

2014 September JAPAN TAPPI JOURNAL

Vol.68, No.9 Abstracts

Univ. Tsukuba- Biomaterials Green-processing Research and Paper Research Liaison with ASEAN Countries

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Biomaterials Green-processing Research Group in University of Tsukuba was established in 2013. Green-processing means an environmental-friendly technology for processing biomass (green material) to build a sustainable society (green society). The research topics conducted there include (1) the development of paper-based medical and environmental check-up sensors fabricated by printing hydrophobic barriers using an ink jet printer with a poly (styrene acrylate) resin ink to build a microfluidic channel on filter paper, (2) utilization of fundamental papermaking technology to improve the speed of delivering aqueous liquid analytes in a micro-channel for high performance of the sensors, (3) bacterial culture system, instead of Petri dishes, using paper and ink jet printing so that paper substrates can have many small hydrophilic areas to accommodate agar media in filter paper entirely hydrophobized beforehand, (4) Device for converting paper vibration caused by sound or noise to electricity using a power generator where the distance between an electrode and electret changes repeatedly and induce alternative current, (5) the saltwater immersion method for paper cultural heritage that is damaged by tsunami and flood to inhibit mold growth as a first-aid treatment, and (6) scientific reexamination of effects created by the air-exposure practices to customarily manage books stored in library for removal of pests and moisture. The research group keeps on making efforts to bring forward international and industry-academia liaisons for further development.

Paper Stock Preparation Equipment

— System, History & State-of-the-Art Technologies —

Kazumi Fujita

AIKAWA Iron Works Co., Ltd.

In the history of paper industry, the refiner has been changed its style from “Beater” to conical type, cylindrical type, and disk type in accordance with the paper market growing in a

rapid pace. These transitions of refiner are intimately-connected to upgrading of paper machine, to variation of paper stock character, and to development of general industrial technologies. Thus knowing of the refiner's history would be very useful for deeply understanding of existing refiners and for studying their future.

Now, we face two big tasks which might force reconsideration of today's main double disc type refiners. The first one is the continual energy saving of refiner for electric power cost reduction and greenhouse gas mitigation. The second one is to getting maximum paper strength by using low intensity refining technology from plantation hardwood pulp which has shorter fiber length and lower freeness. On their principled grounds, some suppliers gave a revival chance to the cylindrical and the conical refiners by using the newest industrial technologies, as the new generation refiners, and another supplier created multi disk refiner,

Also, "Finebar" refining fillings would be one of very effective way to the today's 2 tasks without so much investment. We would like to introduce the good results of "Finebar" trials and actual performances.

History of Paper Machine Approach System and State-of Art Short Flow Concept

Yosuke Takeshita

Andritz K.K.

The approach system that will send the raw material to the paper machine in the final stage is a very important process to control the end product quality. It has been changes with respect to technological innovation associated with mass production and speed of the paper machine approach systems in a corresponding manner. In the first half of this paper, we will describe briefly the historical transitions of the approach system for the last half a century. And the second half of this paper, we will describe the Andritz state-of-art system "short-flow concept" that Andritz proposes currently.

Operating Experience of Combisorter

Yoshihito Utsunomiya

Oita Mill, Oji Materia Co., Ltd.

In Oita mill, there are three paper machines, PM#1, PM#3 and PM#5. Paperboard is mainly produced in Oita mill. In addition to it, gypsum liner board, white paperboard, color board and core board paper are produced.

As the usage rate of used corrugated paperboard accounts for about 80%, the reduction of the

rejected pulp in the corrugated paperboard process leads to the increase of the pulp yield rate. In this report, we will introduce the case that the pulp yield rate has been boosted by the installation of Combisorter, IHI Voith Paper Technology Co., Ltd., at the last screen of the pulp production process.

Trend of the Paper Manufacture Use Precipitated Calcium Carbonate Filler

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OKUTAMA KOGYO Co., Ltd.

Filler grade precipitated calcium carbonate (hereafter called PCC) is used in papermaking to improve the physical properties, optical properties, and printing characteristics of paper, and has a large share of the filler material market in Japan. (It is estimated that in 2013 the quantity used exceeded 70% of the total quantity of filler.)

PCC is manufactured by chemical reaction after calcined limestone, and by appropriately adjusting the reaction conditions the particle shape and size can be controlled as desired, so the particles can be designed in accordance with the required quality of the paper.

