

### **Supply and Demand of Wood Chips for Paper Producing and Its Worldwide Trends**

Kiyoshi kamikawa

Managing Director, Japan Paper Association

Paper and paperboard is indispensable for human life and its main raw material is wood chips. Pulp and recovered paper are also used as raw materials for paper and paperboard producing but their raw materials are also derived from wood chips. So, it can be surely said that paper and paperboard is almost 100% produced from wood chips. The demand for paper and paperboard has been decreasing after Lehman shock mainly due to the development of IT technology. So, the production of paper and paperboard has been also decreasing thereafter. About 70% of woodchips is imported and the imports of wood chips by China have been increasing very rapidly because China has recently been No.1 paper and paperboard producing country in the world.

As for domestic wood chips, the demand of wood chips for biomass has been soaring due to the expansion of wood biomass energy generation by FIT. Therefore, the demand and supply situation of wood chips has been getting very harsh and competitive. On the other hand, Clean Wood Act has been enacted in 2017 to tackle illegal logging ensuing the degradation of forests on the earth and the traceability of wood chips is strongly required by users and consumers. Besides, the increase of certified wood chips by FSC, PEFC or SGECC is the urgent agenda to secure the sustainability of global environments.

### **Chip Mill Operation and Woodchip Quality Control**

Kenji Yoshinaga and Hiroshi Tachikawa

Forestry Dept., Raw Materials & Purchasing Div., Nippon Paper Industries Co., Ltd.

Chipmill managers are not only adjusting their chipping operation in order to fulfill various requirements from customers, but also improving it day by day toward cost-down. There are two famous procedures for woodchip size analysis; one is

“TAPPI-UM21 Sieve Analysis of Pulpwood Chips”, and the other is “SCAN-CM 40:01 Size Distribution”. Since it takes normally only seven minutes (TAPPI) or ten minutes (SCAN) per sample, these are commonly utilized for on-site quality control at chipmill.

Chipsizes are determined by three dimensions of the woodchip; length, thickness, and width. Especially for the chip length, we have to fully understand each of the components of the chipper along with their roles, and also properly have to adjust and maintain them through precise check-out. Although there are several types of chipper, in this paper we mainly described about the characteristics and structure of Carthage chipper, Sumner chipper, and Norman disc chipper.

Referred to chipper components, we explained the function of spout, feed plate, wear plate, knife holder, chipper knife, counter knife, vertical anvil, and horizontal anvil. Also we described the procedure to adjust them using knife adjusting frame, chipper knife gauge, and thickness gauge. Although we listed up woodchip specification failures during operation and their trouble-shootings, some of the solutions are fully based on the fair condition of the chipper disk and stability of its shaft. Therefore it is very important to establish good maintenance team with sophisticated procedures, otherwise there is a possibility that they cannot even notice of the fundamental fault and repeat useless patching-up measures toward each trouble.

At the last part of this paper, we introduced one example of static chipper mill and one from infield chipper. The former is Fulghum Industries 96” – 10 knife disk chipper operated by AMCEL – Amapá Florestal e Celulose S.A. in Northern Brazil, and they process debarked *Eucalyptus urograndis* logs, cut to length by seven meters for each. The latter is Peterson Pacific DDC-5000G (later 5000H) mobile chipper operated by Croxley Pty Ltd in Western Australia, and they do infield-chipping operation for *Eucalyptus globulus* whole trees, producing woodchip with spec for pulp & paper.

## **Current situation and issue of recovered paper in Japan**

Kouichi Nakada

Paper Recycling Promotion Center

The recovery rate of paper and paperboard in Japan has reached to 80.9%. The recovery papers has satisfied 64.1% of the fiber demand for paper making in 2017 (utilization rate) and the balance are exported for overseas demand.

64.1% is a highest utilization rate in the world and we are aiming to lift it to 65.0% by the year of 2020.

To promote the utilization of recovered papers, it is essential to keep and improve the quality, well-sorted and clean. The scheme for sophisticated sorting, inspections and selection has been built through all stage in recovering with the cooperative working among the consumers, recyclers, local governments, and paper makers under the initiative of Ministry of Economy, Trade and Industry. This philosophy of paper recycling enables us to keep higher recovery and utilization rate and to support the export.

