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Successful Reduction of Energy Consumption Rate by 4% for 2 Consecutive Years and Future Efforts

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OTSU PAPER BOARD CO., LTD.

Located on the coast of Lake Biwa in Otsu City in southern Shiga prefecture, Otsu Paper Board Co., Ltd. has been putting efforts to protect the environment first since it started operations in 1955, manufacturing and selling environmentally-friendly paperboard(container board). In January of 2004 it converted its fuel source of a power generation system from fuel oil C to city gas, while also adopting a gas turbine co-generation system, achieving a drastic reduction in environmental burden and energy used. However, with the undeniable upward trend in fuel costs influenced by geopolitical risks and a weak yen, measures to counter-act rising energy costs have recently become an urgent administrative issue. In the midst of this, the entire company came together to work on energy conservation, successfully achieving an energy consumption rate reduction of 4% for 2 consecutive years from 2013. In this paper, I will introduce the kind of point of view the company advanced its energy conservation from, citing examples of improvements.

Activities for Energy Saving in Ebetsu Mill

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Ebetsu Mill, Oji F-Tex Co., Ltd.

EBETSU mill is working together for energy conservation aiming to “reduce 257L/h(2,100kL/year)in terms of crude oil” in 2015 to achieve environmental objectives for ISO14001 of the mill.

However, it is becoming increasingly harder to find new energy-saving projects and plans through capital investments.

Therefore, we have been conducting a sweeping review and improving of previous efforts, horizontal developments promoting in other mills in Oji group, and operating conditions of our

facilities for the pulp manufacturing and the paper making processes.

This report introduces several examples showing we have achieved major energy savings as a result of these efforts.

New Chemicals for Boiler Water Treatment from the Viewpoint of Energy Saving

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Kurita Water Industries Ltd.

Chemicals for boiler water treatment are evolved out of a long process of energy saving requirement. In this paper, two topics which we were concerned to the development are briefly described.

Low pressure boilers in which feed water are mainly softened water have a problem with mineral scales adhering internally. The scales adversely affect energy efficiency. A scale remover has been required in addition to conventional chemicals, but if excessive remover is added, the steel material in the boiler pipe may be damaged. Kurita Water Industries has invented a multi-purpose chemical preventing scale and corrosion in boilers and removing scales. It comprises products approved by the United States Food and Drug Administration (FDA) against customers seeking safer and more reassuring boiler water treatment chemicals, such as hospitals and food and beverage factories.

For High pressure boilers which have steam generators, oxygen scavengers, alkalizing amines and phosphate are used as a conventional treatment programs. In a treatment program based on film forming amines (FFAs), higher concentration cycles can be achieved, leading to lower amounts of blow down water and therefore to a significant reduction in energy losses. Recent lab studies with FFAs have shown that the coefficients of heat transmission from the heating tubes into the water phase are significantly higher than when phosphate treatment is used. As a consequence, lower energy losses can be expected. FFAs have been successfully used in real applications for decades in Europe.

Energy Saving in Waste Paper Stock Preparation

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Our stock preparation system has two lines which are No.1 line used 100% JOCC and No.3

line used JOCC and mixed waste paper. Today, we produce about 80% of recycled pulp for liner board machine. No.3 line was installed in 1991. In this time, we have updated the pulper which is responsible for a part of the screening process. And then we are able to aggregate the screen system in order to reduce the power consumption.

Improving the Operation of a Continuous Digester Using Model Predictive Control and First Principle Soft Sensors

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Continuous cooking is a complex process by its nature. It consists of numerous process stages, with long residence times, and strong interdependencies between process stages and variables. Many of the essential process variables are difficult or impossible to measure, including the characteristics of the raw material and the state of delignification along the process line. It is possible that poorly designed and tuned local feedback control could even increase the variance in the quality variables in the pulping line.

This paper introduces Model Predictive Control (MPC) based continuous cooking APC solution which includes impregnation vessel and digester liquor and chip level controls, alkali to wood ratio controls and kappa number controls. Advanced predictive first principle based kappa number soft sensors are introduced and implemented into to quality control scheme. Reported results include increased stability of the cooking process, resulting over 35% reduction in the kappa variability coefficient, enabling a kappa target increase and significant cost savings.

ASA Sizing Technology Based on High Shear Homogenizer System

—Combining Chemistry, Equipment and Papermaking to Improve Sizing Performance—

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As with most processes in the paper industry, ASA performance is dependent not only on the chemistry of the product but also relies on robust equipment to develop the full potential of performance of the additive and applications expertise to minimize the unwanted interactions and accentuate the positive effects. Kemira has designed and manufactured FennoSize AS 1-series ASA, to meet the sizing needs of the paper industry exclusively. We developed and patented the manufacturing process to make this molecule with as little residual olefin and oligomeric material as possible. A more robust emulsifying system was necessary to fully develop the sizing performance build into the products. On our way we were able to assess other key factors related to the papermaking process that would have a beneficial or negative effect on product performance. Finally, we applied our global sales, application, and R&D expertise making the FennoSize AS 1-series sizing program the best possible program for our customers. The details of the Chemistry, Application Knowledge and Service are discussed in detail in the following paper.

