Facility diagnosing by AI technologies

Naouya Wakamatsu
NEC Corporation.

In recent years, achieving safe and stable operation of plants has become a common challenge facing the process industry due to the increasing complexity of aging and highly modified systems as well as the exodus of skilled and experienced workers from the industry upon retirement. Meanwhile, as machine resources and AI technologies grow in sophistication, we are seeing IoT, BigData, and AI being used as a solution to ensuring the safe and stable operation of plants.

NEC utilizes its technologies and engages in initiatives to provide solutions for plant operations. In this paper, we introduce the Plant Failure Predictive Monitoring System as one such solution that focuses on the relationship between the sensors at plants. Through the use of AI to leverage plant data that has been overlooked until now, NEC aims to deliver advanced security at plants to prevent accidents, improve operational efficiency, reduce maintenance costs, and ensure the succession of technology.

We hope our paper will encourage you to consider augmenting the skills of your experienced workforce and your control system-based monitoring with the introduction and application of AI to support the safe and stable operation of your plant.

Introduction and utilization of Artificial Intelligence Technology

Naoki Kawamura and Koichi Suzuki
NTT DATA INTELLILINK Corporation

AI (Artificial Intelligence) has recently become a common word on everywhere. It has been common for several years, but in fact, artificial intelligence has been studied and used for nearly 40 years. However, it was a little different from the speech recognition and image recognition that we can see today. Here, we will give a basic explanation on the technology of artificial intelligence, which is currently called the third boom, and once again organize the technology and give tips on how to use it.

Advanced analytics improve mill performance and reliability

Atsushi Yamamoto
Valmet KK

The Industrial Internet has enabled the unlocking of the value of vast data resources in a modern pulp and paper mill. Combining process and business data from different mill systems, applying advanced analytics and utilizing industry knowhow allows advanced companies to launch new data driven analytical applications. The applications can just visualize the big data, but also incorporate artificial intelligence to predict future outcomes and increase overall level of intelligence. New applications enable assisted decision making by mill operators and create more intelligent setpoints to the automation system.

Analytical applications and remote connections can be also used by suppliers process and machine experts in their remote support centers. Their analyses, discoveries and recommendations are being used to optimize the performance of mill sub-processes and the whole mill. Suppliers and pulp and paper producers collaboratively implement and sustain mill performance and reliability improvement programs based on various analytical applications for assisted decision making, closed loop optimization and knowledge based services. Specific case studies are presented where productivity has been increased, raw material and energy costs lowered, quality optimized and process uptime improved through advanced analytics leveraged both by operators and suppliers in their services.

The future of data analytics will involve common solutions by suppliers in a so-called "digital ecosystem". Concrete steps in building this ecosystem are being taken by combining the resources and solutions of an automation supplier with a supplier of enterprise resource planning and manufacturing execution systems.

Building multivariable predictive control for pulp processes with slow response

Kunihiko Seto
Honeywell Japan Ltd.   Honeywell Connected Plant

Controlling slow response process such as continuous digester and bleaching unit by regulatory control system is difficult. Model predictive control technique is effective for slow process. Applying soft sensor will help to control slow response qualities of these processes. However, processes with large deadtime have further difficulties to control. Deadtime will be varied by feed rate change and make model mismatch. Variable dead time is required but typical variable deadtime function still has some issue. Custom variable deadtime has been used to support this case. Multivariable model predictive control with soft sensor updated by on-line sensor using custom variable deadtime compensation is one of the solutions to control such slow response processes.

Failure prediction function development for "e-Musen Junkai"

Susumu Nozoe
Akita Mill, Nippon Paper Industries Co., LTD.

"e-Musen Junkai" system monitors vibration and temperature of equipment.
The system enables users to spend less time for equipment regular inspection, and to predict equipment failure more easily before break-down. Even though it is effective to monitor by setting a threshold value, failure prediction function has been developed by analyzing correlation of data from two set of sensors installed both drive end and non-drive end of rotating equipment such as motor, fan and pump. The function can capture changes on bearing health conditions. This report introduces the predictive maintenance technology by "e-Musen Junkai".

Instrumentation introduction example after operation of biomass boiler

Takushi Honda
Sendai Mill, Chuetsu Pulp & Paper Co., Ltd.

Sendai Mill, Chuetsu Pulp & Paper Co., Ltd. Sendai Factory has abundant timber resources in South Kyushu and a system that can collect timber cultivated through paper business. The feed-in tariff system for renewable energy (FIT system) started in July 2012. In November 2015, a new biomass fuel power generation facility using this system was established. Two problems occurred after the introduction of the equipment. The first is a decrease in output due to fuel moisture, the second is the output decreased due to the fuel input method. In order to solve these problems, we installed a moisture sensor (MCT460) manufactured by Process Sensors corporation. And Moisture meter instruction was incorporated into ACC (automatic combustion control) control which is boiler control. In addition, a microwave level meter (MWLM) manufactured by Matsushima Measure Tech Co., Ltd. was installed. As a result, the power generation output was stabilized. This paper introduces the background of the introduction of both instruments and the situation after the introduction.

