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Wearable Device and IoT in the Workplace

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The use of wearable and IoT device at site is expanding.

Nowadays, those devices are highly expected to be as work-style innovation at site even for those fields where ICT (Internet Communication Technology) has not been really introduced.

There is a trial calculation that 50 billion of IoT devices will exist on the earth by 2020 and it is expected that the market size will reach 200 trillion yen in 2020, used by various types of industries such as manufacturing, medical, finance and so on.

On the other hand, it is very hard to predict benefits to be taken by implementing wearable or IoT devices precisely.

Besides it is hard to judge what kind of device should be chosen for each site as there have been already various types of devices.

Current situation is that there are only few devices which fully satisfy needs of field site who would like to implement readily to have an effect.

For this talk, I'd like to explain the usability of wearable and IoT device by showing actual usage at customer's site as well as a verification of benefits and introduction of Fujitsu's wearable and IoT devices that are released in May 2015.

Novel Kappa Measurement Technologies
— A Breath of Fresh Air for Pulp Makers —

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BTG Division Spectris Co., Ltd.

Pulp being an intermediate and commodity is always under pressure to contain costs, meet quality specifications and has the right environmental profile, irrespective of where a mill is on

the cyclic profitability curve. Having sharper and smart eyes to the process not only allows pulp makers to optimize the unit operations but these sensors are providing continuous visibility to mill management and proven tools to tighten controls and take quick preventive actions before it is too late.

The whole Kraft fiberline process from cooking through to bleaching is designed to selectively remove lignin from wood chips to produce pulp that meets brightness and strength requirements and is produced in most cost efficient way. Traditionally, fiberline has been monitored & controlled using fiber kappa alone. Missing information on dissolved lignin has been one of the root causes of lack of implementation of fully automated process controls.

This paper focuses on new sensor technologies available today that measure lignin in various forms including dissolved lignin. Deployment of these sensors at key locations in fiberlines have demonstrated huge savings to mills in yield and chemical consumptions. These innovative measurement technologies have enabled optimum process control strategies for mills to operate and change gears quickly to remain on the sweet spot of optimum cost and productivity curves and that too with attractive payback. These smarter novel sensors are quickly gaining popularity among pulp makers as breath of fresh air and a differentiated approach to operate pulp mills today.

Introduction of Dirt Observation Device「Open-K-DO」at Fuji Mill

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At NPI Fuji mill, DIP plant which has two series 210 T/d has been operating and they use Omron online dirt counter (ASP-D400P) for quality management. Now we see things from every angle and make a plan for achieving higher efficiency. One of our plans was online dirt counter additional installation. However, Omron announced the product will be end of sales on May 2015. Hence, we made up our mind to focus on other maker not Omron due to end of sales, but we couldn't find adequate product in terms of pricewise and maintenance. So we asked our NPI engineering division Nippon paper Unitec (NUT) to develop dirt counter for raw materials process.

NUT had been discussed with Omron and ready for develop successor model by NUT itself. Developing has been started at DIP plant NPI Fuji mill since August 2014. After field test finished roughly 1 year, it's been operated online dirt observation device (Open-K-DO) in August 2015.

This report presents the outline of developing process which we introduced into Fuji mill DIP

plant.

Proposal for Reducing Usage of Freon Gas and Device Maintenance Man-hour

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Paper manufacturing process has distribution panel in order to control device and production line. Current advanced automatic production system needs to prevent electronic equipment from machine trouble and keep reliability of rejecting sudden stop and extending equipment life. In the case of considering causes in heat, it is widely known in paper manufacturing companies that FA cooler is effective to avoid troubles. As results, FA cooler is highly adopted in SD/ BM/ process device.

Electronic device trouble causes can be specified in “alteration and deformation” or “adhering contaminants”. “alteration and deformation” mostly occurs in result of chemical reaction. Electronic devices are delicate and easy to have troubles in temperature rise because chemical reaction speed is more quickly proceeding in high temperature. In relation between temperature and failure rate in control device, Arrhenius equation is well-known. When calculating relation based on Arrhenius equation between semiconductor temperature and failure acceleration, appendix1 shows failure rate 1 in 40. when Semiconductor is 60℃, its failure rate will be 10～30. also, when Semiconductor is 80℃, its failure rate will be 100～300.

Distribution panel countermeasure against heat is still a key technology for distribution panel design because fan, heat-exchanger, and air-conditioning duct are tried in various situation ever; however troubles still occurred by deficiency in cooling performance, cooling irregularity and dew condensation. FA cooler is now well-known to propose and give better solution for all above problems.

Existing FA cooler mostly use alternative Freon gas(ex. HFC134a) for cooling. Usage of alternative Freon gas FA cooler is being anxious to introduce in production line because of rising man-hour by Freon gas emission and reducing law instead of excellent effectiveness. At this time, Apiste proposes new FA cooler to keep good condition in production device and avoid using alternative Freon gas.

