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Development of black liquor viscosity control chemical

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In the craft pulp manufacturing process, 7-10t the black liquor is generated for making 1t of pulp. Generally, the black liquor is concentrated about 75 % under the hot vacuum in concentrating process and burned in recovery boiler for combustion energy with inorganic pulping chemicals. Higher concentrated black liquor is improved recovery efficiency for energy. However, over 75% concentrated of the black liquor makes trouble for handling

In this report describe the results of our research about the chemical reducing the viscosity (fluidity) of the black concentrated liquor. The viscosity of the 80% concentrated black liquor which is treated by this chemical could be handle like 75%. New formulation chemical has founder to control viscosity of black liquor.

Retention Control Key Tool in Improving Papermaking Efficiency

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Paper and board makers face a host of demands: how to make a stable, uniform product at the desired quality level at minimum costs. To make this happen means increasing efficiency, agility and flexibility in production. This is a real challenge while using mixed low cost raw materials, including recycled fibers that contain unknown amounts of disturbance materials. The ultimate target is minimized downtime, off spec production and sheet breaks at the highest possible machine speed. One cornerstone of high production efficiency is a stable wet end.

First pass retention – more precisely, the stability of white water consistency – is a sensitive indicator of wet end stability. White water consistency variation bears a direct relation to variation in end product quality (basis weight, moisture, ash) and to the number of sheet breaks. Furthermore, the level of white water consistency is

connected to formation, machine cleanliness, retention chemical needs, etc. Stable retention and correct use of wet end chemicals can be achieved with automatic controls based on reliable wet end measurements. This article presents practical issues for achieving stable retention and gaining multiple benefits.

New Proposal for Improvement of Fixability of Internal Agent by "AXISZ System"

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In 2017 JAPAN TAPPI Annual Meeting, We introduced a new type retention aid which we developed using “Reactive Polymer Technology”. Now, this retention aid comes to be used in some kinds of paper mills. Recently, performance of wet-end agents has started to decrease because quality of waste paper pulp has deteriorated. Therefore, dosage of sizing agent and paper strength agent tend to increase. We have developed high performance retention aid “REALIZER R Series” and high performance coagulant “REALIZER A Series” which enable these internal agents to attach to pulp fiber by introducing special monomer and “Reactive Polymer Technology”. “Reactive Polymer” can lower machine stain and paper defect by increasing fixability of internal paper strength agents and sizing agents. Many paper mills reduce dosage of retention aid because of agent cost. However, dosing some amount of reactive polymer can enhance the retention of these internal agents, so that total agent cost becomes lower. Increasing dosage of traditional retention aid can improve one-pass retention and ash retention but dosage of internal agents do not decrease in many cases. This suggests that these existing retention aids can not improve fixability of sizing agents and paper strength agents.

In this paper, we report that “REALIZER R Series” and “REALIZER A Series” which has special monomer and “Reactive polymer technology” are different from traditional retention aid and that these new agents show good performance in some paper machine and board machine even if papermaking condition is tough. For example, Cationic retention aid “REALIZER R230” which has new special monomers improves retention of sizing agents in coated paper machine and high-quality paper machine. Furthermore, we have developed new type coagulant “REALIZER A3700” which has two kinds of special monomers. It has been disappeared that these special monomers can enhance the retention of sizing agents and paper strength agents in board machine. “REALIZER R240” which is developed with “Reactive Polymer Technology” can bind to pulp fiber if retention aid is partially broken by the shear of inside system. This retention aid is capable of increasing the one-pass retention and ash retention and improving the formation of paper if relatively large amount of retention aid is dosed.

Separation of wood constituents by soda-AQ cooking for chemicals

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Nippon paper Industries takes part in the NEDO project “Technology development of Manufacturing Process for Non-edible Plant-derived Chemicals/ Development of an Integrated Process for Manufacturing Chemicals from Woody Biomass”. In that, we are developing a technology for separating major wood constituents based on the sulfur-free soda-AQ cooking. Although we investigated the autohydrolysis, a method for extracting hemicellulose prior to cooking, it made lignin higher molecular weight and unsuitable for chemical use. Therefore, we chose a process simply separating wood into black liquor and pulp by the cooking. In case of the hardwood, xylan, the chief component of hemicellulose, can be separated from lignin that preliminarily prepared from black liquor.

