

Thermomechanical Pulp Innovation for Energy Saving and High Brightness Paper Development

Part 2 Pilot Test

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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 diethylenetriaminepentaacetic acid (DTPA) or sodium hydroxide (NaOH) prior to the primary refining improved bleachability and saved 35-40% hydrogen peroxide in the interstage bleaching. 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 and high brightness paper development project in one of the largest paper mills in North America.

Development of new BM Sensor System without Radiation

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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 former is based on the anisotropy of dielectric constant and the latter is based on the dielectric loss of the sample. After developing above two sensor systems, we started to examine the possibility of BM measurement by using the sensor head of the fiber orientation sensor. As a result, we found the unique method for BM measurement 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.

Characteristic and the Latest Trend of Forming Fabric

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Forming A Forming Fabrics is a necessary and integral for modern papermaking machines, performing three main functions: 1) draining pulp slurry; 2) forming the sheet; and 3) transporting the sheet to the press section. Adequate sheet formation is one of the greatest concerns of paper makers, because it affects most of the sheet qualities. Recently, high quality and high productivity have both become top requirements of papermakers. Paper machines have evolved, increasing in size and speed. To meet the current demands of papermakers and the latest machines, forming fabrics have been evolving as well.

The first generation of triple-layer forming fabrics had the hope of being an ideal design, yet they were not able to expand into the market rapidly due to a structural design flaw which resulted in internal wear issues. Second and third generation triple-layer fabrics exhibited design improvements, and have become a current

mainstream design used on today's paper machines.

Aiming to improve quality and productivity, Nippon Filcon has developed "N-FAST", a revolutionary high-tech improvement on triple-layer design. N-FAST has a single-warp and triple-weft structure, which virtually eliminates internal wear (the weakness of triple-layer fabrics). Another advantage N-FAST design has over conventional triple-layer fabrics is greater MD flexibility, which enhances pulsation and improves sheet formation. Finally, our N-FAST provides optimum CMD sheet profile throughout the fabric's life.

In this session, we introduce the history of forming fabrics structure, from single-layer to triple-layer, and their evolution alongside the advancement of paper machines. Finally, we present Nippon Filcon's latest triple-weft design, the cutting-edge "N-FAST" series.

Next-generation Surface Sizing Agent

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Some enzymes have been used for papermaking. Enzymatic technologies had been examined to using for various papermaking applications. If enzymes can act efficiently to their target (for example, pulp fibers and trash), it is expected that higher effects of enzymes to their target are obtained.

We introduce the application using enzymes in pitch control, deinking. We have developed the combination of the different enzymes that showed good effects for the reduction of tackiness, improvement of whiteness and dart count in the waste paper. We hope that enzymes become available more effectively by the combination of enzymes.

In addition, we introduce our enzyme products for the improvement of paper quality and runnability.

Operating Experience of New Softwood Bleaching Plant

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The production of bleached softwood pulp had been reduced at Chuetsu Pulp & Paper, Takaoka mill because of the reduction of the bleached softwood usage in the paper machines. Due to this reason, the old existing bleach plant became too big for

the required production, and the operating and the energy efficiency became lower. There was high maintenance cost with the old bleach plant, and the old bleach plant building (built in 51 years ago) did not have enough strength for big earthquake. In order to solve these issues, Chuetsu pulp & paper decided to build the new softwood bleaching plant at Takaoka mill. The operation of new plant was started in December, 2015.

The reasons for Chuetsu to select the equipment supplier to Andritz were ; DD washer which has multiple stage washing and minimum required space, higher chemical and energy efficiency, and less working load on operators with start-up and shut-down.

There were various issues since the start of production. But the present operation has been stable with modifications and operation tuning.

For our future challenges, we are trying to improve the chemicals and energy consumption, and maximize the benefit with automatic brightness control.

Flying insects, especially chironomid midges, invading paper mills from outdoors

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The preventive effect of nets against invasion by flying insects, especially chironomid midges, was examined. Except the net of 40 mesh (opening: 480 μ m), all the nets prevented chironomid midges from invasion. On the other hand, thysanopteran insects passed through even the net of 50 mesh (opening: 330 μ m). In addition, the present study reviewed lighting management and light trapping method as physical and mechanical control of chironomid midges.

Latest Technology Trend of Headbox Sheet and Rod / Bed

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BTG-IPI (currently BTG USA Mill) was originally an OEM provider of Headbox

Sheet and Metering Rod / Bed for BELOIT and joined BTG group in 2006. BTG-IPI has been recognized as one of the valuable suppliers in the world who can propose the optimization for these products.

Headbox Sheet has been applied for the latest paper machines although the technologies have been for long years in paper industry and it has been known that the Headbox Sheet gives a huge impact on the sheet formation and fiber orientation that are the most important quality for the paper. BTG-IPI can provide not only the replacement but also the optimized design with the simulation of the expansion energy.

Optimization of the diameter and groove shape of the Metering Rod that is used at sizer and rod coater can bring a large cost-saving.

Headbox Sheet and Metering Rod / Bed are ones of the consumable goods and very small parts in the gigantic paper machine. But the optimization of the designs of these products can save a huge production cost and improve the paper quality without a large investment.

In this paper, I introduce the one of the samples for the optimization of these products BTG-IPI has done.

Report on the Results of the Fiscal 2017 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

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

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

- Compared to BAU scenario(based on specific CO₂ emission rate of 2005), reduce fossil energy-derived CO₂ emissions by 1.39 million tons by fiscal 2020 .

- In view of securing forest resources and increasing forest carbon sink, expand forest plantation areas owned or managed by the paper industry at home and abroad to 700 thousand hectares by fiscal 2020.

According to the results of the fiscal 2017 follow-up survey (actual results for fiscal 2016), fossil-energy derived CO₂ emissions in fiscal 2016 was 17.96 million tons, a 28.0% reduction compared to the fiscal 2005 (24.94 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.

Introduction of the Researches Presented at 19th International Symposium on Wood, Fibre and Pulping Chemistry (ISWFPC)

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The 19th International Symposium on Wood, Fibre and Pulping Chemistry was held in Porto Seguro, Bahia, Brazil on August 30–September 01, 2017. Totally about 140 researches were presented (oral 80, poster 60). Presented researches covered wide range of chemistry and were divided into sessions: pulp chemistry versus bleachability and quality, pulping, biorefinery, chromophore formation and brightness stability, bleaching of dissolving pulps, Bleaching for biorefinery purposes, lignin, lignin biosynthesis, nanomaterials, dissolving pulp, hemicelluloses, analytical, lignin preparation, lignin product, and lignin based resins. In this report,

some of presentations will be briefly introduced.

Theory and Practice of Ozone Bleaching

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Ozone bleaching began on an industrial scale in 1992 in connection with increasing environmental pressure and customers' demand for production of Elemental Chlorine Free (ECF) and Total Chlorine Free (TCF) bleached pulps. Ozone bleaching did not immediately reach its optimal efficiency from a technical viewpoint, and 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 with the quality similar to or better than that prepared by conventional ECF. 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 of these processes over the other depends on a number of factors – including investment costs, carry-over load, bleaching filtrates recirculation and bleach plant temperature profile and others.