We are experiencing the drastic modification of quality demands from overseas recently. It looks impacting the supply and demand of all over the world including Japan. With knowing the changes in the world, it is recognized the significantly important to maintain and improve the quality of recovered papers in Japan, which leads to the sustainable recovery system.

We would like to report the current situation and issues for recovered paper in Japan.

### **DIP Technologies to Apply for Today's Low Grade Waste Paper**

#### **-Especially for tissue paper making-**

Kazumi Fujita

AIKAWA Iron Works Co.,Ltd.

Today's DIP raw material waste paper for tissue paper is quantitatively limited by reduction of production of writing-printing paper. Since the Mixed Waste Paper (MIX) import prohibition by Chinese government at the end of 2017, the price hike and quantitative tightening situation of waste paper in Japan have been slightly mitigated, but the low quality tendency of available waste paper is not improved.

From the viewpoint of life cycle assessment, the raw materials of tissue paper should have the optimum balance of waste paper and virgin pulp, and we believe that effective use of waste paper by the newest DIP technologies contributing to energy saving and global warming prevention should be sustainable, based on the fundamental signification of waste paper recycling, such as securing raw material for paper making, effective use of resources and formation of a recycling society by waste reduction.

Our target would be "to achieve 65% recycled paper rate in 2020" set by Japan Paper Association. The inbound effect by the Tokyo Olympic Games 2020 also might be expected. We would then like to introduce in this paper the AIKAWA DIP technologies, especially for the tissue making stock preparation process, i.e. Pulping and pulper continuous de-trashing, Coarse screen rejecting with no fiber loss, Washing & floatation, UV-ink dispersion, First pass retention improvement by POM compact wet end system, White water treatment by DAF, and Cleaners for tissue paper machine fabrics.

## **Application of stabilized halogen in deinked pulp manufacturing, and its benefits**

Shintaro Sato

Katayama Nalco Inc.

This paper is written regarding efficiency of hydrogen peroxide bleaching in deinked pulp plants. First, the paper explains technical background of interference with peroxide bleaching by bacteria, and stabilized halogen technology in pulp and paper industry. Then, the experiment is reported that deinked pulp treated by monochloramine which is well utilized stabilized halogen gave more efficient bleaching than no treatment. Lastly, the paper introduces mill experiences from few deinked pulp plants that bleaching efficiency improvement was achieved by applying monochloramine. Some other benefits at the viewpoint of plant operation were also reported as additional return from the application.

## **Factors affecting pulp yield and improvement measures**

Hitoshi Tsuchida and Jungo Nishimuki

Technical Sales Dept., Hakuto Co., Ltd

The external environmental change that the pulp industry should pay attention to include the reduction of paper demand, the expansion of wood demand, and the utilization of wood resources as the information transmission and recording means change.

As wood resources depend on imports, the Kraft pulp manufacturing method is the mainstream, and most of the manufacturing variable costs are raw wood costs. As the domestic paper pulp industry, it is important to know how to produce high quality pulp. The merit of obtaining is very large.

As factors influencing the pulp yield, it is necessary to appropriately adjust the operating conditions such as optimum chemical composition, pH, temperature, time, pressure, etc. through cooking and bleaching processes, and to assist in the cooking and bleaching process. The use of agents can be mentioned.

As a proposal for measures to improve pulp yield, we will report on the prevention of elution of components that can become pulp and investigation of the optimum operation pH region, focusing on re-adsorption, and our newly developed products with the same concept.

## **Fundamentals of KP Brownstock Washing and Technical Trend of Washing in Japan**

Makoto Iwasaki

MIP Consultant Office

The purpose of brownstock washing is to separate spent cooking chemicals and dissolved organic wood solids from unbleached fiber with using as little washing liquor as possible. The brownstock washing is defined that a separation process located between the cooking stage and the bleaching stage or paper machine depending on the type of stock being produced, however, this article describes about basic knowledge of pulp washing included with Hi-heat washing in a continuous digester, blow line washing, washing before and after O<sub>2</sub> delignification stage as well as washing in bleaching stage. At the same time, the changes of equipment for KP washing in Japan are introduced briefly.

## **Importance of Brownstock Washing Process and Andritz Brownstock Washing Technology**

Kanji Hagiwara and Ryo Yoshida

Andritz K.K.

