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Latest Technology of Polyurethane Cover "High-Top Roll" for Applicator Rolls

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One of our products, High Top Roll, which is polyurethane roll cover, has been used for press rolls, suction rolls and applicator rolls since it was first developed in 1963 and keeping the top market share in the domestic market.

We also introduced High Top SD series in 2010, which is specialized for applicator rolls and more than 200 rolls have been delivered so far.

Furthermore, we have developed as an innovator High Top L series in 2015, which implemented completely new cover structure thanks to our original hybrid bonding system, and it has enabled to eliminate the under layer which has been considered essential not only for polyurethane, but also for any kind of roll covers. We also confirmed that High Top L series is effective against blister- delamination which could not be solved by the conventional polyurethane covers.

In this report, we introduce the technical overview of L series and the superiority as the applicator roll cover.

The Changing and Recent Development of Surface Treating Chemicals

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Paper chemicals, which can help provide stable paper products with a reasonable price, have become more desired in paper industry. Besides, along with the diversifying paper printing techniques, a sufficient paper quality has become significant to meet the highly developed printing techniques. In this report, surface sizing agents and surface strengthen agents of paper have been mainly described.

Concerning Surface sizes, a brief changing in development, which dates back from water

soluble type agent that is styrene-maleic acid copolymer to emulsion type agents, has been introduced. In addition, a newly developed emulsion type surface sizing agent with a special type of surfactant is explained. It can well disperse into paper sheet when coated onto the surface.

About surface strengthen agent, starch solution has been mainly used, while polyvinylalcohol (PVA) and polyacrylamide (PAM) can still occupy a share. However, the demand of thinner paperboard grows, thus the low strength problem has emerged in recent paper industry. A newly developed PAM-type surface strengthen agent with high water-soluble moieties, which can easily immerge into paper sheet, is described in this report.

History and Trends for Calendering and Reeling Technology

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The calendering process is to make a certain density of the paper web by means of press rolls, as a result, the web gets smoothness, gloss and required thickness. There were simply divided into two kinds in different calendaring methods, but nowadays both calenders are harmonized or more subdivided with new technologies. After the calendering process, the paper web is finally wound up on the tambour reel in order to proceed further processes like coating, slitting to small rolls and cutting to sheets. It requires preventing a damage of surface quality and reliable turn-up function. The article describes history, requirements, and some epoch-making topics for the development of each process. There are some interesting innovations, however, predecessor ideas are still attracted and also reminded.

Advanced Technology of Web Inspection System

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AMETEK SurfaceVision, former COGNEX Surface Inspection System Division, developed “SmartView 7.2 Color” inspection system which allows users to see “color defect image” and to classify defects by “color defect features”. I would like to introduce new inspection technologies with color camera and 2 scalable technologies, “Line synchronization” (accurate data tracking between upstream and downstream) and “SmartSystem” (monitoring cameras linking to

inspection system for root-cause analysis).

Technology and Vision of QCS

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A scanner equipped with basis weight sensor and moisture rate sensor was developed in the USA in 1960s. For the Japanese market, Yokogawa has developed it in 1969. It has been introduced to many paper mills for more than half a century.

Here we review firstly the basic technology of QCS, particularly focusing on the devisal for the purpose of on-line measurement. As an example, the technology used for LED color sensor will be reviewed. Secondly, we review how profile data is processed. In closing, we envision future possibility of QCS.

Operating Experience of Replacing Inspection and Slit Aiding Systems on PM1 and PM3

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Since quality improvement and complaint reduction are of constant concern to workers in the manufacturing industries, we strive every day to provide good products for customers.

The previous inspection Systems on PM1 and PM3 in Nippon Paper Industries' Iwanuma Mill were installed in 1997 and offered inspection only by transmitted light. However, as customers became more concerned about defects, it became more and more necessary to have the ability to detect weak contrast defects or surface located defects.

