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Efforts to save power at the woody Biomass Power Generation plant , Sendai Mill

Jun Wakamatsu
Sendai Mill, chuetsu Pulp & Paper Co.Ltd

Based on the FIT (Feed in Tarif) act enforced in July 2012, Chuetsu Pulp & Paper Co., Ltd. Sendai mill started a power generation business using 100% wood fuel as of thinning wood and general wood from November 2015. It was realized by taking advantage of the rich forest resources in south Kyushu and our traditional efficient wood harvesting system. The problems such as facility rising troubles and output reduction phenomenon were solved, total operation has been stabilized finally. After that we tried to reduce equipment's own power consuming ratio to maximize the external power sales volume. As a result of taking actions (1) installing appropriate inverter system, (2) replacement of fan and pump to the efficient type, (3) setting improvement of each system, the own power consuming ratio reduced from 10.7% to 10.1% and we achieved sales increase. In this paper we introduce the power saving method in the wood biomass generating facility's operation, implementation cases for each equipment and finally the result of electric power saving.

Operation Experience of High Efficiency Recovery Boiler (HERB)

Katsuya Yoshida
Mishima Mill, Daio Paper Corporation

Daio Paper Co. installed New High Efficiency Recovery Boiler at Mishima Mill, and the commercial operation was started from July, 2020. We have been operated this new Recovery Boiler with own know-how of the mill, and generated power has been supplied to power grid with Feed-in Tariff scheme.

The specialty of this new Recovery Boiler plant is to include new HD concentrator which concentrate heavy black liquor from 78 wt % DS to 85 wt % DS. The capacity of the new Recovery Boiler plant is 1,330 DS T/D without ash. The new HD concentrator is stand-alone evaporation unit which is completely separated from the existing Evaporation Plant. The new recovery boiler includes vertical air system, emulsion type liquor burner, and flue gas cooler etc. And also the composite tube is adopted at lower furnace for measures against corrosion.

The commercial operation of the power plant with black liquor was started from July 3, 2020. At the beginning of commercial operation, tuning of combustion was not enough. NO_x in the flue gas was relatively high, and char-bet formation was not stabilized. But the boiler operation had been tuning to stabilize the boiler combustion to keep the contract power generation to the grid constantly. As the result, operation was stabilized from September 2020.

The new power plant with RB has been operated commercially for 8 months, and we have been concentrated to stabilize the operation. Our next targets; further improvement of smelt reduction ratio, increase of steam generation efficiency (boiler generated steam /black liquor dry solid), lower the water consumption, and 2 years continuous operation without SD etc...

Energy saving by reducing refiner operation time

Masahiko Ueyama
Saga Mill,Oji Materia Co.,Ltd.

Saga Mill, Oji Materia Co., Ltd. has three paper machines, Machine 1, Machine 4 and Machine 5. Almost 99% of product materials are used paper, so we are playing a part of Oji Materia as a resource recycling mill which is producing containerboards and special paperboards. Recently, the guidelines for paper dust has become stricter and we have been forced to deal with it. Under these circumstances, we have operated refiner which is used to adjust freenes in usual to make paper dust in materials finely divided. However, refiner consumes a large amount of energy such as 300kW and power consumption unit per 1 ton of the pulp has increased. Therefore, we have discussed how to reduce paper dust without operating refiner.

In this paper, we will introduce about energy saveing by revising the screen equipment in used paper pulp-treatment process.

Example of drive load reduction by forming fabric

Kei Furutaka
Technical Dept. PMC • EF In-House Company Nippon Filcon Co.,Ltd

A forming fabric is an integral component in the forming section of a paper machine. It has 3 functions: ① dewatering; ② formation; and ③ carry. The emphasis is on formation which directly affects paper quality. Paper grades can differ widely in weight from low to high gsm. Forming fabric performance must also meet requirements for dewatering and carry, which influence production grades.

The paper industry constantly seeks high-quality paper and increased productivity. Modern paper machines have been developed to accommodate much greater widths and run at higher speeds. Following demands of paper makers, forming fabrics have been developed to keep up with changing trends in paper manufacturing.

