

### **Latest technology and history of Calender section**

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Calendering is one of the fundamental elements in the paper finishing process. Particularly in printing paper, in order to improve its printing suitability, finishing the surface smoothly and giving gloss to paper are important in imparting value added to the paper. On the other hand, technologies capable of executing energy saving and resource saving with better efficiency while seeking the quality of the target are required, and technologies responding to it have been developed. In this paper, we introduce the history and the latest technology of the calendar which have developed technologies unique to each company in order to satisfy requirements of papermaking machine and coating line speeding up, efficiency improvement and product type.

### **History of Winder Technology and Recent Trouble Shooting References**

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Looking back at the history of Winder, the machine has been developing with the changing technology. At first, only Two-drum Winders were common until the 1960's. However, the development was advanced. Consequently, Single-drum Winder was developed in the 70's, and in the 1990's, VariPlus equipped with a center drive came out. When entering the 2000's, rubber-covered drum was introduced into the industry. Rubber-cover has two advantages; first, it reduces vibration. Secondly, it enables Winder to accept larger diameter of baby rolls than before. First benefit is vibration alleviation. The flexible surface will follow and compensate the Cross Direction caliper profile. Furthermore, the damping force through the material reduces vibration. Second advantage is that rubber cover gives wider nip width. It allows producing larger diameter of paper rolls with lower nip pressure even with the same nip liner

load.

Even though there are lots of discussions about new equipment or retrofit technology of the product, there are few practical statements about improvements for existing machines. Therefore, here we show some actual improvements for typical troubles based on the author's experiences. Some examples will be introduced such as, for better performance, setting slitter in the right geometry. For reducing vibration and roll kick-out, setting change of rider roll nip pressure for Two-drum Winder. To improve vibration problem, parts replacement such as worn core chucks and radial play of drive shafts for Single-drum Winder. In addition, setting change of friction damper is effective for vibration reduce as well.

Recently, the acceleration and deceleration rate has been increased for capacity improvement. However, due to vibration, many machines have tended to be prevented from operation with the setting rate. Hydro-pneumatic damping system was developed, and has been installed for new Winders. In the near future, the system needs to be applied to not only new machines but the existing ones.

### **Winder improvement Examples of Winder improvements and labor saving of Finishing – part in the future**

Shoichiro Hayashi

NAGAI TEKKO Co.,LTD

Nagai Tekko started business in 1938 at the corner of RENGO Chibune Mill. In early stage , we grow up our technical skill by parts renewing and repairing at the paper mill. In the 1956, we built a factory at Amagasaki City and grew up from repair business to the manufacturer of paper machines.

In 1980s, we concentrated 2drum-Winder as our core business. Through the OEM-Works, we developed original Winder Automation systems. It fit the customers need of operator reducing.

Recently the needs of Automation systems step forward to the second phase.

We need to develop the new automatic devices or systems that fit the times. Especially we must develop the system that solve the problem of the rapid worker decrease in Japan. For example Connect with the host computer will help reducing the input errors by non expert. Other example Developing the machines without physical strength will help various workers. We will keep advancing technology from now on.

## **About Finish Facilities Labor-Saving**

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We are a papermaking machine maker mainly engaged in designing, manufacturing and selling industrial machinery mainly for papermaking finishing equipment. In the paper industry, the finishing department is an important section for determining product quality. The finishing department is difficult to automate, it complicates the process due to diversification of quality as well as quality as well as product form according to the user's requirement, so anyway it takes a labor intensive work It is said that. However, in each industry regardless of the paper industry, labor saving of work accompanying the automation of machines is proceeding and it is a problem that can not be distracted. In the first place, saving labor is to eliminate labor and labor by introducing and streamlining machines, and as we are involved in the paper manufacturing industry as a papermaking machine manufacturer, we must pursue it. In such circumstances, we propose new facility investment for automatic machines of "flat packaging machine", "skid packaging machine", "winding packaging machine" which are finishing process packaging machines, and at the same time, We have worked on labor-saving activities of users by investigating and remodeling and improving machine problems and needs. In this thesis I will introduce and introduce the latter activities.

## **The Method of Prevention Against Insect Entry to Production Factory Applying Ventilation Unit with Automatic Cleaning Filter**

**-The method of prevention against foreign objects with pressure control inside the building-**

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NIPPON PURETEC CO.,LTD

(Air Filter Insect Protective) To keep the air pressure of production room positive greatly contributes to protect insects from coming into the room. However, introduction of great deal outdoor air needs higher costs for air filter installation as well as for operational and / or maintenance.

