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Operating Experience of Wood Chip Biomass Power Plant

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In recent years, energy conservation, diversification of energy sources and reduction of greenhouse gases are required for companies. Rengo Co., Ltd has dealt with these issues with a goal of 32% reduction in CO2 emissions from the 1990 level by 2020, which is called Eco Challenge 020. Saitama introduced a system in 2010 which encourage the plants using energy more than 1500kl in a crude oil equivalent in a year to reduce CO2 emissions 13% from the base year in 5 years (2015-2019).

Yashio Mill installed the wood chip biomass power plant in Jan of 2016 to achieve the goals. This report shows the performance of the new plant and approach to the three troubles as the operating experience.

Fuel Gas Production from Organic Wastewater by Hydrothermal Gasification Treatment Using Catalyst

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The new technology that can utilize the potential energy contained in organic wastewater is required in the terms of the prevention of global warming.
The hydrothermal gasification process for the wastewater containing organic matter in high concentration was developed and commercialized by Osaka Gas. In the hydrothermal gasification process, the organic matter contained in wastewater is decomposed at high speed and converted into the gas such as methane that can be utilized as fuel in the catalytic reactor under the condition of sub-critical water. The application of the hydrothermal gasification process to the wastewater conventionally treated by incineration because biological treatment cannot be applied enables the energy recovery, CO_2 emission reduction and treatment cost reduction.

The catalyst possessing high gasification activity in sub-critical water was developed. The process was developed by the laboratory scale and bench scale test. The decomposition characteristic of the typical organic matter contained in wastewater and the treating condition of the simulated or actual wastewater was clarified by the test.

The pilot plant was designed and installed in an actual factory. The performance of the hydrothermal gasification process was verified by the operation of the pilot plant for about 8,000 hours. The organic matter concentration of the treated water was maintained in low level and the generated gas composition was enough stable to be used for boiler fuel. The pilot plant has being in operation as the actual treatment plant for the factory after the demonstration test. The accumulated operation time of the plant is now more than 30,000 hours.

Efforts to improving the efficiency by changing the gas turbine operating method

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The gas turbine power generation equipment at the Kanto Mill Hokuetsu Kishu Paper Co., Ltd. has needed to improve its profitability to address the changes in the external environment. We examined optimum operating conditions of the gas turbine and have achieved a great efficiency improvement by controlling the input flow of high pressure steam.

In this paper, we further introduce examples of installing the intake air cooling equipment and other cost improvements for lowering the energy consumption toward a temperature rise during summer seasons.

Maximization of Energy Saving by High Efficient Control System with KAWASAKI Absorption Chiller

—Utilization of Waste Heat to produce Chilled Water more efficiently through Environmentally Friendly Product—

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Kawasaki Thermal Engineering Co.,Ltd

We Kawasaki Thermal Engineering(KTE) are the leading manufacturer of Absorption Chiller and Boiler.

Our latest model of Absorption Chiller "Efficio Series" with the highest COP and system efficiency could be operated not only by natural gas but also by several waste heats such as hot water, steam and solar heat.

We hereby introduce our control system to achieve much more energy saving for Absorption Chiller and its auxiliaries including Cooling Tower, Cooling Water Pump and Chilled Water Pump.

Activities for Energy Saving in Oji Materia Co.,Ltd.

Akihiro Yamamori
Oji Materia Co.,Ltd.

Oji Group has continued to work on energy saving activities for sustainable production. As for Oji Materia Co.,Ltd., we have been targeting over 1.5% reduction per year in total energy consumption since 2002 and achieving good results every year.

Whereas, those activities were approaches separately in each mill, so which was stagnant in some mills in the face of shortage of new items and manpower.

To solve the problems, we organized a Headquarter-centered project team with the cooperation of the engineering consulting firm. And we set objectives to move forward energy saving activities and develop human resources. By these company-wide actions, we have achieved great results.

This paper introduces the above approaches.

Energy Saving by Introducing Circulating Liquid of FGD/Water Heat Exchanger on Boiler

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Nippon Paper Group was formulated Green Action Plan, that is the plan of action for environment. In Green Action Plan 2015, we formulated to reduce carbon dioxide emissions from fossil energy and the use of fossil energy. It was achieved and we formulate new target, Green Action Plan 2020, to reduce greenhouse gas emissions.