The world shares the common goal of developing a more balanced society with respect to economy and the environment, which is exemplified by the Paris Agreement to reduce greenhouse gas emission and Sustainable Development Goals (SDGs). The Energy Conservation Law in Japan is composed of standards that guide industry and society to supply energy with lower carbon emission along with energy savings.

Power generation in Japan is still partially dependent on burning fossil fuels, which emits significant CO₂. We need to move to power generation sources which emit less CO₂. Many paper mills have privately-owned electrical power facility because the paper industry consumes a great amount of electricity. Cogeneration systems have been developed utilizing medium and low pressure steam. By investing in fuel source change and energy saving, the Japanese paper industry's privately-owned power facilities emit less CO₂.

Forming fabrics have already successfully reduced drive load. The Forming unit of a paper machine can consume up to a hundred million Japanese yen per month in electricity costs. Drive load reduction can have a positive impact on energy savings. In the past, forming fabrics designs achieved reduced drive load at the expense of fabric lifetime. Now, the latest fabric designs are able to reduce drive load without sacrificing fabric lifetime. This is a significant breakthrough in forming fabric technology and performance. Here we describe actual results of drive load reduction achieved by our new and improved forming fabric.

Operational Experiences of Ecopump turbo blower

Akio Kato
Yashio Mill, Rengo Co.,Ltd.

In recent years, the importance of corporate activities for the environment has been demanded, and our company has set a medium-term target of reducing CO₂ emissions to 26% below FY2013 levels by FY2030, with environmental efforts as the most important issue. To achieve this goal, the Yashio Mill has been actively introducing energy-saving equipment. However, regarding the vacuum system, the existing equipment had been using, and energy saving was not achieved at all. The eco-pump turbo is easy to adjust the vacuum, and there is a possibility that the power used in the vacuum system can be significantly reduced. This paper reports on the outline, operation experience, and energy saving effect of the eco-pump turbo that started operation in January 2020.

Activities for Reduction of Bleaching Chemicals in Sendai Mill

Mitsuhiro Takata
Sendai Mill, Chuetsu Pulp & Paper Co.,Ltd.

The pulp & paper industry has been facing a challenging situation of lower demand and pricing due to declining domestic population and shift from paper to digital media. This has forced every paper industry to look at opportunities of reducing their costs. Since pulp is the single largest cost in paper making, pulp mills have been forced to reduce their costs in turn. The kraft pulp production lines at Sendai mill of Chuetsu Pulp & Paper Industries has two lines – a continuous digester line (LBKP) and a batch digester line (NUKP, NBKP). The bleach plant with 3-stage bleaching (D₀-EP-D₁) was suffering from high bleaching chemical costs in addition to high brightness variability.

The two key factors responsible for these high costs were [1] The bleach plant does not have an Acid Stage (A-Stage) due to which uncontrolled and high carryover of hexenuronic acid (hereinafter called HexA) entered into the bleaching which in turn consumes higher Chlorine Dioxide (ClO₂). [2] The bleach plant was overdosing bleaching chemicals & running higher brightness to remain safe with quality specifications.

To address the above mentioned challenges, Sendai mill installed a chlorine dioxide/peroxymonosulfuric acid combination dosing equipment on D₀-stage in 2018, which has helped significantly. To further fix the challenges associated with manual process control, operator bias, and ability for bleach plant to handle incoming variability, a Model Predictive Control system (MACS) together with bleach load analyzers was implemented across the whole bleaching process in 2019. These projects have resulted into significant reduction in bleaching chemical costs and final brightness variability. This paper reports on details of these activities and obtained results.

Hachinohe Mill Air Compressor Energy Saving Initiatives

Shoichi Ogata
Mitsubishi Paper Engineering

In recent years, the importance of corporate activities with respect to the environment has been required, and the Mitsubishi Paper Mills Group is working to reduce total energy and fossil fuel energy consumption, making environmental efforts as an important issue. The power consumption of the compressor is said to account for a large percentage of the total power consumption at the manufacturing plant. In case of Hachinohe Mill, five compressors were constantly operating regardless of fluctuations in demand, so we needed to adjust the air pressure according to demand. Therefore, we decided to introduce the compressor number control system in order to reduce power consumption. In this paper, we report the energy-saving efforts and their effects by this control system.

