

### **Facility Improvement with Small Investment**

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VOITH IHI Paper Technology's coaters have been maintaining the world's highest technological standard thanks to Japanese customers who are very discerning when it comes to paper coating quality. We have also focused on developing technologies and products by improving the existing technologies further, acting as a leader in the VOITH group worldwide. Our blade coater technology is the fruit of such efforts. Concerning coater business in our various fields of business, we are focusing on improving facility maintenance and additional functions of the jet-fountain-type blade coater. Concerning winder business, we are also focusing on improving operability and safety measures. So far we have delivered over 150 units of jet-fountain-type blade coater, which have been adopted as a coating material application method for various coated papers. Since some of our customers have been using our blade coaters for over 30 years, we have proposed plans for performing facility maintenance and machine updates, which are needed for the long life of machines. This paper introduces those topics which we are focusing on the improvement of facility maintenance and the additional functions of our jet fountain coater and the improvement of operability and safety measures of VOITH's winder. Concerning the jet-fountain-type blade coater, topics are facility maintenance of loading device and fountain lip, additional functions of jet flow and skip coating. Facility maintenance of loading device means exchanging the corroded and worn rotating parts to new ones, facility maintenance of fountain lip means exchanging lip blade and adjusting lip profile. Concerning the winder, topics are roller bar and safety measures of knife of slit. The installation of roller bar leads the improvement of spread effects and the reduction of product loss.

Facility maintenance will certainly prolong the service life of the machines, maintain machine accuracy and stabilize product quality.

The additional functions, which I introduce here, and also aiming at improving operability and reducing product loss, are being received favorably by our customer.

## **Development of New Surface Sizing Agents**

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In recent papermaking industry, since the trend of cost reduction and environmental protection, chemicals with good performance by small dosage are highly desired.

As for surface sizing agents, it has become much more difficult to achieve better and stable performance under poor condition, i.e. highly recycled fibers are used, high ash content paper is produced *etc.*

Two types of surface sizing agents, which are solution type and emulsion type, are commercially available. Emulsion type products have mainly been developed in industry, because of less foaming trouble.

We have developed three different types of surface sizing agents, Type A, B, and C. Type A, comprising a special emulsifier, is designed to enhance hydrophobicity and dispersibility, so that it suits two-roll size press machine well. Type B is designed to have anionic substituent groups, in order to perform well in rich cationic system. Furthermore, by introducing permeable components into Type C, it can easily show sizing effect in low-liquid-absorbing system such as a gate-roll coater.

In this report, more details will be explained.

## **Development of New Type“AXISZ System”**

### **—Improvement of the Runnability by Proper Wet-end Chemistry—**

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As well known, on any paper making machines, any wet-end chemicals are not able to achieve its acquired effectiveness, due to excess use of waste paper pulp and due to too much dosage of filler. In last year in this conference, we introduced “ New Type Dual Addition System ” which had been developed with new concept to perform better even under these circumstances and we proudly told you that our on-machine trials had met favorable reception. In this paper, we would like to show

our examples of the evolved coagulant in various aspects.

“REALIZER A Series” was developed to obtain the function of pitch-control by adjusting the best ratio of hydrophilic and hydrophobic groups. Recently, as a target, we have chosen the sizing agent among the various auxiliary chemicals which “REALIZER A Series” may help sizing agent or may enhance its sizing function and have been working on the test to improve the supporting capability of “REALIZER A Series” to help the sizing agent to adhere more to pulp and other components in white water. In addition, we have already put newly developed coagulant into the market. The new coagulant is able to enhance the capability of retention aid to improve the retention of filler and pulp and at the same time, so as to improve the total paper qualities, such as formation. On the other hand, another type of “REALIZER A Series” has been developed which can help drainage agent for water to pass through the pulp fibers and other components easily.

The important thing is to establish the best collaboration of coagulant and retention aid to get better paper quality and runnability, and to reduce pitch trouble and paper defects. It is also important to find or judge the appropriate position to add these chemicals with right dosage. Therefore, in this paper, we are going to show our experiments or trials together with the results.

### **Validation of Pest Measures Based on A General Risk Investigation**

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Contamination of insects into products will lead to big problems such as market claims and complaints.

In many factories, they are using monitoring methods to investigate and understand the numbers and types of insects in factories. However, that method is not adequate enough to understand all the problems in the production areas. We need to apply the comprehensive methods. We would like to introduce you the effective methods of investigations of risks of pests.

## **Bleach Plant Optimization Utilizing Novel Measurement Technologies Complimented with Advance Process Control**

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Unit operations in a fiberline are designed to selectively remove lignin to achieve a pulp with desired brightness, cleanliness and strength. Pulp being a commodity there is always a pressure to reduce costs. The primary focus is generally to reduce wood costs but efforts to reduce bleaching chemicals, the second largest cost contributor, cannot be ignored.

Conventional bleach plant process control is based on the lignin content of the pulp fibers expressed as kappa number, combined with brightness measurement in the bleaching stages. There is compelling evidence that carryover consumes bleaching chemicals (Chlorine dioxide, in short  $\text{ClO}_2$ ). In the absence of carry-over measurement, mills compensate by applying a high operator bias to cover peak carryover demand which results in higher bleaching costs. To overcome this challenge, the pulp industry is currently transitioning from conventional fiber kappa number measurement using a traditional multipoint analyzer to the new total kappa measurement using an inline Bleach Load Transmitter for  $\text{ClO}_2$  charge control. In this way, the impact of carryover lignin is also included in the control of chemical charge. This continuous bleach load signal minimizes operator bias and delivers significant bleaching chemical savings.

