

### **Energy Saving Effect by Air Dryer Blow Nozzle Upgrade at PMN6 in Ishinomaki Mill**

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Ishinomaki Mill is one of the main mills of Nippon Paper Industries.

Its annual production amounts to 860,000 tons of paper from its 6 paper machines and 2 off-machine coaters. A pulverized coal boiler provides the main source of energy, with 2 black liquor recovery boilers and a biomass boiler also contributing to the energy supply.

We started operating the N6 paper machine (with on-machine coater) to reinforce our capacity in November 2007. The N6 paper machine is one of the largest capacity machines (1,005 tons per day) in Japan, and makes light-weight coated paper and A3 coated paper.

The speed of this paper machine is restricted by its drying capacity. A further problem is sheet breaks caused by lumps of dried coating color piling up in the air floating dryer. We installed a new blow nozzle in the air floating dryer in September 2014 to enhance drying capacity, and to avoid the lump pile-up by stabilizing web conveyance. As a result, we achieved a 20% energy saving through enhanced drying efficiency. However, it did not prevent lump pile-up enough. In this report I explain equipment details of air-dryer blow nozzle and operating experience with saving energy effect and dealing with sheet running.

### **Characterization of the New Polymer and Its Use for Low Pressure Boiler Water Treatment**

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A boiler had a problem with scales adhering internally. A scale remover has been required in addition to conventional chemical for boiler water treatment, 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 has low in corrosivity against steel materials. It also comprises

products approved by the United States Food and Drug Administration (FDA). It may be proposed to customers seeking safer and more reassuring boiler water treatment chemicals, such as hospitals and food and beverage factories.

## **Approaches and Issues on Odor Problems**

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We receive a lot of consultations about the group-wide odor problems and get requests for analyses of those. The contents include various things such as an official method analysis related to Offensive Odor Control Law and an investigation of off-flavor that occur in the products.

In this report, two topics about odor problems on which we have been working were described. One is concerned with the environmental odor that might affect the surroundings of the mill. The law regulates the odor generated from the mill or the workplace for the purpose of conservation of living environment and health protection of the people. The odorants regulations that measured in equipment, is being changed to odor index regulations using the human sense of smell. Since olfactory panel is required to have normal sense of smell, we have confirmed the normality by the olfactory test using five types of odorants. When the mill has odor problems, we should go there to carry out sensory evaluations and gas samplings. It was possible to help solve the problems by analyzing the samples in our lab to identify the odor-causing substances.

The other is an analysis of off-flavor generated from the products. We are often asked to analyze the tissue papers and the paperboards with unusual smell. We have been manufacturing paperboard and cardboard, have a particular attention to the complaints by the musty order (2,4,6-Trichloroanisole: 2,4,6-TCA and 2,4,6-bromoanisole: 2,4,6-TBA). The case analyzed in the past and the proactive measure were described. We carried out the sensory evaluation of products and sensed musty odor. The sources have been identified by the instrumental and process analysis. As a proactive measure, we have implemented the test for selecting sensitive panels of smell.

## **The Method of Curing Activated Sludge Treatment Process during Shutdown**

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As one of the characteristics in the pulp and paper waste water treatment, we can point out that there are long no-load running terms due to “Shutdown” once or twice a year. Long no-load running terms put load-fluctuation stress on the activated sludge treatment process : main process of the pulp and paper waste water treatment, and cause deterioration of performance or degradation in the quality of activated sludge flocs, and may result in various troubles at the restart after Shutdown.

Expressly after the Lehman Shock, during the large-scale equipment work or adjusting the production, it tends to extend the term of Shutdown. Even the wastewater treatment facilities have actualized a trouble which have not been a problem before, when the restart after the shutdown. Therefore, it has become more important to support during the shutdown.

Mushugen Industries Co., Ltd. have cultivated the technique of curing activated sludge treatment in other industries, and we have promoted the application in the field of pulp and paper wastewater treatment.

In this paper, we describe an overview of the knowledge or results acquired by experience in it.

## **The Latest Wet-end Control Technology by New Type Retention Aid “REALIZER FX Series”**

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We have been working on developing more efficient retention aid with new concept to replace the today’ s main Dual Addition System of Cationic retention aid and Anionic retention aid. As a result of the effort, “AXISZ System” was successfully brought to market, “AXISZ System” consists of “REALIZER A Series” /high-performance coagulant, good for minimizing the stain of paper making machine and “REALIZER R” Series/high-performance Cationic retention aid.

