JAPAN TAPPI JOURNAL
7
July 2023
Vol. 77, No. 7

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Topics & Information

2023 July JAPAN TAPPI JOURNAL
Vol.77, No.7 Abstracts

Case Study of Energy Saving at PM6 after Conversion

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PM6 of Niigata Mill, started operation in 1986 as the first on-line coater machine in Japan, finished its role and it was shut down in 2019 in order to restructure production capacity of coated printing paper. After conversion, PM6 restarted commercial operation in March 2020 as the first corrugating medium paper machine in Niigata Prefecture.

This conversion is a rebuilt from an on-line coater machine to a corrugating medium paper machine for corrugated board, and since the suitability of the production line different due to a difference in product properties, efficient utilization of equipment is an issue. In particular, there is a lot of room for improvement in terms of energy efficiency, and several improvements have been planned for the purpose of energy saving after conversion. In this article, bypassing of the double disc refiner and drive load reduction at wire section are reported.

Energy saving by updating the instrument air supply system

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In Kushiro Mill, instrument air was supplied from three compressors via two dehumidifiers.

Production of the main aircraft, the #8 turbo compressor, was discontinued in 2003 and parts supply was discontinued at the end of March 2014, and spare parts arranged before the discontinuation of parts supply were used and depleted due to subsequent repairs, making it difficult to maintain the equipment.

In addition, consumption rate of instrument air in our mill was inferior to other mills in our company, and we started activities to improve it from 2018. After we determined the amount of instrument air supply required for our mill, we updated the instrument air supply system in 2021 in conjunction with the renewal of aging equipment.

Steam System Optimization and Case Studies in the Paper Industry for Carbon Neutrality

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Steam System Optimization Program (SSOP®) is a sustainable asset management program that continuously optimizes the performance of the entire steam system through visualization. SSOP® consists of optimizing all condensate discharge locations (Best Practice of Steam Trap Management, BPSTM®) and optimizing all steam applications and the entire steam system (CES® Survey).

CES® Survey identifies the potential from reducing the overall plant energy consumption, analyzes the balance between steam and electricity using Steam System Balance Simulator which is developed by TLV, proposes the potential improvement for each opportunity, and identifies risks in the steam system. Optimization through the CES® Survey progresses in the following four steps. 1st: consultation and on-site survey, 2nd: identifying and tailoring the potential solutions, 3rd: engineering and design, 4th: confirmation of the improvement effect. This survey puts importance on the investment profitability of each opportunity. On average, 69% of the opportunities proposed have a payback period of less than two years.

5 example proposals made for paper industry plants are shown in this paper. The first example is the reduction of vented steam from the deaerator. The vent valve is sometimes not adjusted according to the steam production rate. If the vented steam flow is larger than the appropriate amount, adjusting the valve can reduce energy loss without requiring any investment costs.

The second example is for flash steam recovery from a boiler blow-down. Boilers in the paper industry generate a lot of high pressure steam. This means that there is a huge heat loss if blow-down water is not utilized. In this example, the solution was a flash vessel to recover flash steam from blow-down water as low pressure steam.

The third example is for flash steam recovery from a digester which uses a lot of high pressure steam. The steam condensate is usually recovered to the boiler, however flash steam is not utilized. In this example, flash steam is recovered to heat water using a heat exchanger that is open to the atmosphere. Using this specific heat exchanger, no additional back pressure is exerted on the digester. This is an important point when designing heat recovery systems.

The fourth example optimizes heat recovery in the drainage system of a paper machine. There are significant heat losses in the condenser due to the flash steam amount exceeding the demand. This example proposes using an ejector to recover additional flash steam and reduce heat loss to the cooling water.

The last example is the self-circulating system for a Yankee dryer. A Yankee dryer is one of the steam applications where condensate can be difficult to be discharged. The user had opened the bypass valve of the steam trap to discharge condensate, resulting in steam losses. In this example, the introduction of the self-circulating system has allowed the user to keep the bypass valve closed during production.

Company-wide steam traps upgrade for energy saving

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This report explains that we implement the system that periodically upgrades the failure steam traps to new optimized ones during maintenance as per mill. The system works to maintain discharging condensate under optimal conditions for our mills. Throughout the year, the system also contributes steam saving at a maximum although the energy loss of one steam trap have an insignificant impact because our mills have hundreds of steam traps.

Energy-saving and CO_2 reduction by means of fuel conversion and other measures

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Measures for addressing the climate change have been attracting increasing attention in a global manner, Japanese government has declared to realize "Carbon Neutrality by 2050". In addition, a new policy was announced to set a new greenhouse gas reduction target for FY2030, aiming to reduce greenhouse gas emissions by forty six percent from FY2013 levels while continuing strong efforts in its challenge to meet the aggressive goal of cutting its emission by fifty percent. Since our company routinely emits greenhouse gas, it considers it is one of the most significant issues and is implementing countermeasures to fulfill our social responsibility.

This paper describes some facilities for energy-saving and CO_2 reduction by means of fuel conversion and other methods at Komatsushima plant, LINTEC Corporation.

