers is promoted, the quality of old magazines will further deteriorate. Therefore, paper mills that use old magazines in the future will need to consider adapting their facilities.

The latest detrashing technology with Intensa series

Satoshi Orido
Voith IHI Paper Technology Co., Ltd.

For the detrashing system of pulping stage, more effective machine is required because the contaminants ratio of raw material is getting increase recently. The IntensaMaXX and IntensaScreenDrum is the detrashing machine which fulfills the request for better detrashing operation. The IntensaMaxx is 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. The IntensaScreenDrum is equipped with powerful cleaning power and rotation speed control by INV. By controlling the INV, it is possible to set the cleaning and dehydration performance as desired. The introduction of the latest detrash enables more efficient and stable operation, and it is possible to aim for optimal power consumption and wear rate.

Advanced Technology of Handling Recycle Papers with Wet-strength

Jiro Urata
AIKAWA Iron Works Co., Ltd.

The pulp & paper industry has been developing an optimization of all equipment that meets a requirement of an environmental preservation such as decreasing waste and saving energy.

On the other hand, we are now facing a problem that it is getting more and more difficult to procure recycle papers in good quality in the Japanese market, due to the influence on an increasing recycle paper export to China and other Asian countries. It is therefore predicted that we must use low quality recycle papers as a raw material for paper making processes. We then need to optimize the equipment in order to consistently maintain the paper making operations, while keeping the paper quality even the low quality recycle papers are used. This article introduces examples of the cases that focus on pulper & detrash process using the recycle papers with a lot of contaminants.

Initiatives for Carbon Neutral Society in the use of Ammonia

Kazuhiro Watanabe
IHI Corporation.

Thermal power generation has ability to adjust the fluctuations in the output of solar and wind power, as well as the inertial force that can mitigate frequency fluctuations in the event of a sudden power outage and plays an important role in expanding renewable energy. On the other hand, most of the fuels used in thermal power generation are fossil fuels such as coal, petroleum, and natural gas, and their combustion accompanies CO₂ emissions. Therefore, it is necessary to promote conversion to carbon-free fuels that do not emit CO₂ toward zero CO₂ emissions in thermal power generation. One of the promising ones is ammonia. It is easy to liquefy, has a higher hydrogen density per volume, which are superior characteristics in terms of transport and storage compared to other energy carriers.

This presentation introduces the development trends of ammonia utilization technology in coal fired boilers and gas turbines. In coal fired boilers, we have developed 20% ammonia co-firing burners that can reduce NO_x emission and unburned carbon to the same level as 100% coal firing. In gas turbines, we have developed combustors focused on stable combustion of liquid ammonia and reducing emissions that can reduce GHG emissions by more than 99%.

Development and evaluation of cooking accelerators that contribute to building a carbon-neutral industry - Collaboration with the RISE Research Institutes of Sweden AB. -

Takashi Tanaka, Toshio Yamada and Mayumi Yasumoto
Product Development Department
Institute of Surface Science and Technology, Chemicals Unit
Nikka Chemical Co.,Ltd

Lars Sundvall, Mats Westin and Robin Westin
RISE Research Institutes of Sweden AB.

As indicated by the Japanese government's 2050 Carbon Neutral Declaration, efforts to achieve a decarbonized society are becoming an increasingly important issue. Using forest resources is one of the effective means to realize a sustainable carbon-neutral society.

As a method for producing pulp from lignocellulose materials of plants such as wood, digestion using alkali or sulfite is generally used. After the lignin component is mainly decomposed by this cooking treatment, the lignin is removed by filtration and washing to produce pulp.

Although natural resources such as timber are recyclable, excessive deforestation is regulated from the point of view of environment and ecosystem preservation, and the price of timber is increasing. Therefore, in the production of pulp, for example, it is becoming important to increase the amount of pulp produced per unit of raw wood and to produce high-quality pulp products.

As a method to solve these problems, there is a method of using cooking aids (accelerators) for the purpose of increasing the efficiency of cooking and improving the yield of pulp per unit of raw wood. Furthermore, in recent years, there has been a demand for safer digestion accelerators.

This time, we explored various compounds, repeated laboratory evaluations, and developed a new digestion accelerator. However, in order to grasp the cooking capacity more accurately, we thought that an evaluation that reproduced the industrial process was necessary.

Under these circumstances, we contacted the RISE Research Institutes of Sweden AB.

(RISE) and conducted an evaluation of a new digestion accelerator. As a result, it was observed that the pulp yield tended to improve compared to the case where the was not used. Evaluation is ongoing. At the same time, we visited RISE in June 2022, witnessed the laboratory evaluation, and observed the equipment and methods, etc., and found that the RISE cooking evaluation method was more reasonable.

In this presentation, we will explain the theoretical concept of the digestion accelerator developed by our company, and the method and results of the digestion test conducted at RISE.

The operating experience of kneader

Yoshihiro Uotani

Amagasaki Mill production section, Rengo.,co.ltd

After the operation of the kneader facility, many advantages such as increased processing volume of the raw material process, improvement of raw material yield, and stable operation of the paper machine have been obtained. In particular, since the kneader equipment, which is usually used for the purpose of dispersing raw materials, processes the final reject raw material containing a large amount of adhesive foreign matter, there were some unexpected problems immediately after introduction, but now improvements have been made and resolved.

Realtime Prediction Model with using Single Point Morphology SPM-5500

- One of the hottest topics in P&P Industry = Visualization of Fiber Morphology -

Ryohei Watanabe, Hiromasa Matsuno, Nozomu Wada, and Kukjin Yoon

Voith Turbo Co., Ltd. BTG Japan

Paper such as tissue, corrugated board, packaging paper, and graphic paper is an indispensable necessity in the contemporary society, and at the same time, supports our daily lives, industries, and cultures. Graphic paper demand has been shrinking due to the IT development but on the other hand the Pulp & Paper Industry, who successfully circulates forests, energy, carbon emission, and products, has been recently reevaluated as an excellent resource-recycling industry in the world where SDGs is emphasized. The Plastic-Free is one of the major examples.

In Japan, the recovery rate of recycle paper is over 80% and utilization rate of the recycle paper is nearly 70%. This shows that the Japanese Pulp & Paper Industry is one of the top leading countries for the resource-recycling industry in the world.

Alternatively, by the influence of the expansion of the remote work related to the Covid-19, the curtailment of the graphic paper mainly made from the wood pulp has been further proceeded, and this has brought the situation that it become noticeably more difficult to get the high-quality recycle paper. And many paper mills have been trying to use the cheaper chips, that are generally hard to get the good paper strength. These factors have been the bottle neck for achieving the stable quality and operation at site.

The pulp fiber accounts for more than 80% of the paper body and about half of the paper production cost. The pulp fiber varies in the length, width, and fibrillation depending on the chip species, cooking way, and times of recycling.

The fiber Morphology is closely related to the paper quality, for example, softness on tissue, strength on corrugated board & packaging paper, printing quality on graphic paper. The freeness measurement has been applied in the paper manufacturing process as the way of knowing the fiber morphology for years.

The freeness measurement has been one of the good tool to control the important paper quality. But the production side has considered that there is limitation to correctly know the fiber morphology by only the fiber dewatering characteristics.

This article introduces SPM-5550, that is an In-line Fiber Morphology Analyzer, and reference of real-time prediction model for the important paper quality. This is the hottest "Visualization" and "Solution" in Pulp & Paper Industry provided by BTG who has struggled with customer's critical success factors.

Our slogan is "Knowing Your Fiber. Would you please join us to solve your issue by the solution provided by the leading-edge company in this industry?"