

### **Operating Experience of Down Flow Lo-Solids Cooking at Ishinomaki Mill**

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Ishinomaki Mill, Nippon Paper Industries Co., Ltd.

It is Lo-Solids cooking system with a continuous digester was used since 2001 in 1KP process at Ishinomaki Mill, Nippon Paper Industries Co., Ltd. These days, it was difficult to operate stably in the final cooking zone because the ratio of domestic wood chips which basic density was lower than that of wood chips from oversea was increased. The unstable operation made Kappa number of pulp blew from the digester variable. As a countermeasure, high cooking temperature and high White Liquor dosing ratio were required.

In October 2015, new cooking system, Down Flow Lo-Solids cooking, was started in order to improve the operation. A new bottom scraper which had long arms and a big corn to make chip flow smoothly was installed and we changed liquid flow from up-flow to down-flow between C7 and C8 extraction zones. At the same time, liquid extraction from C8 screen was started. The opening area of C8 screen strainer was expanded in order to maintain liquid passing flow rate low and prevent chips clogging between strainer bars.

As a result, the operation was improved with the new cooking system and the standard deviation of the Kappa number was reduced. We were able to make our target of Kappa number 2 points higher than with Lo-Solids cooking system and increase the pulp yield. On the other hand, Kappa number after oxygen delignification process was not changed and reduction of bleaching chemicals was achieved unexpectedly. We thought that washing efficiency with Diffuser was improved because pulp consistency blew from the digester was increased due to the stable operation in the final cooking zone. In addition, temperature set points at the top of the digester and the output from a cooking heater were decreased because chip compaction was increased and actual cooking time was extended in the digester. The reduction of steam consumption was achieved. North America.

## **Operating Experience of Vapor Recompression Evaporator**

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New vacuum evaporator the name of H train systems has been operating in Niigata mill since June 2015. The old evaporator, the name of C train started in 1976 and D train started in 1978 could not handle the pulp maximum production by reason of poor vacuum running caused of the long term deterioration. For the purpose of old facilities update, environmental load reduction, and the stable operation of the black liquor concentration process, we introduced the new vacuum evaporator.

H train has been running over 2 years while overcoming several problems, contributed to the mill's maximum pulp production. 7 body 7 effect equipment and

Vapor-Re-Compression-System (abbreviate it to VRC as follows) compress the steam by the re-compression fan strengthen the black liquor concentration ability.

In this paper, we briefly describe the outline of the equipment and operating experience of H train.

## **Realization of Quality Improvement by Optimizing Plate Design for Thermomechanical Pulping**

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Kushiro Mill, Nippon Paper Industries Co., Ltd.

In The specific refining energy reduction in TMP plant is the task to be developed continuously from the view of cost down and energy savings. Especially pulp quality improvement with energy savings identified with refiner plate character has been studied as the most important task.

We, Nippon Paper Kushiro Mill, have tried to install a variety of low energy plates for many years. Now, our TMP process achieved 20% specific refining energy reduction caused by installation of non-conventional plates designed by ANDRITZ. In addition, the operating condition with great performance of new plates was established with three times pulp strength improvement and 75% shive reduction. This report explains our significant efforts.

## **Operating Experience of Intensa Maxx**

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Rengo Kanazu Mill, located in Awara city in the northern part of Fukui prefecture, owns one paper machine for corrugating medium and its average production volume is 650t/D. The waste paper plant has two pulpers of 7.6m in diameter for OCC and one another of 5.3m used for core board.

Stable operation in the stock preparation is essential for paper board production to keep high productivity and quality.

This report describes general information and operating experiences of Intensa Maxx which was installed in March 2017 to improve pulping process and stabilization in fine screening process.

## **Outline of the Tokai Mill Hydropower Station**

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Oji F-Text Tokai Mill, comprised of three manufacturing sites producing specialty paper in Fuji and Fujinomiya City, Shizuoka Prefecture, also has eight hydropower stations in Fujinomiya. They started operation in 1919 to 1964 and have been working for a stable electricity supply, but they also have been aging over the 53 to 98 years operation.

Oji F-Text has been replacing these old stations in order to ensure thorough maintenance of hydroelectric facilities and pursue a long-term stable supply of hydroelectricity as a clean energy resource.