Energy savings through the renewal of the gas turbine cogeneration system

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Otsu Paperboard Co., Ltd., located on the shores of Lake Biwa in Otsu City, southern Shiga Prefecture, has placed the highest priority on efforts for environmental protection and has been manufacturing and selling environmentally friendly paperboard (base paper for corrugated cardboard) since commencing operation in 1955. In January 2004, the company switched its fuel from heavy fuel oil C to city gas and started to operate a GTCC system (gas turbine combined cycle, total power output 12,910 kW), where the gas turbine cogeneration was newly incorporated into the existing BTG system (power generation boiler and steam turbine). However, as a result of the significant reduction of electricity and steam consumption on premises due to continuous energy saving activities, overall energy efficiency decreased and the aging GTCC system needed renewal. Against this backdrop, we achieved 4.2% energy savings and 6.0% reduction in CO_2 emissions by upgrading the facilities to the optimal system suited for the current situation. This paper will discuss how we upgraded our facilities and show some examples of energy savings and CO_2 reduction.

Energy saving and work environment improvement by heat shield material "Top Heat Barrier"

Teruyuki Fukushima
NIHONSHANETSU

Heat shielding materials can be used in all kinds of industries and construction sites (roofs, walls, floors, equipment, cars, pets, tanks, tents, refrigeration, freezers, helmets), which are energy-saving materials with infinite possibilities. Although there are ups and downs depending on the surrounding environment and conditions, energy savings of about 30% can be expected.

Development of Ammonia combustion technology development for coal fired power station

Shinji Masaki
IHI Corporation

Toward zero carbon dioxide emissions by 2050, IHI aims to realize a decarbonized recycling-oriented society and a comfortable, secure, autonomous and distributed community. On the other hand, for ammonia, we are working to build an ammonia supply chain by participating not only in the ammonia utilization technology introduced this time, but also in the production side business.

Low-carbon and Decarbonization Approaches for Thermal energy
-Importance of decarbonizing across the continuum from low-carbon measures in the transition period-

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The wave of carbon neutrality that originated in Europe has been rapidly expanding on a global scale since 2019, and the realization of a carbon neutral society by 2050 is a common challenge for all humankind. In Japan, after the declaration of carbon neutrality in November 2020, companies are rapidly striving to become carbon neutral.

While the use of renewable energy sources is expanding to green electricity, heat demand accounts for 60% of Japan's energy consumption in the consumer and industrial sectors, so decarbonizing heat energy will be a key issue for achieving carbon neutrality in 2050. The key to decarbonizing thermal energy is "green hydrogen. In order to implement and expand the use of green hydrogen in society, it is essential to balance it with economic efficiency, and we believe that the use of "e-methane" is an effective way to achieve this.

The following is the latest status of various activities aimed at realizing the decarbonization of thermal energy through the large-scale social implementation of "e-methane".

Performance Improvement for an ESP, by Replacing T/R sets, Internal Parts and/or by Upgrading to SIR® (Switching Integrated Rectifier)

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Electrostatic Precipitators (ESPs) for Soda Recovery Boilers often experience difficult process and aged parts conditions from their years of service, resulting in high dust emissions. Depending on the root cause, ESP performance can be improved by upgrading the mechanical and electrical ESP equipment. This paper will discuss various solutions to improve aged ESP performance;
- ESP Internal parts
- T/R set and EPIC controller
- SIR® (Switching Integrated Rectifier)

Implementing the process optimization control system (advanced Model Predictive Control) for the recovery boiler

Mitsuhiko Chiura
MPM OPERATION Co., Ltd.

Power generation facilities at Hachinohe plant of Mitsubishi Paper Mills Limited consist of a coal-fired boiler, a waste boiler, black liquor recovery boilers and steam turbines. These facilities are being operated to supply energy to manufacturing processes both the steam and power demands fully while using many fuel sources such as heavy oil, coal, black liquor and waste efficiently.

Recently, we introduce the implementing the process optimization control system(advanced Model Predictive Control) for the recovery boiler. The system has solved some operating problems and reduced power generation costs.

Let's Go Further than Visualization of Product CO_2.
-Introduction of Efforts to Reduce CO_2 Emissions-

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This paper describes the global situation toward achieving carbon neutrality and its impact on Japan, and introduces the importance of working to reduce CO_2 emissions.

YOKOGAWA's efforts, including case studies, will be proposed to address the issue of the lack of utilization of "visualization" systems that have been introduced.

The Improvement of work efficiency in containerboard warehouse by using DX and automatic devices

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The Rengo Yodogawa Logistics Center, which started operation in September 2021, introduced a truck management system and picking application developed in-house, the Japan's first laser-guided automatic clamp lift, and an RFID system.

The truck management system is effective for sharing information and improving work efficiency for logistics personnel, and the picking application is effective for pre-loading at the Yodogawa Distribution Center. The average staying time of trucks at the Yodogawa Distribution Center is less than 30 minutes, which greatly contributes to reducing the waiting time of truck drivers.

The RFID system enables automatic reading at the time of warehousing in the automated warehouse and at the time of shipping from the Logistics Center, and the latter leads to a reduction in the incidental work of the truck drivers and safety measures. RFID initiatives will be used in downstream corrugated cardboard factories in the future, and have already contributed to the reduction of receiving time using one factory as a model, and it is expected that they will be expanded to other factories and the entry of other companies.