JAPAN TAPPI JOURNAL
2
February 2026
Vol. 80, No. 2

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Household and CNF

2026 February　JAPAN TAPPI JOURNAL
Vol.80,　No.2　Abstracts

Characteristics and Development of Phosphorylated Cellulose Nanofibers

Takafumi Sai
CNF R&D Center, Innovation Promotion Division, Oji Holdings Corporation

Recently, woody biomass is regarded as a carbon-neutral and renewable resource, and various applications is expected. Particularly, cellulose nanofibers (CNFs) are receiving attention as a new nanomaterial derived from cellulose, one of the major components of trees. We have developed a unique method for producing CNFs by introducing phosphate groups to the hydroxyl groups in wood pulp and mechanically processing the resulting phosphorylated pulp. The obtained phosphorylated CNFs were completely nano fibrillated (about 3 nm in width), and the aqueous dispersion of phosphorylated CNFs can be dehydrated and dried to form transparent sheet with densely-packed CNFs. This sheet has high strength and thermal dimensional stability, and low oxygen permeability. Furthermore, polymer exchange membranes (PEMs) with high proton conductivity are required to increase the efficiency of fuel cells and water electrolyzes for hydrogen production to reduce the consumption of fossil fuels. The high proton conductivity particles found in previous studies cannot be formed into membranes by themselves. Therefore, we are aiming to create PEMs with high proton conductivity using phosphorylated CNFs. We will continue to develop new applications for phosphorylated CNFs with unique characteristics.

Development of Total Heat Exchanger Element Liner with Cellulose Nano Fiber

Yoshiyuki Yamada, Kentaro Tanaka, Kazuki Miyazaki, Ryoji Takahama Kasumi Kinoshita and Hitoshi Okada
Filter Business Division, Oji Industrial Materials Management Co., LTD

In recent years, due in part to the impact of the COVID-19 pandemic, awareness of indoor air quality (IAQ) and SDGs has increased, and the demand for total heat exchange ventilation systems that can ventilate while reducing energy loss has been expanding. The system exchanges heat and moisture without mixing indoor and outdoor air. The energy recovery ventilation (ERV) core, which plays a key role in this system, is required to have a high degree of airtightness and heat and moisture exchange functions.

In this study, we have developed a new exchange liner for total heat exchange elements with enhanced functions by forming cellulose nanofibers (CNF) as ultra-thin films (moisture-permeable polymer films) on top of the base film (substrate) using our proprietary technology.

This moisture-permeable polymer film has a very dense mesh structure with no gaps because it uses CNF, and although it is ultra-thin, it has extremely high airtightness, and it is a membrane that does not allow CO_2 or dirty air to pass through. In addition, taking advantage of the high hydrophilicity of CNF, it has significantly high moisture permeability, and has an ultra-thin structure with the substrate to achieve higher moisture exchange capacity than conventional exchange membranes. This report provides an overview of the new liner and its performance.

Potential applications for CNF （nanoforest)

Hiromi　Hashiba
Research & Development Dept.,Chuetsu Pulp & Paper Co.,Ltd

At present, the realization of a sustainable circular society is widely required in the midst of growing interest in environmental problems. Chuetsu Pulp &　Paper has been researching and developing cellulose nanofiber (CNF) as one of advanced utilization planning of pulp which is raw material of papers. In addition, we have obtained several practical application cases that utilize the characteristics of our manufacturing method. We have been considering compounding CNF with resins or rubbers for industrial applications. In order to compound CNF with good dispersion, it is necessary to remove water from the CNF water dispersion and prepare dry powder. We are developing a nanoforest-PDP, which is CNF in dry powder form, and examining as an additive for resins and rubbers.

Yankee Coatings Optimization by Laser Sensing and Spray Technology

Shota Ide
Maintech Co.,Ltd. Development and Production Engineering department Division1

In recent years, the labor shortage in the Japanese manufacturing industry, stemming from the decline in the working population, has become serious. Consequently, the paper industry is also required to promote work style reforms aimed at improving the working environment and enhancing operational efficiency. In this context, business improvement through the introduction of DX and IoT technologies has progressed, and the introduction of sensors, cameras, and various measurement systems has accelerated at manufacturing sites. On the other hand, confirmation of the coating condition of Yankee dryers, which is a crucial element in the papermaking process of household paper, still relies on visual judgment based on the experience of experienced operators, and personal methods are the mainstream approach. This qualitative evaluation method requires extensive experience and presents a significant challenge in terms of standardizing operations and technology transfer. To address these challenges, we have developed a monitoring system that can visualize and quantify the coating condition of Yankee dryers in real time. This system enables everyone to understand the condition based on a common standard and is expected to serve as a stepping stone to the standardization and automation of operations. In this report, we will describe the principle and configuration of this system, its effectiveness through actual application cases, and prospects.

