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Basic concept and latest headbox design

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The function of headbox is defined as "A device rectifies the stock and pours it on the wire with certain thickness and speed". The function typically demanded on headbox is as follows.

- Makes proper stock dispersion and supplies the stable stock flow to the slice section.
- Jets the uniform stock flow free from streak and diagonal flow in cross machine direction.
- Maintains the stable slice section not influenced by the pressure and temperature variation.
- Keeps cleanness inside and easy for maintenance.

On the other hand, high functional devices such as dilution profiling system, headbox sheet, and evener rolls according to the client's specification are requested to apply. Therefore, the selection of proper devices depending on paper quality target is very important engineering work. Evaluation of headbox is very much concerned with the paper quality such as basis weight profile, formation and properties.

This reports the latest dilution type profile system as well as the basic function and mechanism of our headbox.

Lubrication management utilizing advanced oil purification method and IoT with cellulose capillary filter

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JSD, through the sales of cellulose capillary filters, has been involved in lubrication management in many manufacturing industries throughout Japan, including paper and pulp, metal rolling, machine manufacturing, and semi-conductor manufacturing. Cellulose capillary filters are made through special processing of the capillary system found in trees. Using such a filtering medium, it can remove particles as small as 0.1μm (100 nanometers). Such fine filtration causes the oxidation in the oil to stop, thus not only removing the sludge and varnish that lead to machinery wear and breakdown, but actually prevents the sludge and varnish from forming in the first place. The oil is kept cleaner than new oil, which means oil changes are no longer necessary. Furthermore, the oil that is now super-clean will flush the insides of the machinery system. With the contaminant particles removed, the oil will be able to fully function as a lubricant, thus massively reducing maintenance cost due to a large reduction in machinery breakdowns and repairs.

In order to further improve lubrication management while saving labor, oil quality sensors, which monitor the oil condition in real-time, and particle counters, which calculate the particle amount in the oil and show the result in IOS or NAS standards, are available for use. Joining these equipment through an IoT (Internet of Things) system will also be available for implementation in the near future.

Efficiency improvement by optimizing coal boiler control

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Power generation facilities at Hachinohe plant of Mitsubishi Paper Mills Limited consist of a coal-fired boiler, a waste boiler, black liquor recovery boilers and steam turbines. These facilities are being operated to satisfy both the steam and power demands fully while using many fuel sources such as heavy oil, coal, black liquor and waste efficiently.

Recently, we introduced new optimum parameters to a system of a conventional controller to operate a coal-fired boiler. The system has solved some operating problems and reduced power generation costs.

Indirect Food Additives for Food Packaging Paper

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Harima Chemicals Group, Inc. has been supplying various paper chemicals such as strength and sizing agents for paper and paperboard mills in order to provide desired functions on papers.
Paper and paperboard have been widely used in our life not only for printing, wrapping and transporting purposes but also as food packaging materials such as boxboards, paper plates and beverage cartons. Food packaging materials have been regulated in countries around the world, and paper chemicals used in paper intended to come into contact with food also need to be compliant with the regulations.

In this situation, we have developed and begun sales of polyacrylamide (PAM) type dry strength agents, dispersed rosin sizes which were approved by FDA (Food and Drug Administration) for indirect food additives. Both PAM strength agent which has high molecular weight and amphoteric property, and dispersed rosin size which applied synthetic anionic polymer as an emulsifier, are the first products in the world of paper chemicals to meet FDA regulatory requirements.

The FDA approved PAM strength agent, "Harmide KS series", and dispersed rosin size, "NeuRoz® series" as well as the efforts to aim for "the development of safe products as indirect food additives" are introduced in this report.

Next Generation of Automated Paper Testing and Online Pulp Analyzing System
-L&W Autoline and L&W Freeness and Fiber Online-

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In all types of mature business, constant improvements are required for a company to stay competitive. Today it is more important than ever. Search for cost reductions and improved efficiency is always on the agenda. In the pulp and paper industry, the first goal is to produce a product within given specification at the lowest possible cost - quality testing and process monitoring is one way getting there.