High Concentration Evaporators and HERB Recovery Boiler-Energy Creation by High Concentration Evaporators **-State-of-the-art Recovery Process Technology by Andritz-**

Masato Tsuchitana
Andritz K.K.

The modern kraft pulp mill is integrating fibroline processes, recovery processes. By upgrading or integrating a HD-unit into Recovery boiler can create more green energy and more efficiently from the black liquor. Andritz has the state of art for the integrating the mill process to produce more green energy from the HD-unit and Recovery boiler as the integrated one unit.

An Essay on Methodology for Innovating “JAPAN TAPPI JOURNAL” **Part 12: Bidirectionality of Information required for Qualitative Enhancement and Vitalization of The Journal**

Fumihiko Onabe
Professor Emeritus, The University of Tokyo (Paper Science)

The relationship between the editor and readers is significant issue for innovation of journals. To keep symmetry of information in the journal will be attained by introducing bidirectionality in editing process.

The twelfth article of this series is intended to analyze the significance of bidirectionality of information and existence of critical spirits in the journal. The overall contents are described as below.

1. Introduction
2. Bidirectionality in communication
3. Bidirectionality and critical spirits
4. Critical spirits indispensable in the age of crisis
5. A paradigm shift in the Japanese paper industry and the necessity of critical spirits
6. A method for introducing bidirectionality in the Journal
7. Editorial engineering aiming for systematization of editing techniques
8. Epilogue

Revolutions in the history of civilization induced by paper **Part 5: Parchment and vellum that succeeded papyrus**

Kiyooki Iida

Parchment and vellum were used more than 2000 years as writing media, are made of untanned skin of animals such as sheep, calf and goat. Vellum is the finest one made from young animals,

Animal skin had a long history of writing media. Then, in the 3rd century B.C., Egypt banned on the export of papyrus, main writing media at that time, to Pergamon. To cope with it, Pergamon developed mass production of parchment. The most laborious work in manufacturing is scraping skin, which is comparative to beating in paper and papyrus productions.

Compared to papyrus, parchment is thin, strong and written on both sides of a sheet, and can be formed to codex, though unstable to humidity change,

Parchment codices steadily substituted papyrus scrolls in Roman society. In medieval Europe, though paper spread in the region by way of Islam, variable books were still of parchment. Then, the Reformation turned Europe to society of paper.

Preparation of raw materials for cellulose-nanofiber blending water-based paints - Application of soda-anthraquinone cooking and peracetic acid bleaching -

Forest Research and Management Organization
Kengo Magara, Eiji Togawa, Satoshi Kubo and Tomoko Shimokawa

We have studied selected applications of cellulose nanofibers (CNFs) prepared via the wet fibrillation of pulp treated with cellulase in a bead mill. We observed that the weatherability of water-based wood paint can be improved when using CNFs as an additive in the undercoat paint (sealer). For the application, however, the low dispersibility of CNFs obtained from commercially available papermaking pulp caused a major problem while adding the CNF to the sealer. From a preliminary study, we established that a uniform blend comprising the CNFs and sealer needs low-viscosity CNFs prepared from a low-viscosity pulp. In this study, we used the soda-anthraquinone (AQ) cooking method to prepare a low-viscosity pulp for reducing the viscosity of the CNFs. The soda-AQ cooking and the following multistage bleaching with oxygen, peracetic acid, and alkaline hydrogen peroxide decreased the viscosity of the pulp to about 3 mPa·s, while brightness ranged from 73% to 81% ISO. Furthermore, the simplified process of single-stage bleaching with peracetic acid after soda-AQ cooking also resulted in a low-viscosity pulp (viscosity of 3.7 mPa·s) with a brightness of 73% ISO. From this result, we concluded that the process is appropriate for small-scale operations to produce CNFs for the specified small-scale industries with no experience in pulp production.