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Introduction to the "Cooperative Process Optimization" -Case Example of a Liner-board Machine-

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The pulp and paper manufacturing process is a complex continuous process that contains numerous control loops. Improving such an entire plant requires analyzing a vast amount of data to identify issues and causes. Additionally, optimization must consider interferences between processes. The "Cooperative Process Optimization (CPO)" is a comprehensive solution conducted by control consultants using data analysis and simulation, including on-site surveys, identification of improvement themes, estimation of improvement effects, and implementation. Typical improvement effects achieved by the service are grade change time reduction, quality improvement, labor savings, and reducing reliance on skilled operators.

The basic flow of CPO involves several steps. First, problems are identified through on-site surveys and interviews with operators. Next, plant data is collected and analyzed. Then, improvement measures are proposed. Improvement effects are quantified by simulation and can be confirmed prior to implementation. This process can be repeated over a long period to enable continuous improvement activities.

As a specific example, we will introduce the results achieved at a three-layer liner-board machine in a Japanese company. Key results included a 15% reduction in the standard deviation of moisture content, a reduction in steam usage, and a 36% reduction in grade change time. These improvements resulted in tens of millions of yen in annual profits. In addition, these improvements led to labor savings, reduced reliance on skilled operators, and stabilized operations.

Moisture content fluctuations during production and moisture content hunting during grade changes were identified as problems at the site of this case. Comprehensive correlation analysis identified basis weight and dryer vapor pressure control as major factors. Frequency analysis identified specific fluctuation cycles. Improvement measures were proposed, and simulations confirmed their effectiveness in advance. The actual improvement results matched the expectations from the simulations.

Moreover, with the introduction of automatic grade change control, the average grade change time was reduced from 20.7 minutes to 13.2 minutes. This allowed for an additional 27 hours of production per year, and also significantly reduced the operator's workload, achieving stable operations without relying on individual skills.

Operational Improvement Measures Using the AQUAS CLEANJET SYSTEM

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In recent years, efforts to achieve the SDGs have been gaining momentum on a global scale, and paper companies are promoting water conservation as part of their environmental measures. As water conservation efforts proceed through closed systems, organic and inorganic matter from raw pulp and wastepaper, as well as organic matter from additives such as starch, sizing agents, and latex, are generated. The slime produced by microorganisms that grow within the dirt deposits causes deterioration of product quality, forcing increased regular repairs and resulting in reduced productivity. To solve these problems, we developed the AQUAS CLEANJET SYSTEM.

The AQUAS CLEANJET SYSTEM is a patented technology that uses our original dedicated eductor. By using chemical treatment alone, as well as chemical treatment in combination with injection equipment, it is possible to spread the chemicals evenly and reduce deposits in the pit, which are a breeding ground for various types of dirt. As a result, while water conservation through closed sewage treatment is progressing, paper breaks, defects, BOD load, odor, cleaning work, etc. that occur are reduced, and chemical treatment costs are also reduced. This paper introduces operational improvement measures using the AQUAS CLEANJET SYSTEM.

Operating Experience with the Introduction of the Aquas Clean JetSystem

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Nippon paper Ashikaga Mill, Ashikaga is located at about 70km north from the Tokyo metropolitan area and about 50km south-west from Utsunomiya city,Tochigi prefecture. The mill owns the PM1 that produces core paper, pasting paper board and water-resistant paper board, and the PM3 producing conventional corrugated medium and heavy-duty water-resistant corrugated medium.

In terms of factory location, the site is characterized by the presence of municipal roads and rivers crossing within the premises. Furthermore, residential areas and farmland adjoin the factory site, making it an environment where careful consideration for the surrounding conditions is required.

The comprehensive drainage is discharged into the old Fukurogawa, a tributary of the Watarase River, and the control indicators are pH, BOD, and SS. In March 2021, the drainage standards in Tochigi Prefecture were revised, placing a greater emphasis on water quality improvement. In response, our factory implemented measures to enhance the drainage facilities and reduce the drainage load from our production processes.

In this article, we will introduce a case study focusing on the drainage load reduction measures using the AQUAS CLEANJET System, chosen from among various initiatives.

Suitable quality management for stronger corrugated board
-New flute testing method, S-test, defined by ISO in 2024-

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Currently, industry got strong pressure from the market because Japan government announced carbon neutral industry by 2050. In Japanese industry, especially material industry, there are several serious potential issues like lack of human resource due to less attractiveness for young people, retirement of baby boomer and the technical transfer. On the other hand, there are bright future in paper industry because paper is excellent material for plastic reduction and new functional material, Cellulose Nano Fiber.

ABB started following four approaches to cooperate with customer to solve facing issues.

1) Reliable and high performance online measurement for Refiner, Wet end control
2) Cutting-edge fiber analyzer for new material development
3) Speedy, Safety and high precise paper testing machine
4) High speed, high precise and reliable automated paper testing machine

In the paper, 2) Cutting-edge fiber analyzer for new material development is described. You can understand how to optical fiber analysis method is useful to understand refining status and it helps your refining process optimization for quality control.

Rheology management as a tool for coating color optimization

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For paper and board coating request higher machine speeds and new functionalities in these days.

Therefore, coating rheology becomes more important to control raw material quality and optimize runnability. As the matter of fact, 2 new TAPPI standard methods are approved. However, despite these methods are approved, rheology management is not considered important. That is because typical viscometer cannot measure the viscosity as same as the process situation. AX-100 is the viscometer for coating color to measure the viscosity in not only low shear rate but also high shear rate as same as the in-process conditions. In addition, it also measures extensional viscosity for curtain coating. AX-100 is the machine designed for rheology management.

Deodorant‘DEOMAGIC’harmonize with the stench, arise fragrance.

Yutaka Tsujimoto
SHIKIBO LTD.

‘DEOMAGIC’ is a new deodorant develop by Shikibo Ltd. It showed good effect for the odor which difficultly be removed by ordinary deodorant. ‘DEOMAGIC’ was developed by use the mechanism of perfume. By harmonizing with bad odor, ‘DEOMAGIC’ can change the odor to good smell.