An overview of the replacement project of Urui river No.2 power station as well as the outline of each hydro station is described. The hydropower design is optimized by examining the flow regime, the water head, and the water wheel type, resulting in annual increase of 4,054 MWh power generation after replacement.

## **New program with FiberWhite® for DIP process optimization**

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pH in DIP process is important control point that can be influence operation and quality of DIP. Therefore constant rate of chemical is dosed to maintain proper pH.

However circulation water recovery and reuse is common and DIP system is a good environment for bacteria growth. In fact, bacteria count at a DIP system was very high. Also, bacteria growth is confirmed in a process like a tower that requires long detention time, and pH is lowered due to generated organic acid. In such a condition, we confirmed that caustic soda is consumed and hydrogen peroxide is resolved unintentionally.

We have been introduced various slime control technology for paper making process. By applying monochloramine, one of those technologies, we considered DIP process optimization program and achieved not only pH improvement but also other problem solving and optimization at DIP process, and as a result, we managed total operational cost reduction and quality improvement. We would like to introduce one of those cases.

### **Novel Polyvinylamine Product“RZ series”for Pitch Control in Paperboard Making**

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Pitch troubles such as sticky deposit on equipment, dirt, breaks and holes of paper are one of the main issues in paperboard making. After studying the solution to address these issues, we succeeded in synthesizing new Polyvinylamine(pVAM) Emulsion Products “RZ series” as pitch control agents for paperboard making process.

The charge density of RZ series can be designed in wide range. Furthermore, the molecular weight of these products becomes much higher than that of existing pVAM products by applying our emulsion polymerization technology. Therefore, RZ series can make a beneficial effect on the fixation of pitch in paperboard materials.

The evaluation of the fixation performance was carried out by “Micro pitch-image analysis system”, and the evaluation for reduction of sticky substances was carried out by “Heat press-image analysis system”. As the results, RZ series showed superior performance to other widely used organic cationic coagulants.

We assumed the reason why the RZ series showed a superior fixation effect, and the verification test of following tree items was conducted.

- 1) High performance on the fixation of micro-pitch to pulp with keeping small size of pitch.
- 2) High performance on the fixation of micro-pitch to pulp with strong interaction.
- 3) High performance on reducing the adhesiveness of pitch.

**Purification of papermaking process water using coagulant with multiple kinds of reactive site and continuous monitoring of unfixed micro particulate matter by a new sensor**

Takashi Saigusa

Kurita water industries LTD.

Along with the recent increase in paper recycling rate and closed systematization of the paper making process, various substances accumulate in the water of the paper making process, and cause the deterioration of paper quality and runnability of paper making machine. Fixation of the accumulated substance is important and the need of the coagulant increases.

We developed the new coagulant with multiple kinds of reactive site which increased reactivity by reaction of non-cationic site. Fixation and retention performance of the new coagulant was higher than conventional cationic coagulant. In addition, we were able to add the characteristic performance by regulating the balance of the reactive site, such as the fixation of pitch, the reaction in the cationic substances surplus, and the prevention from foaming by the poor fixation.

In addition, we developed the new sensor which measured unfixed micro particulate matter level consecutively. By using the new coagulant, the unfixed micro particulate matter of white water was reduced to half level, and the number of the spots decreased. The new coagulant contributed to cleaning of papermaking process water and improvement of paper quality and runnability of paper machine.

**New Approach to Effluent Load Reduction by“AXISZ System”**

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Somar has developed wet-end improvement system named “AXISZ System” which enables various types of wet-end chemicals to demonstrate the original and intrinsic performances to the maximum. “REALIZER A Series” is high-performance coagulant which is effective for sticky pitch and defect paper surface and is also, special cationic polymer which is good to be applied to stuff box. High-performance retention aid, “REALIZER R Series, FX Series” is multifunctional polymer with special structure and can achieve higher retention even with small dosage. Optimum Wet-end system can be obtained by combination of those chemicals. Also, it's should be noted it is unique that each chemical alone can demonstrate its own capability.

The match which reduces the displacement because the amount of consumption is quite watery by paper industry becomes important. The tendency which rises every year can see white water load by which it's for COD and the electric conductivity. I focus on effluent load reduction in paper mill by writing and introduce several new way to approach to which white water load of a papermaking machine is reduced. During these research and development, we found that the application of wet-end improver “AXISZ System” could reduce wet-end chemical dosage, reduce effluent load, and reduce other environmental load. Development of wet-end chemicals focused on less environmental load is the main feature of Somar and its performance is verified through number of machine trials. This report describes effect of our latest paper chemicals.