“AXISZ System” is very unique and is extremely different from competitive products design. Especially, in case of Cationic-single addition, “REALIZER-R300” achieved extremely better retention that resulted in expanding its application to coating machines and board paper machines. Since then, we kept working on the development of Cationic polymers good for single addition.

As was pointed out, closed system of water and increase of waste paper ratio have brought a

lot of pitch and ash. Consequently, there has been a trend that increased dosage of various kinds of chemicals for fillers. As for retention aid, there are cases that conventional dual addition system or cationic single addition cannot work well as before.

Under these circumstances, we newly developed “REALIZER FX Series” /Anionic retention aid and then, have been working on establishing the innovative retention system based on the Anionic retention aid. In this paper, we would like to show the instances of REALIZER FX System applications and dual addition system with new concept which is effective in stable fixation of various kinds of chemicals for filling in combination with “REALIZER A Series” .

### **The Latest Technological Trends of PAM Based Dry Strength Resins**

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Polyacrylamide based dry strength resins (PAM) are multifunctional chemicals which are widely used to enhance paper/paperboard strength, and to improve drainage, and retention of fiber, fine, and filler. In recent years, papermaking conditions have changed by greater use of recycled pulp, high amount of coated broke in furnish, higher loading of filler, increases in speed of paper machine and closed water system in paper mill. These trends results in the rising of pH values and electric conductivity of furnish and the increasing of dissolved and colloidal substances in papermaking systems, that disturb the absorption of papermaking additives to fiber and fine. Under these circumstances, the performance of conventional PAM has become unsatisfactory.

Recently we developed two types of new technology for PAM. One is the manufacturing process for highly branched and higher molecular weight PAM, and the other is introduction of novel absorption unit in PAM. In this report, we will explain the characteristics of our new PAMs as the latest technological trends of PAM.

### **New Generation of Functional Coating Binder Allows New Coating Properties Design and Higher Coat Efficiency**

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The main functional role of a Paper coating binder is to bind the pigment particles, which make up for more than 85% of the dry weight of the formulation. In addition the binder affects the printability of the paper by helping the absorption and drying of the printing ink. Thus a range of coating binders has been developed over the years to cover the needs of coating pigments with different surface characteristics and fineness as well as work well for various printing processes. Approximately 50% of the coating costs can be attributed to the binder system, so one of the main driving forces in binder development has been to reduce the cost of the binder system. As starch as coating binder is significantly cheaper than latex it has become very common to use more and more starch in coating formulations. Especially in pre-coating and also top coating for matte and silk papers of lower quality adding more starch is a feasible option. Too much starch as binder, however, has also some disadvantages like lower binding strength, negative effect on gloss, fold cracking and mottling and results in lower coating solids, high shear viscosity and difficulties to run lower coat weights. The new patented Fennobind binder technology deviates in a significant and surprising way from well-established knowledge about synthetic binders. We will demonstrate in this paper the main deviations and give some ideas how it is possible to utilize these new findings to develop more cost effective formulations and show how papermakers can pass with this knowledge the current boundaries in order to create additional value.

### **“ANDROMEDA” Latest Technology for Tissue Converting Machine by FUTURA**

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FUTURA is a leading global technology company that creates and delivers converting solutions which allow producers to capture market share and gain significant competitive advantages worldwide. Some of FUTURA's unique and proven technologies are introduced in this article.

### **New Softness Evaluation Tissue Softness Analyzer TSA**

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One of the most important characteristics to determine whether a tissue is functional or not is the “softness”. The consumer can directly sense this parameter so that it influences the purchasing behavior decisively. However, the commonly used term “softness” is not correct. The words “handfeel” or “grip” or “haptics” respectively should be used as softness is only one of several factors that influence the individual evaluation of tissue.