Start-up of New LinerBoard Machine

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VOITH IHI Paper Technology

Marusan Paper PM8, the new linerboard machine started its operation in Dec, 2014, supplied by VOITH IHI Paper Technology. This project is a full turnkey basis including engineering, procurements, construction works, and commissioning, and the scope of delivery are the paper machine, approach flow system, broke handling system, fiber recovery system, finishing machine, field instrumentation, control system such as MCS, DCS, QCS, drive system as well as control system for paper properties in cross direction, additionally all the auxiliary facilities including the overhead crane. In the construction period, temporary storage or space for transport was very limited due to the mill location also due to overlapping the disaster reconstruction projects in the vicinity, and this occurs changes the traffic every day. Therefore the transport unloading and installation work were always in on-time, which is aimed at the delivery and installation timing in accordance with the progress of construction work. Risk management of the installation/construction period delay and safety management was carried out by our construction work on the basis of a number of experiences and references of the past.

The project management of IHI and VOITH IHI ensured the quality, the delivery time, and the thoroughness and the safety, furthermore the success of the scheduled start-up. This paper introduces the outline of project including installation and start-up phase, as well as the specification of PM8.

A New Concept of Wire and Press Section Deposit Control under Deteriorating Furnish Condition

—Discharge Deposit from Paper Machines by Reducing Its Stickiness—

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As the recycled pulp in the furnish is increased, the amount and kinds of adhesive deposit is also increased in the system. Particularly, the adhesive deposits lead to serious problems in paper-making machine which cause sheet breaks or defects in a finished paper.

This report introduces the details of a New Concept “Pitch guard” developed by our company, and examples applied in the paper machines are also presented.

Analysis of Distributions of the Paper Chemicals on Paper(IV)

—Visualization Analysis of Polyion Complex Formed by Paper Strengthening Agent and Application for Development—

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In recent years, there is a growing demand for paper chemicals to show higher performance for the following reasons. Firstly, pulp fiber quality is becoming worse due to an increasing recycling rate of used paper. Secondly, as the consumption of fresh water being restricted, the electrical conductivity (EC) of water becomes higher in paper making process. We aim to develop new paper chemicals, which is optimized for the above change of the wet-end condition.

Visualization analysis of Polyion complex (PIC), which is formed by Amphoteric Polyacrylamide (PAM) based paper strengthening agents, has been investigated by Scanning Probe Microscope (SPM). Using an advanced SPM measurement, clear image of PIC which

retains on the pulp fiber in aqueous solution was achieved. It was also found that fixation state and floc size of PIC was dependent upon wet-end condition. The increase of EC prevents PIC formation and thus decreasing PIC size. Therefore we have designed a novel paper strengthening agent, which can make larger size of PIC under high conductivity. This new agent gave higher dry-strength of paper than conventional one.

From the Researches Presented at 18th International Symposium on Wood, Fiber, Pulping Chemistry (ISWFPC)

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The 18th International Symposium on Wood, Fiber and Pulping Chemistry was held at BOKU university (Vienna, Austria) in September, 2015. Totally about 220 researches were presented (oral 90, poster 130). Presented researches covered wide range of chemistry related to wood - lignin, nanofiber, biorefinery, bioenergy, biomaterial, pulping, bleaching, cellulose, paper, and others. In this article, 86 presentations will be briefly reviewed.

—Peer Reviewed—

Peroxymonosulfuric Acid Treatment as an Alternative to Ozone for Totally Chlorine-free and Elementary Chlorine-free Bleaching of Hardwoods Prehydrolysis-kraft Pulp

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This study is focused on improving totally chlorine-free (TCF) and elementary chlorine-free (ECF) bleaching by using peroxymonosulfuric acid (P_{sa}) instead of ozone (Z). Bleaching was conducted by a combination of oxygen (O) with P_{sa} , followed by alkali extraction with hydrogen peroxide (E_p) and chlorine dioxide (D) stages in accordance with proposed sequences O- P_{sa} - E_p - P_{sa} - E_p and O- P_{sa} - E_p -D. Increments in pulp consistency during the O stage and an addition of $MgSO_4$ during the E_p stage were performed to improve pulp brightness and viscosity.

The O-P_{sa}-E_p-P_{sa}-E_p sequence was compared with the O-P_{sa}-Z-E_p sequence, and 87.3-88.3% ISO brightness was achieved by TCF bleaching corresponding to the O-P_{sa}-E_p-P_{sa}-E_p sequence. However, the viscosity obtained after the final stage of the TCF bleaching was 5.1-6.0 cP, while the O-P_{sa}-Z-E_p sequence resulted in an 83.1% ISO brightness and viscosity of 5.4 cP. It was difficult to reach brightness above 88% ISO with viscosities greater than 6.2 cP, which are the minimum standard levels for dissolving pulp, using the TCF bleaching sequence. Further studies with better qualities of raw materials are required to investigate this possibility. Meanwhile, brightness 88.1% ISO and viscosity 7.3 cP were achieved by the ECF bleaching corresponding to the O-P_{sa}-E_p-D sequence with only a 0.5% ClO₂ dosage, which suggests a potential reduction in the usage of chlorine-containing chemicals during the ECF bleaching.