This system is the solution of above problem, by possibly being applied to the domestic consuming paper plants, with the use of automatic insects evacuation style rotary disc filter together with outdoor air intake fans, aiming at the insect protection by the pressurized room air in economical way.

## **The comprehensive chemical approach for realization of stable operation by the optimum foam control**

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In the papermaking process, various troubles may be caused by foaming everywhere. Troubles due to foam not only hinders operability and productivity but also often adversely affects the quality of products, and foam control is extremely important in solving the above problem.

Since we began supplying papermaking chemicals to the paper manufacturing companies nationwide in 1943, we have worked on improving foaming problems with our customers, we have a large selection of customized products for each customer process, and as a chemical assistant for foaming troubleshooting today There.

In this paper, we describe our recent efforts on foam control method in each process.

## **Polyacrylamide-based Pitch Control Agent for Pulp and Papermaking Process**

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Deposits of organic contaminants can cause serious problems on runnability or quality. Contaminants can come from wood (pitch) or from manmade sources through recycled fiber (stickies). They can impact the paper making process from the pulp mill to the paper machine. Traditional methods to control pitch and stickies including addition of talc or dispersants can hardly solve these problems in closed system of water.

We developed a novel pitch control agent based on amphoteric polyacrylamide for pulp and papermaking process. First, this agent can be adsorbed onto the surface of organic contaminants, stabilize them in colloidal state, and reduce their surface stickiness to prevent further agglomeration. Second, this allows the particles to be retained in the pulp sheet and removed from wet-end system without creating deposits. Furthermore, this agent has excellent abilities of heat and alkaline resistance so that it performs effectively in various pulp and papermaking conditions as well. We call this agent the “AS series” concept for organic contaminant control.

In this paper, we introduce feature of “AS series” and trial results of improving pulp

quality and operation by applying it for pulp machine having pitch trouble.

## **How the paper industry in Japan has technologically responded to the paradigm shifts of the Japanese society**

### **Part 2 : The Paper Industry in the 1970s (2)**

Kiyoaki Iida

Following the previous issue, the technological approaches of the paper industry in the 1970s were reviewed.

The sharp rise of oil price was devastating to the industry, which, as a whole, started to save energy in any measures. As results, unit consumption of the total energy went down from 133 in 1981 to 92 in 1999, expressed in index with that in 1990 as 100. The ratio of yearly purchased energy value to that of yearly paper and paperboard production was reduced from 19.5% in 1981 to 6.8% in 1993..

The menace of imported products was countered by improving cost performance of products.

Synthetic pulp and paper, which were attractive in the late 1960a and expected to take a 20% share in the 1970s, failed due to oil price hike.

As a result, the paper industry, having technologically dealt with problems like environmental pollution, scarce wood supply, high energy price and menace of imported products, recovered profit more than the average of other industries. It was, moreover, understood in public that the industry was ecologically friendly and sustainable.

The technological development of process industries, one of which was the paper industry, was stagnating in the 1990s and the revolution was beginning.

### **All-cellulose materials adhered with cellulose nanofibrils**

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All-cellulosic materials called vulcanized fibers, in which cellulose fibers are gelatinized and adhered to each other by zinc chloride, have been known for more than 150 years. However, the swelling and adhesion mechanisms have not yet been clarified. In this study, X-ray diffraction, scanning electron microscopy (SEM), and specific surface area (SSA) analyses of cellulose sheets treated with different concentrations of aqueous zinc chloride solutions were performed to elucidate the behavior and mechanism of cellulose fibers adhering to one another during ZnCl<sub>2</sub> treatment. The X-ray diffraction analysis revealed that the ZnCl<sub>2</sub> treatment caused swelling of intercrystalline regions but did not significantly change the original crystal structure of cellulose I. The SEM observation of the freeze-dried sheets revealed less aggregated structures of the fine fibers and the existence of three-dimensionally entangled cellulose nanofibrils (CNFs) between the cellulose microfibrils. The increased SSA values of the freeze-dried sheets supported the formation of CNFs during the ZnCl<sub>2</sub> treatment. These results indicate that in these all-cellulosic materials, CNFs are entangled and form dense networks that are not completely detached in water. In addition, the presence of moisture leads to more viscoelastic behavior as a result of slip between the CNFs during tensile testing.