The project plans to construct the integrated process at kg-scale and evaluate economic efficiency during last two years (2018-2019). We have developed a kg-scale system for separating wood component. As for lignin, we introduced “portable lignoboost skid” (Valmet), a bench-scale lignin manufacturing equipment. Therefore we started to provide pulp and lignin samples at kg-scale to chemicals companies.

Why it is important to measure charge in the paper making process
—a presentation of state of the art for laboratory and online charge measurement—

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In the pulp suspension of the paper making process there are fibers, fillers, fines and anionic trash particles. Anionic trash describes a wide range of anionic dissolved polymeric and colloidal substances. Ex. Dissolved Electrolytes, Suspended fibers, suspended fiber fines ant etc...

Most colloidal or filler particles and fiber surfaces are covered with a negative or positive charge cloud on the surface. Negative and positive charged particles attract each other. Particles with the same charge repel each other.

In the wet-end part of the paper making process, a variety of process chemicals and additives are added.

Additive: Stay in the final product to optimize or to improve the product properties, ex. Sizing agents

Process Chemicals: Control and optimize the paper making process, improvement of

waste water and waste air treatment. Do not stay in the final product, ex. Fixing agent

The charge of pulp fibers is anionic while also the charge of trash particles is usually negative, i.e. anionic. Process chemicals, which are used to influence the quality of the finished product, and additives are mainly positively charged (cationic).

The knowledge of the charge of the chemicals, the anionic trash and the fibers enables a correct and effective dosage of charged chemical additives. Now it is obvious that these amounts of charges, especially the charge of the anionic trash – but also the fiber charge itself – have to be measured in some way in order to take necessary action with regards to chemical dosing.

We introduce two very useful and state-of-the art laboratory tools for this purpose: The CAS touch! – Charge Analyzing System as well as the FPA touch! – Fiber Zeta Potential Analyzer.

With help of these devices, it is possible to get information about the amount of anionic trash in the pulp suspension as well as about the zeta potential of fibers (fiber surface charge).

Solution for existing wastewater treatment

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UNOX system which is wastewater treatment using oxygen gas the system has many references for Pulp and paper mills. （More than 150 units in Japan and Southeast Asia area).Sometimes existing facilities are requested that the capacity of the wastewater treatment be increased by changing the upstream process after the introduction of the UNOX system. Therefore we will introduce examples of capacity adding by combining with existing water treatment facilities. In addition, although the oxygen generator(PSA/VPSA) is added to the UNOX system, and then sometimes the PSA/VPSA also may have cases where the making capacity declines compared to the time when the capacity was first installed PSA/VPSA that have been in operation for more than 20～30 years since its introduction, therefore we will also introduce examples of energy saving effects by updating them to the latest version of VPSA. Plus, we will also introduce examples which making capacity recovery was expected by replacing a part of adsorbents. Our company's predecessor Showa Kankyo System (Showa Engineering) have become the Veolia Group, we can introduce technologies possessed by Veolia, in addition to our own wastewater treatment technology. Finally, we will introduce the bio carrier that Veolia possesses. The carrier can be easily utilized for improvement the capacity of existing wastewater treatment facility.

High Brightness Mechanical Pulp from Eucalyptus Planted Trees

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The mechanical pulp yield is about 85 to 95% of the original wood, compared with around 45 to 55% for chemical pulp. Hardwood mechanical pulp has the desirable properties of low cost, high opacity and good printing quality due to its high bulk, high smoothness, resiliency, and good ink absorption. Hardwood mechanical pulp tends to have shorter fibers, higher light-scattering coefficient and lower strength value. Eucalyptus plantation tree is a common tropical hardwood species and is used for the production of lower yield chemical pulps such as kraft pulps. It is believed however that Eucalyptus mechanical pulp is not suitable for the production of graphical paper grades because of its low initial brightness and limited bleachability. Alkaline peroxide mechanical pulping (APMP) and thermomechanical pulping (APTMP) use caustic soda, hydrogen peroxide, and stabilizers to soften and brighten wood chips prior to refining in a disc refiner. The chip pretreatment facility employs a screw feeder device to apply mechanical compression on wood chips and squeezes out the detrimental substances for bleaching. It also partially destroys wood structures allowing for easier fiber separation and reduces refining energy. In our study, APMP and APTMP were applied to Eucalyptus-globulus planted trees by pilot plant tests and significant benefits were obtained to improve bleachability. Brightness of Eucalyptus APMP reached 87% ISO brightness that surpassed 80% ISO brightness of aspen APMP.