Papermaking 4.0 Concept of VOITH Paper

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Industrie 4.0 is a project in the high-tech strategy of the German government and is the title given to the next fourth Industrial Revolution. As part of Industrie 4.0 Voith Paper has already started to introduce and promote the Papermaking 4.0 concept globally. It based on the next generation of cyber-physical systems, encompassing the full life-cycle knowledge and intelligence necessary for the autonomous decentralized control of manufacturing plants. This coupled with big data analytics providing better insight and predictive capabilities allows for the next leap in productivity and cost reduction. Papermaking 4.0 is the sum of three main talents in a system of systems:

OnEfficiency SmartControls delivers sustainable performance. Papermaking 4.0 encompasses decentralized self-autonomous yet modular and integrated control solutions, distributed along the entire paper & board production process, enabling producers to easily drive their plant on THE key parameters to continuously achieve business objectives.

OnCare SmartMaintenance delivers intelligent reliability. The smart self-diagnostic capabilities and seamless connectivity of Papermaking 4.0 ready products facilitate the highest attainable plant availability at the lowest overall cost of maintenance through a high degree of predictive foresight, automated service and material management.

OnServ SmartService delivers immediate assistance. Around the clock capabilities and assistance deployed through remote, on-site and on-call arrangements, supporting our customers with data analytics, diagnostics and real-time process optimization, ensuring highest plant performance and availability.

The most important differentiating factors from tradition automation solutions are in the high degree of modularity, step by step approach and unison between both production & maintenance faculties. The value delivered by our solutions substantially exceeds the sum of value from the individual components, generated through our USP, our know-how embedded into these solutions.

Optimization of Pulp Production by Sustainable Optimization Modeling

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Total optimization becomes increasingly important with the growth of distributed energy supply that combines diverse energy sources such as renewable energy, cogeneration, and battery. In plants, optimizing the whole process/plant attracts attention rather than per-equipment optimization.

However, optimization requires mathematical models of every piece of equipment in the plant. Building models needs broad knowledge such as thermodynamics and chemical engineering on the process and equipment, statistical analysis, and mathematical programming. It is too costly to build all models by human engineers. Furthermore, both the number and the kinds of models increase when the coverage of optimization expands.

YOKOGAWA developed Data-Driven Plant Optimization Modeling (DDM) to solve this problem. It automatically formulates equipment models from historical data of operation. Using this technology, we can reduce the cost of initial model building and model maintenance.

We have started experiments of DDM in several processes in order to verify the cost reduction of the modeling and the accuracy of automatically created models. With a utility plant, for example, we archived the reduction of 80% of man-hour to create equipment models for the plant. This technology will be applicable to pulp production processes.

Case Study by Replacing QCS of a Paper Machine

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Hachinohe Mill, Mitsubishi Paper Engineering Corporation

In June 2014, QCS of PM5 in Hachinohe mill, has been updated. At the planning stage, we intended to reduce the frequency of routine parts replacement/repair for the moisture meter sensor head placed in the high temperature environment around the size press, and intended to reduce the paper broke through the improvement of the basis weight cross direction control performance, as one of the benefits obtained through QCS update.

Few problems had been occurred and resolved. Major issues were the measurement value fluctuation of ash meter sensor just after automatic calibration and basis weight cross direction control. The excess profile variation was caused by the following two reasons. One was inexperience in new control algorism and the other was mismatch between existed actuator system and new QCS. After resolving these issues, we have succeeded to reduce the paper broke.

This paper introduces the issues and their solutions in detail occurred in the installation and start up.

Replacement Project of PM5 Rewinding Control System

Hiroyuki Sato

Niigata Mill, HOKUETSU KISHU PAPER CO., LTD.

Jagenberg ‘Vari-step’ winder in Niigata mill has been operated more than 27years to wind up mainly woodfree uncoated paper which is produced by PM5.

This winder is used two drum winding system and that drive adapts Fuji Electronics’s DC motor control system. On the other hands, Jagenberg original system controls slitter position, core chuck position and rider roll nip pressure curve.

Currently, IHI Voith which inherits winder business from Jagenberg announces end of support of this winding system, so that we decided to replace this system to latest one. At this time, these replace project was the first case in Japan. In this report, we introduce the overview of this replace project and difference between new system and old one.

Scanning Measurement Reboot
— ZipLine —

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Honeywell's ZipLine measurement device combines Honeywell's proven sensor designs with a new, patented, flat sheet scanning system which is easier to install, and has a lower total cost of ownership than traditional scanner designs, while assuring product quality and higher yields for superior economic benefits.

Honeywell ZipLine is a self-contained scanning measurement device which provides high-speed measurement of flat sheets without the cost, size, and complexity of traditional O-frame scanners.