In order to measure this type of defect, we replaced the previous inspection systems with new one which has both transmitted and reflected light inspections in 2013 and 2015. In addition, we also installed Slit Aiding Systems which convert the defect location information from parent roll to finished roll. Immediately after the replacements, there were few occasions where we were unable to distinguish between holes and transparently unevenness, or to inspect wrinkling.

As a result, the inspection systems became excellent tools not only for judging acceptability of products, but also for finding operational problems.

Stabilization of Coating and Improvement of Roll Maintenance by Rubber Cover for Applicator Roll

Shigetada Kadomatsu

MEIJI RUBBER & CHEMICAL CO., LTD.

We, Meiji Rubber & Chemical Co., Ltd. established in 1900, have been supplying rubber covering materials for Pulp & Paper industry for 115 years. We are dealing a variety of materials and developing the optimum cover rubbers for each section of paper machines based on the years of experience.

In recent years, due to the diversification of coating & sizing liquid and high speed machine operation, the requirement of quality stabilization for Applicator rolls cover is becoming harder.

Our material “ Super Polyforte” is a polyurethane material containing the special polymer, have been adopted in many Applicator rolls and Smoothing press rolls, etc. since starting sales in 1999.

Now we would like to introduce references of Super Polyforte, particularly focusing on Applicator rolls in the several paper mills which have achieved stabilization of coating and longer replacement cycle of rolls.

Fully Sprit Seal for Accurate Rotation

—Application to the Vertical Rotating Equipment—

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Adoption of the mechanical seal has been progressing for sealing system of rotating equipment in the pulp and paper industry. However, the applications of the mechanical seal are limited to the black liquor or coating collar of pumps or screens.

For the most cases, end users are using gland packing for horizontal and vertical agitators with axial runout and vibration that are troublesome to the maintenance persons.

In order to reduce energy conservation and maintenance costs and to provide safety and stability for the daily operation, we have over the past two years introduced the fully split mechanical seal that is based on our own design with rubber bellows for horizontal agitator with vibration problems.

Today, we would like to introduce our extensive experience of application for vertical pulper that is running under the severer conditions. For that, we propose an optimal solution using our

fully split mechanical seal for the equipment with axial runout and vibration.

Some Preventive Methods against Erosive Wear in Fluidized Bed Boiler

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In the power industry, it has been demanded and expected to cope with the energy resources issues and global environmental problems. Under these expectations, biomass power generation using wood fuel with a CO₂ reduction effect has been increased as the effective use of resources. Biomass boilers are burned by flowing the fuel and the medium in a high temperature environment, especially circulating fluidized bed boiler. The advantage of this boiler is that impact on the global environment is low. It should be considered that economic problems remain because the erosion wear of the material that is used in the furnace and that repair costs many occur at the earliest.

This paper discusses about high-temp erosion wear of water-cooled panel and air nozzle in the boiler furnace (fluidization nozzle) through the test by overlay welding and thermal spraying to find out proper measures against surface wear. Main results obtained herein through the erosion test are as follows.

a. As for water-cooled boiler panel of pressure boundary heated to about 400°C , Ni-base material like Alloy 625 is one of the candidate material which has good property in weldability , thermal expansion co-efficient etc.

b. As for air nozzle heated to about 800°C , Co-base material like Stellite No.12 maintaining high hardness until high temperature seems to be one of candidate material onto the air nozzle. These material will be hereafter tested including addition of ceramics like Cr₃C₂.

c. In the erosion wear, scratching (microplowing) seems to be dominant phenomena for ductile material.

On the other hand, spalling also seems to be dominant one for brittle material.

Wet End Improvement Method by Correlation Analysis between Water Quality and Machine Operation by S.sensing

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Recent environment around paper industry has been changing, especially in regard to increasing paper recycle rate. It causes in fluctuation of furnish quality, that influence on machine running stability and paper product quality. In such a complicated situation, we focus on “water” used a lot in paper-making process to improve productivity. We report our new technology, “ S.sensing system” to achieve it by stabilizing water quality. S. sensing system has three functions: monitoring, analysis and control.