## **Development of SE Rotor Vane type II**

Yujiro Deguchi

Rotor Industry Co., Ltd.

SE Rotor Vane developed by our company is a high efficient rotor vane, which boasts a sales result of more than 30 units including large and small ones since its release. It is a great honor for us that this Rotor Vane was awarded the 43th Sasaki Award and the 17th Chugoku New Business Awards. We named a new product that improved the usability of the SE Rotor Vane SE Rotor Vane II.

The SE Rotor Vane II is the one which realized the improvement of the SE Rotor Vane's usability and durability with the shape of the SE Rotor Vane unchanged. The shape and appearance of Rotor Vane that contributes to improving the production efficiency and material quality of pulper is the same as before.

There are several changes in the SE Rotor Vane II. The part that we thoroughly thought is how to change a spare blade. In past years, the most popular approach is to attach the spare blade with three bolts prior to releasing the SE Rotor Vane. However, in the SE Rotor Vane, the number of mounting bolts of the spare blade significantly increases in exchange of easy replacement of the spare blade. Through a long development period, the number of mounting bolts of SE Rotor Vane II becomes three (3) bolts, the same as before.

We are diligently developing products other than the Rotor Vane, including projects that we already have been moving forward to acquire rights. We have a plan to occasionally announce them at the phase of completion of acquisition of the rights after completing actual proof thereof in future.

### **BW Papersystems Finishing Equipment Technical Improvement Program (TIP)**

Hayato Tanioka

K.K.IRISU (C.ILLIES & CO.,LTD.)

BW Papersystems has a long history of drive and motor designs, going back 31 years. In this paper, we discuss how we got to the unique advantages of the liquid cooled drive and motor system.

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

#### **Part 6 Overseas Developments**

Kiyoaki Iida

Until around 1970, overseas projects were proceeded to secure raw materials necessary for increasing domestic paper demand. They were some of followings: importing woods and chips, bringing back home pulp produced overseas and carrying back finished paper products. In the 1970s, oil price hiked, pollutions caused by the industry were censured and environmental conservation was concerned. The paper industry tried to use more amount of recycled pulp, and understood an economic advantage of and invested in having large costal integrated mills using imported chips. It could not afford to proceed overseas ventures in those

years.

In the 1990s, the paper industry, having recovered a relatively stable economic condition, started to work on overseas ventures. The its first concern, this time again, was securing wood chips and afforestation was carried out in many countries overseas. The other was how to deal with Asia. Some companies began to operate box plants in Asia to supply corrugated containers to their customers who moved their plants to Asia. As a whole, however, some was eager and others were not. The paper industry scored the lowest figure in the ratio of overseas sales to its total among manufacturing industries in Japan in 2002. It was so even in 2015, though the industry would like to do.

### **Characterization of TEMPO-Oxidized and Refined Pulps**

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Catalytic oxidation using 2,2,6,6-tetramethylpiperidine-1-oxyl (TEMPO) can be used to selectively convert primary hydroxyl groups in accessible regions of cellulose and hemicellulose molecules in pulp fibers into aldehyde and carboxy groups. Clear improvement of the wet tensile strength of handsheets prepared from a TEMPO-oxidized pulp (TOP) was previously demonstrated without the use of any wet strengthening agent. Moreover, the paper chemical contents added at the wet end and retained in the handsheets increased. However, the practical use of TOPs as raw materials in papermaking has not yet been sufficiently studied. In this study, the effects of refining TOPs on the resultant fiber morphologies and properties were investigated. TOPs with carboxy group contents of 0.42 and 0.86 mmol/g were prepared and refined to various levels using a PFI mill. The average fiber lengths of the TOPs decreased and their fines contents increased with increasing number of PFI revolutions; these results were similar to those for the original pulp. However, the freeness remarkably decreased and the water retention value significantly increased with increasing number of PFI revolutions compared with those of the



refined original pulp. Moreover, the fibrillation behavior of the TOPs with refinement clearly differed from that of the original pulp in terms of the changes in pulp morphology and the amount of functional groups.