Report on the Results of the Fiscal 2018 Follow-up Survey on" JPA's Commited Action Plan for a Low carbon Society" and Related Information on Measures against Global Warming in the Japanese Paper Industry

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The Japan Paper Association (JPA) established its "Voluntary Action Plan on Environment" in 1997, in response to The Japan Business Federation's call to the Japanese business community to organize "The Voluntary Action Plan on Environment". Since then, JPA has carried out a follow-up survey and published the results every year.

As the Voluntary Action Plan finished in fiscal 2012, JPA newly started "the Action Plans towards a Low Carbon Society" and has been actively addressing global warming prevention in order to achieve the following targets set in the plan:

- Compared to BAU scenario(based on specific CO_2 emission rate of 2005),

reduce fossil energy-derived CO_2 emissions by 1.39 million tons by fiscal 2020 .

- In view of securing forest resources and increasing forest carbon sink, expand forest plantation areas owned or managed by the paper industry at home and abroad to 700 thousand hectares by fiscal 2020.

According to the results of the fiscal 2018 follow-up survey (actual results for fiscal 2017), fossil-energy derived CO_2 emissions in fiscal 2017 was 17.85 million tons, a 28.4% reduction compared to the fiscal 2005(24.95 million tons).This is attributed to each manufacturer's active efforts including energy saving and energy conversion from fossil energy to non-fossil energy such as biomass energy.

In addition to the results of the follow-up survey, this report introduces the current energy situation in the Japanese paper industry, outline of the next phase of JPA's Action Plan for Low-Carbon Society spanning the ten-year period from fiscal 2021 through 2030 and the latest information of countermeasures against global warming.

The History of Paperboard

Part 3: Paperboard Production in Japan

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With the start of the Meiji ear, the social systems of western countries were imported in to Japan, and industries supporting the systems were born. The paper industry was one of them and tried to produce printing paper for letter press printing and paperboard for paper cartons that would help the distribution of goods.

As the market of carton grew to about 4000 tons in 1886, using imported paperboard, a Fourdrinr machine which was of the modern specifications of that time was imported and installed to supply paperboard domestically, using rice straw pulp. As the market was promising and rice straw was abundant in Japan, entrepreneurs in local districts got in to the business. Starting from Tokyo, Osaka and Shizuoka, the business spread to Okayama, Niigata, Hokuriku, Gunma, Saga and so on, as a typical local industry, and became a boom in the 1930s. Domestic machine builders, which were already capable enough, delivered numbers of cylinder machines. The shift of pulp from straw to waste paper is supposed to have begun after 1930.

Corrugated containers started to be served in the 1930s, though it could not be a major player before the World War II.

The statistics for paperboard production were available since 1914, and its share in the total paper and paperboard production remained about 30-40%, and is now about 40%.

Analysis of Gloss Constancy in Light Source Size Change

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Appearance is observed as the results of association among various physical factors. For example, the color appearance is well known. We have an ability to estimate the primary color of object through an adaptation, even if only the light source color is changed. It is called as color constancy which is remarkable ability of human eyes. Likewise, here, we define gloss constancy as a human ability to estimate the original gloss of an object even if the light source is changed. In this paper, we verified the influence in gloss and material constancy under the artificial environment by changing the size of light source. We performed two type observations in subjective evaluation, one is the gloss appearance which is mainly observed by the distribution of specular reflection, and the other is the material appearance which is mainly observed by all distribution of specular and diffuse reflection influenced roughness as whole appearance of object. We prepared two kinds of printed paper object which has different roughness, and four kinds of light image generated by LCD projector. A paired comparative experiment was performed under different light source with real printed paper object. The present result about difference in gloss appearance suggested that sharpness of the gloss appearance is affected by the size of light source. Apparently, perception of gloss is decreased as the size of light sources increase. The other evaluation was performed by observing the difference of material appearance. It is suggested that constancy of gloss appearance only appears when we observe material property such as roughness and contrast as whole appearance of object. We find the effect of material constancy. However, we hardly find the effect of gloss constancy. Gloss appearance evaluation is affected in the size of the illumination. In the pulp & paper industry, it is suggested that the lighting condition is important to evaluate the paper gloss appearance subjectively.