Manipulation of multiple process variables is required to achieve effective bleach plant control and it is extremely challenging to optimize each of the controlled variables to maintain the process close to target. While it is of utmost importance of have the sensors functioning accurately and regulatory control loops in place; it is practically impossible for operators to manually optimize bleaching chemicals to achieve final brightness at minimal cost. To overcome this challenge, Multivariable Advanced Control System (MACS), a proven advanced control platform, has the potential to deliver large savings to mills. MACS uses dynamic process models to account for the effect of bleach load disturbances on downstream kappa number and brightness, and manipulates the  $\text{ClO}_2$  dose to compensate for these disturbances. MACS corrects for unmeasured disturbances via feedback

control, and accounts for varying process delays and non-linear bleaching curves via real time model adaptation. MACS also optimizes the bleach load applied at each stage to minimize bleaching cost for a given final brightness.

This paper highlights the advantages of a synergistic approach to optimizing bleach plants by utilizing proven, novel and differentiated measurement technologies with advanced process control strategies. Some case histories taking this approach are also included.

### **Introduction of the Latest Application of Tissue Softness Analyzer (TSA)**

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The tissue production is a very complex process: extremely fast and at the same time it needs to be guaranteed, that the quality of the base material and also of the finished product meets the expectations of the converters and customers. Chemicals have to be added at the right time and in the right amount and the machines for the production and converting have to be set in the right way.

Besides this, producers and converters of tissue are under pressure from the consumers, because more and more these customers expect a quality on the highest possible level, but at the same time to the lowest possible cost.

This actually contains a couple of issues for tissue producers and all companies which are somehow related to the tissue production, such as pulp and chemical suppliers, but also manufactures of tissue production and converting machines.

### **Saving Energy by Protecting Coal from Moisture**

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In paper mills and power plant, coal is stored in an outdoor location. Most of the coal absorb moisture from rain or the water sprayed for dust control. Increased coal moisture causes troubles such as clogging in the transport equipment as well as

energy loss in combustion.

As a solution to these problems, a method that utilizes an impermeable and strong coating agents is reported. The Lab results as well as field results of the coating agents are reported in this document prove the moisture inhibition effects of the agents.

A solution provided by coating agents is a simple yet effective method to prevent the increase of coal moisture.

### **Energy Saving by Means of Lower Industrial Air Pressure in Mill**

Tuneo Ito

Matsumoto Mill, Oji Materia Co., Ltd.

Oji Materia Co., Ltd. Matsumoto mill worked on the energy saving of compressors since 2013. In fiscal year 2014, we saved energy curtailing waste of electricity by controlling pressure of compressors that supply air to lines in our mill. As a result, we were able to reduce compressors electricity in 1.73 MkWh/ year from 2.24 MkWh/ year. Furthermore, compressor electricity was finally at 1.655 MkWh/year by suppressing the consumption of the air blow and we achieved reduction of 26% electricity. To plan the effective use of facilities, we enabled monitoring of compressors electricity, air pressure, air flow quantity and the remote control of the compressors.

### **The History of Technological Developments of the Paper Industry in Japan after World War II**

#### **Part2 Rayon and the Paper Industry**

Kiyoaki Iida

The paper industry has been supplying dissolving pulp to cellulosic fiber industry, which was newly born at the beginning of 20th century, and of which development in the early stage the paper industry was in part involved in. With the study of cellulosic fiber, the concept of high polymer was invented and new industries such as those relating to synthetic fiber and petro chemistry started.

As the monopoly by Courtauld ended in 1920, rayon was now produced worldwide,

and Japan also started its manufacturing. By 1937, it took the 28% share of the world production. The paper industry supplied pulp to them and developed the technology of using domestic woods such as red pine, beech and cedar.

After World War II, rayon production recovered very quickly from ruin. Then, synthetic fiber rapidly took the market from rayon and the domestic rayon manufacturers retreated from the business. So, the dissolving pulp manufacturers in Japan turned to paper making.

### **Report on 2016 TAPPI PEERS/RFR Conference and IBBC Conference**

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The 2016 TAPPI PEERS (Pulping, Engineering, Environmental, Recycling & Sustainability) Conference/RFR (Research Forum on Recycling) and IBBC (International Bioenergy & Bioproducts Conference) were held in Jacksonville, Florida in September 2016.

There were several remarkable reports which focused on using poor recyclable papers such as packaging products in PEERS/RFR. Wide range of studies were presented to utilize wood biomass materials in IBBC: separation methods, developments of products, improvements of facilities and so on.

Some notable papers were summarized in this article.

### **Preparation of Lignin Composite Kraft Pulp Based on Black Liquor Absorption and the Following Acidification**

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Kraft pulp is the most expanding pulp in the world, applicable to every kind of wood species. A few drawbacks of kraft pulping are that its yield is low around 50% and the dissolved lignin is used only for energy after concentration of the black liquor. This research aims at overcoming them by development of novel lignin composite kraft pulp. We propose a unique lignin composite process based on black

liquor absorption with pulp and the following acidification. Various kinds of lignin are typically dissolved in alkaline solution and are precipitated at neutral or acidic pH. According to this mechanism, lignin could be precipitated in pulp swollen with black liquor.

Model black liquor was prepared by dissolving commercially available kraft lignin in 2 N NaOH. Bleached softwood kraft pulp was immersed in the black liquor for 5 min and the pulp was acidified with 10% acetic acid. After defibrillation, a hand-made paper was prepared from lignin composite pulp. The paper demonstrated good tensile and tear strength with increased hydrophobicity. It seemed that lignin is less oriented at the surface and included more in the cell wall of the fibers. This kind of fiber is very difficult to be produced by both mechanical and chemical pulping. Our method could contribute to increase the yield of kraft pulp and create novel fibers with various characteristics.