This article introduces the effectiveness of control of PCC particles for control of paper opacity and bulk, and for reducing bleed through of ink.

Transition and Latest Technologies in Wet End Chemistry of Paper Board (Internal Paper Strengthening Agents)

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Paper making system have been changing from the viewpoint of environmental protection and cost reduction. Recycling rate of used paper has been increasing, fiber quality has become worse. For a reason of operation cost reduction, consumption of fresh water has also been restricted. Under such highly closed wet-end condition and high electrical conductivity, various wet-end additives or internal wet-end agents cannot show desirable performance. We have already been developing various type of internal paper strengthening agents optimized in such a worse condition, by controlling physical properties of amphoteric Polyacrylamide(PAM) such as molecular weight distribution, molecular weight, branching degree and distribution of ionic charge density.

In this paper, we outline the transition and latest technologies in wet-end chemistry of paper board. In addition, we also introduce our new internal paper strengthening agents, which shows

higher performance in high strength paperboard.

Operating Experience of Shaking System at PM6 in Iwakuni Mill

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PM6 at Iwakuni mill has been operating since 1974 and until 2009 was producing coated base paper. However, since a rearrangement of the corporation's paper production operations, PM6 now produces a large variety of paper grades and quality. This includes regular coated base paper, cast coating base paper and wood free paper. Compared to the original coated base paper, for wood free paper and cast coating base paper quality demands differ according to the customer, and we were asked to meet more stringent quality requirements.

In order to meet these quality requirements, as well as to improve competitiveness with our competitor's products, we were able to improve paper formation and lower the MD/CD ratio by installing a wire shaking system in December 2010. In this presentation I will report on the outline of the equipment, our operating experiences and changes in paper quality.

Introduction of First Smart Sizer

Kosuke Fukushima

Kobayashi Engineering Works, Ltd.

“Smart Sizer” is a sophisticated development of rod metering type size press.

There are many factors that go into designing and operating a successful high-speed rod metering size press, and Paperchine created a quite new and unique technology as “Smart Sizer” .

The purpose of this paper is to highlight and evaluate the key areas for the equipment design and the process conditions. The development concept of “Smart Sizer” is based on “3C”, that is, “Compact design, Clean operation, and Cheap equipment” .

“Smart Sizer” is being used throughout the world to produce a variety of grades ranging from linerboard grades applying starch to high quality woodfree coated paper with high solids coating.

PVAm (Polyvinylamine) Technology; Improvement in Folding Endurance and Optimization of Chemical Use

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Ashland Water Technologies
Kazuki Kato
Riken Green Co., Ltd.

Fiber type and source are perhaps the most limiting factors to achieving sheet quality and machine performance targets. As the use of recycled fiber in the global papermaking industry grows, maintaining furnish quality becomes increasingly challenging. Recovered paper fibers now account for over 70% of the industry's raw material needs. Old corrugated containers (OCC) make up more than half of all recovered fiber tonnage, and are used to make most of the corrugated and folding cartons found on store shelves today. As these fibers repeatedly cycle through the processes of papermaking, converting, end use, and re-pulping, papermakers typically have to add more recycled furnish to the sheet to meet strength targets at nominal basis weight. This is not an attractive economic option due to the volatile recycle furnish market.

The paper machine wet end is one of the most complex and influential areas in the papermaking process. In a well-balanced wet end, additives impart sheet functional properties, improve machine performance, and increase operational flexibility. A chemically unbalanced wet end, often typified by overuse of additives, competing ions, and performance variability, can severely limit sheet quality and productivity.

Improving and optimizing the wet end additive scheme can reduce total input costs, boost machine performance, expand operational flexibility, and improve sheet quality. Based on these concurrent needs, Ashland Water Technologies has introduced a unique single-chemical additive called Hercobond® 6000 paper performance technology that is designed to provide step changes in the areas of strength, drainage, and retention; thereby increasing operational flexibility.

New HYBRID™ Polymer and Application to Papermaking Processes

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Nalco Company
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Katayama Nalco Inc.

HYBRID polymers are more effective in hydrophobic contaminant control and RDF (Retention, Drainage and Formation) applications because of its unique characteristics.

In recent raw material situation of paper industry, Nalco reviewed design of HYBRID

polymers and found optimum specification of polymer in each RDF and contaminant control application. Regarding RDF case, performance of developed polymer was confirmed in duplex board and gypsum liner machines. Various benefits were observed such as retention improvement, and more efficient dewatering from the wet web, reduction of steam consumption comparing with old type of HYBRID polymer.

