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Advanced IT to support production
—Advanced data Analysis, Applying IoT—

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We adopted the online system that runs 24 hours 365 days in 1968 ahead of other industries in Japan. The system made production high efficiency. Since then, we have been adopted supply chain management systems and production management systems at our company depending on the advancement of the computer. We have worked on improving the efficiency of manufacturing and sales.

In the 2010s, because ability of the computer also dramatically increases, computer can process a large amount of data, and gather large amounts of data from mobile units at low cost, which was difficult in the past. So, Machine-Learning called one of the big data analysis, and third generation artificial intelligence entered the practical stage.

In this paper, we introduce examples of application of these advanced IT in our company.

Remote Monitoring and Diagnosis Technology of Kawasaki Heavy Industries, "Techno Net"

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Kawasaki Heavy Industries provides a variety of products including trains, motorcycles, ships, aircraft parts, helicopters, industrial robots, hydraulic equipment and power plant. As one of these products, we have gas turbine co-generation power plant that is equipped with various control instrumentation systems. In this paper, we will introduce the remote control and monitoring technology that we take an active interest in. We call this system "Techno Net".

Online anomaly prediction detection system by AI which became practical stage and its example

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Over the past few years, the idea of revolutionizing various activities in the world by using state-of-the-art ICT such as IoT, BigData, AI is becoming a big trend. This trend also spreads to various industries, and the value creation in each area of QCDES (quality, cost, distribution, environment, safety) has started.

We introduce the outline of " online anomaly prediction detection system " which is becoming the beginning of utilization of AI in industry.

Proposal to Make Full Use of Web Inspection System by IoT Technology

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Manufacturers are seeking high-value-added monozukuri, high quality, and stable production. They are also demanded of effort for global competition and new technology evolution.

The new technology evolution as IoT, robotics, AI, etc. started in current environment for manufacturers. We can see these movements in Industrie 4.0 in Germany or Industrial Internet Consortium in the USA.

Manufacturers involved in big changes to handle diversified requirements by small-volume production, to pursue the sophistication of monozukuri by factory management evolution using huge amount data, to have stability global production framework by multipolarized production bases, to have automated production caused by a shortage of skilled person or rising labor costs.

Therefore utilization of latest technology is more important to correspond to monozukuri evolution and to meet market needs changes. In this report, we will introduce Omron i-Automation concept and application in sheet inspection system.

Operation optimization of pulp manufacturing

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With the development of IIoT (Industrial IoT) technology in recent years, Yokogawa Solution Service Corporation began to develop services that utilize this technology for plant operations at paper mills and provide advanced operation support. In order to

prevent obsolete model of model predictive control due to aged deterioration which was difficult in the past, utilizing the co-creation space based on the Internet and utilizing the method of tuning the model from plant data in a short time, quality stability by optimum control and we realized "optimal operation support service" that can maintain cost reduction effect.

In this paper, we describe its modeling technology, tuning method using IIoT, and the result share contract to maintain its cycle. In the future, we will promote the overall optimization of the paper mill including optimization of other processes, and further consider adapting to other industries, so it will be popularized as a case at the manufacturing plant through the use of IIoT we are aiming to go.

Case Study of Latest Type Near Infrared Color Defect Detector

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The defect detection device of Marubishi Paper Tech Co., Ltd. was updated to Omron's latest type Near Infrared Color Defect Detector.

Since the conventional defect inspection device was a combined reflection and transmission method, it was necessary to adjust the balance between the amount of reflected light and the amount of transmitted light for each product type.

Therefore, by adopting the color reflection / NIR transmission independent system, there is no interference of light, adjustment of light quantity becomes easy, and highly accurate inspection can be performed stably.

This makes it possible to detect minute foreign substances, etc., and is useful for improving the quality of products.

Energy saving by introducing energy management system (EMS)

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Pulp and paper is the industry which consumes significant amount of energy, ranks with iron and steel, chemical, cement and oil refining. Shimada mill of Shin Tokai Paper Co., Ltd. purchases electrical power beside self-generation to satisfy the large electrical demand in production.

Therefore, energy efficiency improvement has been one important agenda aims reducing environmental burden and production cost reduction. Based on this background, in a project of biomass boiler construction, we have introduced Energy Management System (hereafter EMS) of Azbil Corporation for existing utility plant (boilers and turbines).