ZipLine is remarkable for what it doesn't have; rigid scanner beams, drive belts, carriage wheels, linear bearings, power track, compressed air, or water. Compared to a traditional scanner, ZipLine has 90% fewer parts, which, along with simplified installation and high performance measurements, contributes to a low cost of ownership and unparalleled value.

The Strength and Technology of State-of-the-Art LED Color Sensor

Takato Kishi
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For online color sensor in paper production line, conventional xenon flash lamps have been used as light source. Xenon flash lamps have some advantages on color measurement, because they have sufficient illumination and relatively flat spectrum from violet to red for accurate color measurement. However, on the other hand, the xenon flash lamps require seconds of time for charging high voltage that makes color measurement intermittent. And its spectrum contains ultraviolet ray which disturbs measurement on fluorescent sheet. To evaluate the effect of fluorescence, the conventional color sensors have optical filter mechanism to switch "UV-in" measurement and "UV-out" measurement. This means the two measurements are not obtained at the same spot of the sheet simultaneously. On the purpose of addressing the challenges, Yokogawa have developed a new online color sensor using LEDs as light source. The design and technology of controlling visible LED and UV LED separately enable continuous color measurement and reliable fluorescence measurement. Further, the LED controlling technology provides a function of rejecting ambient light coming into sensor gap.

Another issue is that color measurement may be influenced by the positional relationship between sensor and measurement plane because it is a kind of reflective sensor. Our new LED color sensor is equipped with an optical system designed to minimize characteristics of pass-line and pass-angle. In addition, it has a function of pass-line detection and compensation using IR LED (our patented technology). As a result, our sensor is insusceptible to deflections of pass-line and pass-angle.

The History of Technological Developments of the Paper Industry in Japan
Part 5: Integrated Mills and New Wood Resource Sites

Kiyoaki Iida

The integrated mill model, where paper was manufactured with pulp produced in-mill, was established using softwood in Kiso and Fuji areas, which the Meiji government sold as a new source of revenue. At the end of the 19th century, the integrated mills were constructed one after another mostly in Shizuoka area. Their plants mostly imported were in a larger and larger scale. A group of engineers, introduced as the second generation in the Part 3, worked actively and know how was accumulated in the industry. That made the next expansion possible.

As the demand grew and wood resource got scarce, mills were constructed in Hokkaido which reserved more forest. Tomakomai mill, Oji paper and Ebetsu mill, Fuji Paper were large enough to be competitive for imported paper so that their product replaced the imported.

The demand still kept growing at the rate of 10 % a year, forest in Sakhalin was interested in. Oji Paper, which took over geological survey by Mitsui & Co., and Fuji Paper built mills there.

Fuji Paper, of which CEO was Ohkawa, introduced kraft process and sold wrapping paper with good profit. In 1938, Sakhalin shared 40% of the total pulp production in Japan, and that of Hokkaido was 35%. In 1942, the pulp capacity in Sakhalin was 421 thousand tons per year and a half of the pulp produced there was brought back to the inland.

Corporate Profile & Products Information (30)

Honeywell Japan Inc.

We Honeywell Japan Inc., is Japanese subsidiary of Honeywell United States, it was established in 1982, which has subsequently led domestic affiliate companies to join into one Honeywell group. Honeywell products have been around in Japan for more than 60 years. Three SBG Honeywell's products being supplied in Japan are, Aero space, Automation and Control Solutions, Performance Materials and Technologies. As Honeywell group, it is home to 127,000 employees in 1250 offices and factories in 70 countries around the world.

We described further details of Honeywell Japan in Japanese below.

－Peer Reviewed－

Chemical Mapping of Cell Wall Components

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Time of flight secondary ion mass spectrometry (TOF-SIMS) is a rapidly developing technique that provides chemical information about the solid sample surface and does not need any pretreatments. The significant advantage of TOF-SIMS over other methods is the direct visualization of many organic/inorganic chemicals on the sample surface with submicron lateral resolution. Here, the applications of TOF-SIMS to wood science are reviewed.

Plant cell wall consists of three major polymers (cellulose, hemicellulose, and lignin) and many other inorganic and low-molecular-weight organic chemicals. Usually, the polymer components are detected as fragment ions in the TOF-SIMS measurement. The fragmentation behaviors of the polymers are essential to discuss the original structure so that the behavior is described. Especially, the behavior of lignin is described in detail. Subsequently, several results on the relative amounts and the chemical structure of the lignin in specific plant tissues are

discussed. A report using TOF-SIMS to discriminate the indistinguishable sapwood from heartwood in discolored ancient wood material is also introduced.

The recent advances in cryo-TOF-SIMS are described. Cryo-TOF-SIMS can deal with a frozen-hydrated sample and is a powerful approach to visualize water-soluble chemicals of nearly equal distribution in a living system. At last, results on pulp and paper chemistry using (cryo-)TOF-SIMS are described briefly.