In this paper, authors are trying to explain polymer development and commercial trial of new HYBRID polymer.

Characteristics and Potential Applications of Cellulose Acetate

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The acetylation of cellulose followed by the partial deacetylation leads to the solvent-soluble cellulose acetates, which have been widely used in various industrial fields including, *inter alia*, membrane separation, photo film, liquid crystal display, and, textile and other fibers. In this article, we focus on the remarkable surface properties of cellulose acetates. In this context, the recent development of cellulose acetate-based hollow fiber membrane for drinking water treatment is reviewed; owing to its outstanding negative ζ potential, the cellulose acetate membrane is more resistant than other-polymer-based membranes to the fouling problem by the suspended solids in surface water which are negatively charged in general.

In light of the theory for interfacial forces in macroscopic systems developed by van Oss et al., characteristics of cellulose acetates are also discussed in this article; cellulose acetates are characterized by their high electron acceptability, which could be an origin for affinity towards electron donors such as metals and carbons, suggesting that the cellulose acetates are inherently suitable for the binder for the production of electrodes of rechargeable lithium ion battery and other electrical storage devices.

In an effort to verify the affinity between cellulose acetates and carbon materials, composite films of cellulose acetate and multi-walled carbon nanotube (MWNT) were prepared. The composite films from cellulose acetates exhibit high electrical conductivity than other polymer based composite films, revealing that MWNT is highly dispersed in cellulose acetate matrix presumably because of the electron acceptor – donor interaction (Lewis acid – base interaction). We are ready to offer samples of non-conventional water-soluble grades of cellulose acetate as well as conventional solvent-soluble grades for potential applications as such.

Corporate Profile & Products Information (14)

Aikawa Iron Works Co., Ltd.

Aikawa Iron Works Co., Ltd. was founded in 1924, and it has been contributing to the development of the Japanese Pulp & Paper industry as a dedicated manufacturer for the Pulp & Paper related equipment since its Japan's first innovation of the continuous stock preparation equipment "Super Refiner". And Aikawa started a technological collaboration with Lodding (U.S.A) in 1965 and Lamort (France) in 1970. Aikawa has been establishing a sturdy foothold by responding to the recent global market trend of saving resources and energy.

Aikawa opened the Okabe Mill in Fujieda city, Shizuoka prefecture in 2003 to integrate the machining dept. and assemble dept., and opened a foundry shop in Mariko, Shizuoka city for better production efficiency in the foundry process. We then moved the headquarters operations to the central Shizuoka at 24-2 Tenma-cho, Shizuoka city for more efficient management functions.

We have further established a foothold to the global market by an acquisition of POM and AFT that were based in Finland and North America (fundamental areas for the Pulp & Paper industry) for the operations and manufacturing and having the worldwide distribution channels, in order to gain the strength against the global competition. Our target is to be a leading supplier that provides with cutting edge technologies, products and services for the stock preparation equipment, paper machine equipment, approach flow technology, refining plates, screen cylinders, Pulper rotors, doctor blades and other major consumables.

We appreciate for giving us an opportunity for introducing our company, products and technical information.

— Peer Reviewed —

Role of Deinking Agent and Its Challenge

— Deinkability of Inkjet Printings —

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The basic deinking process for old newspapers, the role of the deinking agent, the science and the condition for good deinking are reviewed based on the results in our laboratory first. Then, by using this typical deinking process, the deinkability of the pigment-based inkjet printings was examined.

In commercial printings, the transition to on-demand printings is in progress, because the

on-demand printings enable to print many various lots and even small lots. Among them, the ink-jet printing has attracted attention in terms of printing speed. Therefore, it is thought that the waste papers printed by ink-jet printers will be used as raw materials in pulp manufacturing in near future.

In deinking of pigment-based inkjet printings, there were no problems in the ink-releasing process. But, inks released from the waste papers were too small to be rejected out in the flotation process. For increasing the efficiency of the flotation, it was found that the weakened shear in the ink-releasing process and the combined use of the aggregating agents such as fatty acids in the flotation process were effective. However, by this method, it is considered that ink-releasing will be not enough in the deinking of old newspapers and electrophotography printings.

It is necessary to establish the deinking method of mixed waste of ink-jet printings, electrophotography printings and old newspapers by adopting the suitable deinking systems and deinking agents and/or improving the ink-jet inks.