Brown-stock Washing Process is one of the key processes in Kraft Pulp Mill. Purposes of Brown-stock Washing Process are (1) remove dissolve organic material and in-organic material from pulp which are generated in cooking process and oxygen delignification process, and send filtrate to recovery process. Efficiency of Brown-stock washing is very important for Kraft pulp recovery process. This paper explains basic and important points of brown-stock washing technology.

## **Development of wash machine and the technologies for improving washing efficiency**

Yan Ju

Valmet K. K. Services business line

With development of washing machine, it is common understanding that wash press (especially TwinRoll™ Press Evolution, TRPE) is mainly adopted for washing pulp recently. By installation of the wash press it is possible to recover the chemicals and the dissolved wood components efficiently, and reduce COD carry over to the bleaching

plant. On the other hand, by installation of the wash press in the bleaching plant (especially in D0 stage) it is also possible to minimize COD carry over to the next bleaching stage, and adjust the bleaching conditions easily (pH, temperature etc.), reduce the bleaching chemical consumption, and minimize the discharge of effluent. With DiConn™ system it is possible to increase the washing efficiency both in washing zone of the digester and in the pressure diffuser, produce more flash steam, and increase dry solid content in weak black liquor which is related to reduce the steam consumption in the evaporation plant.

### **Characteristics of Pulp Mill Effluents and Activated Sludge Process**

Masayuki Watanabe

Research Laboratory. Nippon Paper Industries Co., Ltd

In pulp and paper mills, flocculent settling process, a kind of physicochemical process, and activated sludge (AS) process, a kind of biological process, have been used for wastewater treatment. The former is to remove SS by flocculation with chemicals, and the latter is to decompose dissolved organic matter by aerobic bacteria.

Wastewater in the pulp and paper mill is classified to wastewater from KP plant, wastewater from DIP plant and wastewater from paper machine, each of which contains various organic matters. The former two, pulp mill effluents, are treated with AS process in most cases.

In order to evaluate characteristics of pulp mill effluents, dissolved organic matter in wastewater from each pulp plant was fractionated into five components : hydrophobic acid (HoA), hydrophobic neutral, base, hydrophilic acid, hydrophilic neutral. Based on measurements of the degradation rates of the fractionated components, it was confirmed that the most refractory matter was fractionated into HoA. The main source of HoA was KP bleaching process drainage, and a major composition of HoA seemed to be lignin.

Degradability of wastewater was affected by not only characteristics of wastewater but also performance of AS. Biodegradation test with combination of wastewater and AS indicated that AS samples of some mills had different ability for degradation. And, Genetic analysis suggested that high performance AS had much bacteria preferring aromatic compounds which were hardly degradable.

## **The wastewater treatment systems in the pulp and paper mill**

Toshihiko Abe

Sumitomo Heavy Industries Environment Co., Ltd.

The wastewater from pulp and paper mill is classified into the following 4(four) kinds. a. pulp wastewater b. KP evaporator drain wastewater c. paper machine wastewater d. DIP wastewater. The wastewater treatment systems are decided about by the factory scale, locational condition and production item, etc...

Typical wastewater treatment systems are Primary coagulation sedimentation, Activated sludge and Post coagulation sedimentation, wastewater is processed below the processing water quality standard and drained in a public area.

Oji Paper Co., Ltd. Tomioka factory introduced EGSB system (methane fermentation system) of energy and space saving. The biogas is used as supplement fuel of a kiln, and the energy recovery.

## **Principles of Kraft Cooking and Computer Simulation of Continuous Digester**

Takanori Miyanishi

JAPAN TAPPI

The computer model was developed to simulate two-vessel Kamyr continuous digester. The model was a static model that simulated steady state processes for process optimization and retrofit feasibility studies. A new equation that described cellulose degradation by dissolved lignin was incorporated in our model, which made it possible to evaluate the effects of multiple points of black liquor extraction. One of the kraft digesters of Nippon Paper Industries was designed by MCCTM (Modified Chemical Cooking). Prior to the startup, simulation was performed to predict pulp yield and strength properties of hardwood pulp. Simulation shows that higher pulp viscosity and yield were obtained at a given kappa number by several modified cooking methods. The dissolution of the hemicelluloses was best understood by separately considering the two major types: glucomannan and xylan. The content of xylan in MCC cooked pulp was higher than that of the conventional pulp because xylan remained relatively stable to alkali. As hardwood chips contain more xylan than softwood chips, it was predicted that the pulp yield increase in MCCTM and EMCCTM (Extended

Modified Chemical Cooking) would be more pronounced in hardwood kraft pulp than in softwood kraft pulp.