In Ishinomaki Mill, we adopt circulating heat exchanger on #1 Biomass Boiler. This is liquid of FGD (Flue Gas Desulfurization)/water heat exchanger. This heats boiler feed-water and it is energy saving by reducing the use of steam on deaerator. We installed plate heat exchanger on another boiler. This was also liquid of FGD/water heat exchanger, but it often got clogged heat exchanger for liquid of FGD and ash. So we decided to adopt spiral heat exchanger because it is strong to slurry solution like liquid of FGD. In addition, we selected the biggest heat transfer area for Kurose to be able to build it. As a result, it works well on energy saving and keeps inside clean.

From Energy-consuming Mill to Energy-creating Mill

Daisuke Nagamine、Ryo Yoshida and Chiaki Kawakami
Andritz K.K.

COP21 adopted the Paris Agreement in December 2015 that emphasizes the urgent needs to reduce greenhouse gas emission to control the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre- industrial levels.

Japan is committed to reduce by the year 2030 CO2 gas emissions by 26% compared with the level of 2013.

Kraft pulp production mill system is an ideal process since it processes biomass not only to produce pulp stock but at the same time to generate energy, that is more than required for the pulping processes.

The kraft pulp mill is consisting of various fiberline processes, recovery processes and various sub-systems as well as auxiliary equipment.

By upgrading and integrating the mill processes and through optimization, it will be possible to create more green energy and more efficiently from the biomass that contributes to the reduction of greenhouse gases and pulp mill economy.

Operating Experience of Advanced Process Control (APC)
on the Kraft Pulp Bleaching Process

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At Akita mill, fuel cost reduction in the kiln process has been achieved by use of oil cokes that started in 2013, there is more room for the energy saving because the operation of the kiln still depends on the experience of the operator. Also in the bleaching process, there is room for chemical saving because the process is always operated conservatively to keep the final brightness in the upper part of target range. For the above reasons, we introduced process optimization system to both the kiln and bleaching process in expectations of steady operation and cost reduction. Now, we are working on an early realization of the process improvement.

In this report, the management after the introduction of the system and the operation after the modification of bleaching process are explained. Although this system has many installation records overseas, it is first installation in Japan.

Development of New Retention Aid and Paper Quality Evaluation

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Recently the waste paper is noticed a reduction in quality, as strong demand for export of high quality waste paper, and slowdown in domestic paper spending. Furthermore, the basis weight of paper has been become lighter and ash content in paper has been become higher, in an effort to cut cost. Therefore, it is the issue that the lower retention rate, caused by variation of such papermaking surroundings, should be solved.

In order to develop new retention aid, which will solve the issue above mentioned, we focused on the distribution in existing polymer. In this section, we report the concept of new technology 'Selection: control of polymer distribution' and high-performance retention aid developed by this new technology.

In general, polymers have certain distribution in the molecular weight, the structure, and the electric charge. We established 'Selection-technology' which enable us to select active components for retention and to remove disadvantageous components for paper quality, from the distribution of polymers.

By this technology, we succeeded to develop the new retention aid that have high abilities of both macromolecule bridging and charge neutralization, which were the main mechanism of flocculation of fibers and fillers. Because the new retention aid is superior in the flocculation of fiber and ash, it showed not only high retention but also improvement of paper quality, for different properties on fiber length and amount of ash.

These results supported that the new retention aid exerted a beneficial impact on the best performance under the changing of papermaking surroundings.

A Solution to optimize operation at a pulp plant

— Operational improvement with IIoT(Industrial Internet of Things) —

Akira Endo

Yokogawa Solution Service Corporation

Smart devices and cloud computing services have spread in our society at a rapid rate. Known as the “Industrial Internet” sponsored by companies based in the United States, and the “Industry 4.0” project led by the German government, the Internet of Things (IoT) has been well discussed in this current trend. The term, the Industrial IoT (IIoT), is often preferred in especially, manufacturing industries. Yokogawa also has proposed making the most of big data for operations analysis of customer plants, to give feedback to customers, and to help them improve their process control. However, every manufacturing plant has its own challenges to tackle. In order to seek operational improvement, it is essential to fully understand how the plant works and to clarify the key issues. In this session, I will explain our concept of IIoT and several solutions for optimized operation aiming at problem solving in the pulp and paper industry.