Efficiency improvement by optimizing coal boiler control

Syuuichi Tsukidate
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 satisfy both the steam and power demands fully while using many fuel sources such as heavy oil, coal, black liquor and waste efficiently.
Recently, we introduced new optimum parameters to a system of a conventional controller to operate a coal-fired boiler. The system has solved some operating problems and reduced power generation costs.

Real-Time performance monitoring
-Need for Powerfull Analytics Tool Enables Smart Operations -

Sadao Ueno
Honeywell Japan LTD Honeywell Process Solutions

Demanding performance requirement, aging workforce and data integration to action. Today, process plants across globe face common challenges. 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. This paper explains the mechanics of the powerful analytics tool for industrial operations.

Optimization of operation by monitoring paper machine deposits
-Benefits of SmartPapyrus^{TM}-

Hitomaru Sakata
Fuji Technology Development Center, Technology Development Team, MAINTECH CO., LTD

Maintech innovates and distributes technology of chemicals and spray equipment to avoid deposits on paper machines.95% of domestic paper making mills adopt Dryer Surface Passivation(DSP) as a deposits and paper breaking counter measure, also 673 chemical spray machines 'MistRunner'and'ShowerRunner' are in operation across the world.

In recycled papermaking, as the Deposit levels and profiles on the fabric and rolls often change, it is required to adjust the chemicals and chemical spraying equipment according to the conditions. However, it is dangerous for workers to check the fabric condition inside the dryer hood in a high temperature and humidity environment.

We have been developing the 'SmartPapyrus' system which visualizes and quantifies the deposits of paper machines and optimizes the amount of chemicals depending on the deposit conditions. We have also developed the system 'SmartDepo.' to visualize the Deposit conditions on the fabric in the dryer hood with heat resistant camera, and quantification by image processing.

Also, we have begun applying the 'SmartChemical' system which controls the discharge amount of chemicals, the total management of usage at the office, and the ordering of chemicals automatically subject to the usage of chemicals.

I will talk about its concept and the results in the main context.

Introduction of Cooperative Process Optimization between Paper Machines and Stock Preparation
-A New Approach to Improving Control Performance and Automating Grade Change Operations-

Ken-ichiro Wada
IA-PS Analyzer Center P&W Solutions Dept., Yokogawa Electric Corporation

In existing paper mills, improvement activities of control efficiencies are continuing aiming at improving operational efficiency. However, such efforts typically do not extend beyond optimizing individual processes. This paper introduces our approach to improving the control efficiency of a plant composed of multiple processes by optimizing contiguous processes, and outlines our technologies for analyzing huge amounts of data and computing optimal control parameters. The paper also introduces a newly developed software product to reduce time required for grade changes.

Work style Reformation of Inspection Work
-About DX efforts by"inspection cloud service teraSpection"-

Iwao Kakegawa
Digital Solution Service Business Division, FUJITSU LIMITED

In this paper, we will introduce the"Inspection Cloud Service teraSpection" (manufactured by Fujitsu) that is effective as a digital transformation startup in the field of maintenance.

Importance of Rheology and Viscosity in Paper and Board Coating

Vesa Kukkamo, CEO and Jyrki Laari, CTO
ACA Systems Oy, Outilantie 3, 83750 Sotkuma, Finland

Market demand for coated graphical paper has declined steady as a result of electronic media. However, other coated grades such as coated board and barrier coated packaging papers and specialties are forecasted with decent growth grades. Despite of the actual market situation the operational environment and coating functionalities are under continuous investigation. Flow properties i.e. rheology plays an important overall role in optimizing runnability and quality. This paper demonstrates the importance of rheology and viscosity in paper and board coating. A focus is in high shear viscosity that has been demonstrated to be in a critical parameter in coater runnability. Its importance will be discussed both from theoretical and practical standpoints. Furthermore, a new instrument for measuring high shear viscosity fast and easy will be discussed.

Research and Development Trend of Nanocellulose

Takanori Miyanishi
JAPAN TAPPI

2019 International Conference on Nanotechnology for Renewable Materials was held at the Makuhari Messe International Conference Complex in Chiba, Japan during June 3-6, 2019. Renewable nanomaterials, primarily derived from plants such as trees, have generated much excitement because they are renewable, recyclable, and appear to have limited safety, health and environmental issues. They can be produced in large quantities at costs appealing to material users. They possess unique properties that enhance the performance of consumer products and applications when used with other materials. The conference was attended by 400 participants from 26 countries. Invaluable 130 scientific papers were given in oral presentation and active discussion was made. A full schedule of technical sessions gave TAPPI Nano attendees from around the world the chance to focus their time on specific areas. Finland, which has a thriving forest-products industry and ambitious environmental performance goals, is in the right climate for support of new markets for cellulose materials. This makes Helsinki the perfect location for TAPPI Nano 2020, which will be held on June 8-10, 2020.