### **New stock preparation Portfolio - Voith BlueLine Product**

Junichi miura

Voith IHI Paper Technology Co., Ltd.

Modern stock preparation has to provide maximum performance with the highest system efficiency. Efficiency means not only using less energy, fiber and water, but also sustainability in terms of quality and reliability. Machines in stock preparation have been developed what are demanded by the period and improved day by day in long history continuing providing the machines. Also surroundings and the needs are changed a lot in different countries.

In this change, Voith presents its new product portfolio BlueLine for stock preparation from several thousand references and experiences in a variety of product ranges.

### **Energy Saving and Demonstration of Operation Experience by New Integrated Lime Kiln**

Hiroto Tsuchida

Hokkaido Mill, Nippon Paper Industries Co.,Ltd

Nippon Paper Industries Co.,Ltd Hokkaido Mill-Asahikawa has two lime kilns in recausticizing process of kraft pulp plant. Lime kiln, which is part of the process for making alkaline solution used in kraft pulping, is lime reburning process to convert calcium carbonate to calcium oxide.

We implemented major upgrade on one of kilns with the aim of shutting down remaining kiln to reduce heavy oil consumption.

In this paper, we will report on the details of the upgrade work, energy saving and demonstration of operation experience by new integrated lime kiln.

## **How the paper industry in Japan has technologically responded to the paradigm shifts of the Japanese society**

### **Part 2 : The Paper Industry in the 1970s (1)**

Kiyoaki Iida

The period from 1970 to 1975 was one of paradigm shifts of Japanese society, as oil price hiked, the Rome Club warned that resources are limited, and the environment deteriorated severely due to the rapid economic expansion ahead of it. The paper industry, suffering imminent free trade of paper, steep rise of wood price and complaints on its pollution from public, had a sense of crisis for its business

To cope with the problems, it invested more than 800 billion yen to control pollution acceptable, mostly on effluent treatment, in the five years. As for wood supply, hardwood could be one of main wood supplies, wood chips were imported systematically, and old newsprint could be processed to newsprint furnish.

What happened in those years were characterized as a technological revolution in Japan. The solid state was a key technology, and every industry in Japan, similarly making the best of it, became prosperous in the world. In the paper industry, many new paper machines were installed. Paper companies worked with unique and close cooperation with domestic suppliers who were licensees of foreign equipment suppliers, and improved their production capability to the top level in the world, and became competitive to imported products.

The next issue will discuss energy saving and international business in those years and sum up the era.

## **Kraft Cooking and Bleaching Ability of Low-density Acacia Wood and Hardwoods with Varying Chemical Characteristics of Lignin**

Keishi Tanifuji , Ken Nozaki and Taro Sugiura

Hokuetsu Corporation.

Hiroshi Ohi

Graduate School of Life and Environmental Sciences, University of Tsukuba

Low-density acacia (*Acacia hybrid*) wood chips, relatively high-density acacia (*Acacia mearnsii*) wood chips, eucalyptus (*Eucalyptus globulus*) wood chips, and

Japanese mixed hardwood chips were cooked through a kraft cooking process using the continuous conventional mill digester. Chemical composition of these wood chips and properties of the obtained pulps were compared. Low-density acacia wood chips showed the highest lignin content, the lowest combined yield of syringaldehyde and vanillin obtained by alkaline nitrobenzene oxidation analysis of the lignin, and the worst cooking response among the four kinds of woods. When the mixture ratio of low-density acacia wood chips in the feedstock was increased, pulp yield and hemicellulose (xylan) content of the pulp were decreased. The physical properties (breaking length, bursting strength, and folding endurance) of the bleached kraft pulp hand sheets slightly decreased with decreasing xylan content of the pulp. However, changes in the hand sheet strength properties had negligible effects on the quality of the paper products.