BTG High Performance Creping Blade for Bulk Increase & Fiber Saving, and Long Toilet Paper.

Ryohei Watanabe, Mamoru Ochi, Hirohiko Kato and Tsukasa Ato
Voith Turbo Co., Ltd. BTG Japan

In recent years, we can see significant price increases around the world. Due to the impact of the Covid-19, Russia-Ukraine war, supply chain disruptions and soaring energy prices, raw material and energy costs rise sharply. Of course, the household paper industries are no exception, and we have had to revise our prices several times over the past few years.

On the other hand, the economic burden on normal consumers is heavy, and household paper manufacturers are increasingly reviewing and optimizing manufacturing costs to mitigate sharp increases in product prices.

As the needs of household paper manufacturers change, the performance required of creping blades is also changing. Here we introduce a newly developed blade.

① 『SATINY』: Improving productivity, Stable bulkiness, Less paper dust
② 『TILLIUM』: Stable crepe quality, Reduction in long fiber usage
③ 『TEXTURA』: Improving bulkiness and water absorption, Reduction in Basis weight
④ 『TRAMPOLI』: Balancing increasing bulkiness and improving softness

Voith Yankee Onsite Service: Measurement, Grinding, Metallization

Nobuaki Ajioka
Voith IHI Paper Technology Co., Ltd. Domestic Sales Dept. Fabric Group

Voith, alongside BTG and Toscotec, is a comprehensive supplier for tissue manufacturing needs. The Yankee cylinder, crucial for tissue production, requires optimal maintenance. Voith's Fabric & Roll Systems division offers on-site services like "ProSurface" for precise surface measurement during operation, "MiniGrinder" for efficient grinding, and "TerraDry H Family" for advanced thermal spray coating/Metallization.

"ProSurface" allows detailed mapping of the Yankee cylinder's surface and temperature during operation, aiding in early detection of issues. The "MiniGrinder" enhances productivity by reducing preparation and downtime, while improving grinding precision. "TerraDry H Family" coatings extend cylinder life and improve heat transfer efficiency. Voith's Yankee Onsite services ensure optimal Yankee cylinder performance, contributing to improved operational stability for tissue producers.

KAWANOE Total Engineering for Household Paper Production Equipment

Tomoyuki Shinohara
Kawanoe Zoki Co, LTD.

Kawanoe Zoki Co., Ltd. was founded in November 1944 and has been manufacturing various types of paper and pulp production equipment for over 80 years, while also developing related machinery and equipment and undertaking modifications to existing equipment. The COVID-19 pandemic brought about significant changes in living environments, and the rapid depreciation of the Japanese yen due to global economic uncertainly has led to sharp increases in raw material prices and logistics issues, resulting in unprecedented changes in the market for household paper products. To reduce transportation costs and packing materials, and to save space, long-length toilet rolls, which were previously in high demand for commercial use, are now being adopted for general use toilet rolls. As a result, toilet products with more than three times the length of conventional products are now widely available on store shelves, and various types of long-length toilet products are becoming mainstream.

In response to these market changes, we are working "together with our customers" to develop new high-value-added products utilizing the pilot converting machine installed in 2020. We are committed to enhancing customer satisfaction through our "KAWANOE Total Engineering" approach, which covers from new product development to maintenance, and we would like to introduce our efforts in this regard.

Valmet's Advanced Automation Solutions for Tissue Production
-Integrated Solutions Lead the Way for the Future-

Yohei Okuyama
Valmet K.K. Automation Solutions Business Line

The tissue production industry faces instability due to labor shortages and generational skill gaps. As the only full-scope Original Equipment Manufacturer (OEM), Valmet offers integrated solutions covering the entire process from raw material preparation to converting, providing a robust response to industry challenges.