The individual perception of the handfeel is therefore mainly determined by the following characteristics: the actual fiber softness/fiber stiffness (which is determined by the fiber material itself, but also by added chemicals like softeners, wet strength agents or lotion); the surface and internal structure, which depend on the manufacturing technology and on the “creping” and “embossing”, if applicable; and the stiffness, which is mainly determined by the fiber material, the manufacturing technology and the used chemicals. Furthermore, the thickness, the grammage and the number of plies come into play. This makes clear that it is, similar to the evaluation of the taste of wine or whiskey, a very complex and extremely subjective and therefore unreliable parameter. This parameter is further influenced unconsciously by the color, the smell, printed patterns, the tester’s current mood and motivation, even the weather and the season as well as personal preferences.

## **The History of Technological Developments of the Paper Industry in Japan**

### **Part 7: Summary and Discussion**

Kiyoaki Iida

After the Meiji Restoration, printing (letter press) and packaging (carton and container) were introduced as a new life style, and paper for them, called “yoshi”, was imported. Then, the domestic paper industry was born to supply those kinds of paper. It, however, took thirty years for the industry to take off. Since then, the industry grew at the rate of 6-10 % a year, supported by the steady growth of GDP which was three percent a year, and replaced the imported products. I believe that the thirty years before the takeoff was the preparatory period for the technological development of the industry.

One fact contributing the takeoff was a group of engineers who graduated from Tokyo Higher Technical School (Tokyo Institute of Technology). They had chances of visiting abroad while young, and innovatively led mill constructions and operation thereafter.

Regarding building paper machines, Japan started by copying imported machines. Then,

Japanese iron works imitated newest technologies in imported ones, and finally supplied half a number of paper machines installed in Japan. Auxiliary equipment were also made by domestic suppliers.

The most important characteristics of the Japanese paper industry is to have had interest in wood pulp in its early age (10 years later than America) and to have built integrated pulp and paper mills. They started using softwood in Fuji and Kiso areas, and moved to Hokkaido and then to Sakhalin, and built mills big enough to be competitive like Tomakomai mill of Oji Paper Co.

It is believed that the high levels of culture and technology in the Edo period, one of which was high literacy rate, helped the growth of the Meiji era. People and goods in the Edo period, however, could not move so freely as in Europe of the Industrial Revolution. The Meiji era released this restriction and the technology began to develop dynamically along with cultural evolution. The paper contributed to this development as a mean of helping free movement of information and materials.

### **The 9<sup>th</sup> Public Meeting with Japan Patent Office Examiners**

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JAPAN TAPPI

The 9<sup>th</sup> public meeting was held for the examiner of Japan Patent Office to explain recent developments of Japan patent policies and to hear experts' opinions of intellectual property departments of paper companies. The Patent Law has been revised, and it has become acceptable for employees and companies to discuss and decide on fair rewards for inventions beforehand. For the company, deciding on rational rewards through consultation means avoiding the management risk of being hit later with a huge claim by an in-house inventor. The Japan Supreme Court has given a new and unique ruling on the interpretation of product-by-process (PBP) claims. The Supreme Court held that for an invention of a product, even if a process to manufacture the product is stated in the claims, the technical scope of the invention and the gist of the invention should be determined and recognized as covering products that are identical in structure and feature to the products manufactured through the process described in a patent. The Supreme Court adopted the product identity theory.

## **Preparation, Characterization and Application of Organic Conducting Polymer-Silica Nanocomposite Particles**

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We have prepared organic conducting nanocomposite particles which utilize polypyrrole/polyaniline as conducting parts and small silica particles as dispersants. The nanocomposite particles of polypyrrole/polyaniline and silica represent a potentially useful processable form of polypyrrole/polyaniline, a normally intractable conducting polymer. Transmission electron microscopy (TEM) studies confirm that the polypyrrole-silica/polyaniline-silica nanocomposite particles are made up of microaggregates of the original small silica particles, which give rise to a raspberry morphology. The particle diameter of the nanocomposites as measured by the TEM observation can be varied over the range 200 – 400 nm depending on the colloid synthesis conditions. We demonstrated that the polypyrrole-silica/polyaniline-silica nanocomposite particles can be utilized as display elements for electrophoretic display due to their high colloid stabilities. The electrical conductivities of polypyrrole-silica/polyaniline-silica nanocomposite particles are measured and the paper sheets coated with these nanocomposite particles have higher conductivities compared to a conventional paper sheet. The polypyrrole-silica/polyaniline-silica nanocomposite particles can be utilized as conductive paper sheets.