First, we monitor water qualities and accumulate machine running & paper quality information from customer.

Second, we analyze the correlation among them. Third, we control water quality and achieve improvement on machine running stability and paper product quality. In this report, we introduce the case study that defects on paper reduced by analysis correlation between water quality & defect causes then controlling water with S. sensing system.

Novel Dissolved Lignin Carryover Measurement in O₂ and D₀ Stages Brings Opportunities for Significant Improvements in Fiberline Operations

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Conventional fiberline control is solely based on the lignin content of the pulp fibers expressed as kappa number combined with brightness measurement in the bleaching stages. The kappa number is measured using a traditional multipoint analyzer with several sample locations sharing the limited capacity of one central analyzer thus resulting in low update rate and lack of redundancy. Some mills still only use manual sampling and laboratory kappa measurement which inevitably means very low update rate and typically also poor repeatability. While the fiber lignin content and brightness indeed are critical parameters for the unit operations’ control, it has been shown that the dissolved lignin in liquor phase, often referred to as black liquor carryover, plays a key role due to its impact on the occurring reactions. This carryover measurement has been a critical missing link in having a fully automated optimum fiberline process control.

This study presents results from evaluations of two new sensors for capturing the dissolved lignin carryover in the pulp stock, to properly account for its impact in oxygen delignification and chlorine dioxide stages. Mill data is combined with laboratory data which confirms the benefits of these novel control concepts, employing the new sensor tools.

Recent research and mill studies have revealed that if appropriately implemented, these new measurement and control capabilities bring significant improvement potential in fiberline

operations, in terms of optimizing pulp yield and quality, production rate, and consumption of bleaching chemicals.

—Peer Reviewed—

Improvement of Air Filters by Nanocelluloses

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Freeze-drying of 2,2,6,6-tetramethylpiperidine-1-oxyl(TEMPO)-oxidized cellulose nanofibril (TOCN) dispersions in water/ tert-butyl alcohol (TBA) mixtures was applied to prepare TOCN/glass fiber composite air filters. The influence of TOCN content in the filters, exposing conditions of the filters to humid air and the amount of particle loading on the filter properties were investigated. The TOCN content in the composite filters was controlled from 0 to 0.126% by controlling the amount of the TOCN/water/TBA mixture sprayed to the base glass filter. When the TOCN content was 0.081%, the filter quality factor showed the highest value. At the TOCN content higher than this value, densely packed TOCN networks rather formed and prevented the efficient capture of oil-aerosols used as model particles. After exposing the TOCN-containing composite filters to high humidity conditions, the pressure drop decreased and the particle penetration ratio increased. The original porous networks mostly remained and the high quality factors were maintained even after exposing the filters under humid conditions, while scanning electron microscopy images indicated that some TOCN networks shrank. The durability of the TOCN-containing composite filters was evaluated by continuous loading of oil-aerosol particles for 3 h. When the air filter had high TOCN contents, the pressure drop slightly decreased, because the TOCN networks were aggregated with the particles. However, no TOCNs were removed from the filters even by the air flow with growth of particle agglomerates. Thus, the porous networks of TOCNs had sufficient durability against particle loading. Although there are several problems in practical applications of nanocellulose to air filters, the unique properties of the TOCNs such as the extremely small fiber diameters, high aspect ratios and tough network structures are advantageous in preparing new air filters with high performance.

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Technological Transition of Web Inspection System

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Web Inspection System has carved a history of about 50 years in Japan. Once the except for the inspection of special paper, WIS which has not been considered less important than the instrumentation, such as QCS, became indispensable important system to making paper now. The manufacturer of new entrants to WIS increase, manufacturer to sell currently in Japan, was about more than 10 companies. There are some strong demands for the quality of the user, the result of competition between WIS manufacturers, performance and function became very well. I will introduce the evolution of WIS technology.