The History of Technological Developments of the Paper Industry in Japan after World War Ⅱ

Part 3：Hardwood as a New Pulp Resource

Kiyoaki Iida

Until the 1950s, pulp was manufactured from softwood. As Japan did not have enough softwood, it was necessary to use hardwood as an alternative.

Then, USA, which was the largest paper manufacturer but scarce in good softwood resource, studied on using hardwood and developed SCP and CGP processes. Japan suffering from softwood shortage quickly adopted them and blended CGP up to 30% in its newsprint furnish. The key technology was the refiner of high power that was developed in Sweden and USA.

The effort continued and one paper company manufactured printing paper of high grade from hardwood bleached kraft pulp (LBKP). As its quality proved to be fine and the demand for that type of paper increased quickly, many paper companies in Japan started to produce that kind of paper. With technological advances that followed such as introducing chlorine dioxide for bleaching, perfecting continuous digester, and surface sizing for vessel troubles, fine grade printing paper of LBKP, invented in Japan, has become a world standard.

Japan, however, could not keep up against increasing paper demand with its domestic wood supply, and started to import wood chips overseas by chip carriers. It greatly changed the structure of the industry which will be discussed in the coming issue.

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Paper and Ink technology applied for high-speed inkjet production printing

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A High-speed inkjet production printer which prints aqueous inks onto continuous feed-roll paper has been growing by enabling digital printing such as on-demand and variable outputs. For example, direct-mail, transaction and trans-promotion with small lots, personalized addressing and contents are provided with low cost paper and ink performing medium color printing quality.

Permeable papers with inks are used in these printing outputs reflecting inkjet principles, however, printing companies expect to print on offset coated paper for commercial printing as a natural requirement because it reduces costs remarkably. The penetration into the coated paper were observed which required more than one second, although the penetration was completed in several tens of milliseconds on the plain paper, and then the fixing and the drying of the inks were the issues in printing systems. To manage these issues, a resin in the ink is utilized to fix colorants, and moisturizing agents are eliminated from the ink which was conventionally applied in traditional inkjets to maintain the dehydration performance.

As a result, monochrome ink having above improvements enabled personal addressing onto pre-printed coated paper and enhanced the concealed postcards in the folded form for example. Furthermore, for the color inks, when image density is high about more than 200 %, the system for pre-coating layer on the paper is introduced to coagulate ink colorants to avoid mixing and migrating of the printed dots. In the nearest future, ink is expected to print on coated paper and nonpermeable film materials with the system assistance, or the inkjet paper is expected to alternate coated paper in both price and quality.

Inkjet makers introduced 1200 dpi printers on drupa 2016 where the print quality has been improved although it was single pass printing, and also presented the fixing technology onto nonpermeable media. Although inkjet technology is supposed to stagnate around the beginning of the 21st century, inkjet is expected to innovate by facing the challenges in production printing market.

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Dependence of Enzymatic Saccharification on Residual Lignin Structure in Sugarcane Bagasse Pretreated with Alkaline Sulfite

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Effects of residual-lignin structure—expressed as the syringaldehyde to vanillin (S/V) ratio—on the enzymatic saccharification rate was studied as a key step of bio-ethanol production. Alkaline sulfite-anthraquinone (AS-AQ) and soda-AQ cooking methods were applied to delignification of sugarcane bagasse (SB) and oil palm trunk (OPT), and the resulting pulp samples were subjected to enzymatic saccharification. The S/V ratios of residual lignin in the pulp were determined by the nitrobenzene oxidation method. This study showed that the AS-AQ method is more suitable for delignification of SB than the soda-AQ method is. SB pulp released more glucose than OPT pulp did under the same conditions of cooking and saccharification. A decrease in the kappa number (residual lignin content) significantly increased the saccharification rate. In a comparison of AS-AQ pulp samples at the same kappa number (20), the SB pulp with a lower S/V ratio (0.68) yielded a higher saccharification rate (0.0327), whereas the OPT pulp (S/V ratio: 2.56) yielded a lower saccharification rate (0.0252). In a comparison of SB and OPT, we found that syringyl-rich lignin kept in pulp results in a lower saccharification rate of the pulp samples prepared by the AS-AQ cooking method.