Valmet DNAe (Distributed Network Architecture evolved) is a scalable, next-generation integrated automation system that controls and optimizes the entire tissue production line. It unifies process control (DCS), quality control (QCS), analyzers, instrumentation, drive control, and machine control into a single platform, eliminating the need for complex system linkages. Valmet IQ Quality Control System (QCS) holds a strong market share and delivers innovative measurement technologies. The Valmet IQ IR Fiber uses non-nuclear technology to measure basis weight and moisture, eliminating the need for radiation management and reducing total cost of ownership (TCO) by up to 75%. The Valmet IQ Softness is the world's first online softness sensor, using advanced image processing to objectively measure sheet softness and crepe count in real-time during production. Valmet Pulp to Tissue Technology is an advanced process control (APC) solution that optimizes the entire process from raw material preparation to converting. Its core soft sensor uses advanced algorithms to predict final product quality characteristics in real-time, while DNAe's integrated control automatically maintains key performance indicators (KPIs) such as tissue strength, eliminating over-quality. These advanced Valmet automation solutions maximize customer competitiveness by improving raw material and energy efficiency, minimizing web breaks, enhancing overall equipment efficiency (OEE), and supporting operators.

Packaging Solutions from Italian Manufacturers TMC and OMET in Response to European Market Demands

Atsushi Tomiyama
Shinsei Co.,Ltd

Since its founding in 1997, Shinsei Co., Ltd. has been delivering equipment from the latest processing machine manufacturers, mainly from Italy, to customers in the paper industry, particularly in the household paper market. After I assumed the position of President and CEO in 2024, we have been focusing not only on the sale of imported machines but also on after-sales maintenance, creating a system that allows Japanese customers to use the latest equipment with confidence. In this article, as indicated in the title, we will introduce the packaging machines from TMC and OMET from the perspective of what types of packaging machinery EU customers of these companies are seeking.

Participating in the 2025 Specialty Paper Conference/ Paper-based Material Exhibition (Hangzhou, China)

Hiroshi Ohi
Professor Emeritus, University of Tsukuba
Kohei Michikawa
Former Executive Officer, General Manager, Innovation Promotion Division, Oji Holdings Corporation,
Jiayi Chen
Senior chief researcher, Kurita Water Industries Ltd.,
Haruya Sawamura
President/CEO, MOLZA Corporation,

The 2025 Specialty Paper Conference and the Paper-based Material Exhibition was held in Hangzhou, China on 2-5th November, 2025, organized by the China Technical Association of Paper Industry (CTAPI) and the China National Pulp and Paper Research Institute (CPPRI). The event brought together over 400 participants for the conference and approximately 5,000 for the exhibition. The conference featured keynote speeches and general presentations on the latest trends in specialty paper, including market forecasts, technological challenges, and growth areas. Notable presentations included insights into the future of specialty paper, the development of paper-based materials as plastic alternatives, and analyses of the Chinese specialty paper industry's current status and outlook. The exhibition showcased a wide range of specialty paper products, production equipment, chemicals, and related technologies, with active participation from Japanese and international companies in addition to the domestic in China. The event highlighted the expanding role of specialty paper in various industries, the importance of technological innovation, and the growing significance of international collaboration in the sector.

Structural Analysis of Dry-Defibrated Paper Fibers

Tatsushi Kato, Masayuki Omoto, Koichi Morozumi, Mayumi Nakata, Sayaka Kimura, Yoshiki Nakashima,
Sotaro Oana, Yoko Nakai, Hideki Tanaka

SEIKO EPSON CORPORATION

Wood-based cellulose fibers, which are widely utilized, are gaining attention as one of the materials driving resource recycling. The defibration process is essential for recycling in resource circulation, but much remains unknown about the changes in cellulose fibers during this process. This is because cellulose is a crystalline polymer material with a complex hierarchical structure, and there are limited means to investigate the changes in this complex hierarchical structure during the defibration process.

In this paper, we elucidate the mechanism of the defibration process of cellulose fibers for the first time by applying a method that combines small-angle X-ray scattering and transmission electron microscopy. As a result, it was found that in dry defibration using impact force, the cellulose preferentially peels off from the crystal planes with the least hydrogen bonds and the most hydrophobicity. This characteristic can be utilized, for example, in selective adsorbents, and will create new possibilities for cellulose resource recycling.