In this speech, I would like to share our experience and knowledge which has been obtained from installation base of more than 500 systems of L&W Autoline all over the world. Especially herein, I introduce our brand-new small system of automated paper testing, L&W Autoline S, which has been just released this year 2019, based on completely new basic design of its user interface, digitalizing capability and advanced reliability, and able to shorten ROI period.

And, I continue to explain the design concept features of L&W Freeness Online, L&W Fiber Online, and our new solution, L&W Freeness and Fiber Online which can combine the online measurements of freeness and fiber properties. Just in 2 years from our product release, almost 20 x systems of online pulp analyzing have been delivered globally including Japan, and it is attributed to the fact that customers acknowledge its advanced and innovative feature as well as its maintenance ability and reliable measurement capability.

Reliable system of automated paper testing and online pulp analyzing helps to monitor and control properties and qualities, and to create the best possible continuous and uniform process throughout from pulp furnish and to paper product. It is also mandatory to obtain precise and huge data of quality assurance automatically, and to share, analyze and feedback information necessary for process optimization by digitalization.

Effects of Insecticides on *Ochotellus glaber* and Other Species of Ants

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The effects of a new insecticide, piliprolol FL (phenylpyrazole), and a slow-acting insecticide, fipronil FL (phenylpyrazole), on the black house ant, *Ochotellus glaber*, were examined by using the filter paper contact method. The insecticidal effect of the former was higher or as high as that of the latter. Similarly, fast-acting insecticides including two organophosphorous compounds, fenitrothion FL and propetamphos AE, three pyrethroids, β-cyfluthrin FL, bifenthrin AE and etofenprox AE, and a neonicotinoid, thiamethoxam FL, were tested. Propetamphos AE showed the highest potency, followed by fenitrothion FL and bifenthrin AE. Aerosol (bifenthrin 0.07%) knocked down the test ants 100% in 10 minutes after direct spraying, confirming that it was a fast-acting, potent agent against ants.

An Essay on Methodology for Innovating "*JAPAN TAPPI JOURNAL*"

Part 6: "Psychophysics" : An Academic Area that links Human Aspects with Natural Scientifc Aspects by Human Mediation

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For deep understanding of essentials of paper, human aspects of paper as well as natural scientific aspects are significant. This kind of way of thinking is attracting particular attentions recently with a view to solve the problems associated with paper related complicated issues in the contemporary society. Psychophysics has a possibility to link between human aspects with natural scientific aspects.

The sixth article of this series is intended to analyze the possibilities of applying psychophysics as tools of designing a variety of paper products. Furthermore, this article is seeking for the possibilities of applications for innovating JAPAN TAPPI JOURNAL.

The overall contents are described as below.

1. Introduction
2. Human being as Information Processing System.
3. Phychophysics as an academic area
4. Psychophysics as linkage between Psychology and Physics
5. Psychophysics as paper designing theory
6. Theoretical interpretation of the development of human-oriented papers
7. Epilogue

Rapid measurement method for molecular weight distribution of cellulose using tetrabutylammonium acetate / dimethylsulfoxide (TBAA/DMSO) mixed solvent

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A rapid size exclusion chromatography (SEC) analysis system for cellulose was successfully developed using a mixed solvent of tetrabutylammonium acetate (TBAA) / dimethylsulfoxide (DMSO). The cellulose sample was dissolved within 30 minutes without pretreatment, the molecular weight distribution measurement was completed in 30 minutes, and the average molecular weight was calculated based on pullulan standards. In the high-purity cellulose samples, a high linear correlation was found between the common logarithm of the weight average molecular weight (M_w) and the viscosity average molecular weight (M_v). In pulp and commercial cellulose powder, peaks or shoulders derived from hemicellulose appeared in the low molecular weight region and the polydispersity increased. Even when hemicellulose was contained, almost the same correlation was observed between M_w and M_v as the high-purity cellulose samples, and the approximate degree of viscosity polymerization could be estimated. The method developed in this study can be a powerful method for measuring the degree of polymerization, which can replace the viscosity method that requires complicated operations.