Multi-variables, model-predictive control SORTiA-MPC of the EMS executes optimization control for the utility plant, and operation with maximized power generation has been accomplished while input energy is same and operation constraints such as steam and power demands are satisfied. This report introduces the EMS which realized the energy efficiency improvement and operation cost reduction.

Real-Time performance monitoring
―Need for Powerfull Analytics Tool Enables Smart Operations and Cyber Security―

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Modern process control systems are designed and instrumented with the goal to control the process, but do not necessarily give all the information required to efficiently and effectively run the process, equipment and business from a performance and reliability standpoint. With an accurate measurement of process performance continuously compared with a proven benchmark, personnel can better operate their plants and ensure production has been fully optimized. Industrial facilities also need timely notifications to take the right proactive actions, which minimize degradation, poor performance and secondary damage to equipment to ensure lower costs, increased throughput and higher profits.

"Industrial" cyber-attacks against industrial facilities such as electricity, gas, pulp and paper, oil, chemical products as well are on the rise. Recently, as the Industrial Internet of Things (IIoT) has been focused on control system's cyber security countermeasures and strengthening of the defensive power have also been taken as urgent problems.

This paper explains the necessity of the powerful analytics tool for industrial operations and industrial" cyber security of the control systems.

Advancing the intelligent factory with AI and IoT

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The environment surrounding the manufacturing industry, including Industry 4.0, is constantly evolving. In order to realize further improvement and efficiency, new technology such as AI and IoT has been drawing attention.However, how to utilize AI and IoT is an issue at the manufacturing site. This time, I will introduce the latest case studies on smart manufacturing.

IoX solution to evolve manufacturing
—Introduction of Safety monitoring for factory workers and Predictive & preventive maintenance solutions—

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In this paper I introduce the IoX solution which is the concept of NS Solutions. The IoX solution aims to provide solutions to both Internet of Things (IoT) and Internet of Humans (IoH).
In the IoH solution, Safety monitoring system for factory workers, and the IoH solution, predictive & preventive maintenance solutions. Both systems are cases our customers use it as a production system.

The History of Paperboard
Part 2: The Birth of Paperboard

Kiyoaki Iida

After the industrial revolution, countries such as the UK and the USA increased their productivity at a high rate per year which was 3-4 times as much as that in the precedent era, extended rail way networks and expanded mobile area of goods, and accomplished the social paradigm shift. In the 20th century, the USA created the society of mass production and consumption, for which marketing and .distribution of goods were essential. The paper industry helped to develop carton boxes and wrapping paper for the former and corrugated containers for the latter.

As the market of carton boxes grew in the 1800s, the paperboard made of straw pulp and sheeted with cylinder machines was developed and continued to be produced in the 1900s. Newly invented carton converters, fancy image printing by lithography and modernized railway networks further enlarged the market. The volume of publications by printing also grew year by year and old printed paper was reclaimed as a new source of recycling. Then, in about 1920, the urban paper mills appeared and became popular, making paperboard with multi-vat cylinder machines, using reclaimed old printed paper.

Corrugated containers began to be used in replacement to wooden boxes around 1900. The early liner was made of straw and jute pulp, called jute liner. Then, mills in the US south took over the market by inventing kraft liner, which was less weighty and was made of kraft pulp from pine that was abundant in the south, sheeted with Fourdriner machines with some modifications. Corrugated containers are accepted in

the world, though Japan and Europe make their liner with waste paper as its main resource.

In the next issue, the history of paperboard production in Japan will be reviewed.

Factors affecting the yield of phenolic monomers in an oxygen-soda anthraquinone cooking

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The process of lignin oxidation by oxygen gas or other oxidative catalysts to produce phenolic monomers, such as vanillin, has become important in the development of new methods for producing polymers from renewable resources. It was found that oxygen-soda anthraquinone (AQ) cooking produces a phenolic monomer yield of over 17%, including vanillin, under higher liquid/solid ratios. Higher liquid/solid ratios always achieved a higher yield than under lower ratios. This was thought to be due to the condensation reaction which progresses under low liquid/solid ratios, as there was a higher concentration of eluted lignin in the black liquor compared to high liquid/solid ratios. However, there was no evidence to verify this assumption from the average molecular weight measurements of the black liquor. On the other hand, there was a positive correlation between the phenolic monomer yield and NaOH consumption during cooking. Therefore, NaOH consumption is considered to be important for increasing the phenolic monomer yield in oxygen-soda AQ cooking.