Water Treatment Chemicals
IIoT and Remote O&M

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Water Treatment Chemical Companies will play a Leading Role in IIoT and Remote O&M

Water treatment chemical (WTC) companies presently derive substantial profit from their process knowledge. This asset will be leveraged in the new world of IIoT to create double digit profit growth for those who seize the opportunity. The profit increase will include

- Higher margins per pound of chemicals sold
- Broader sales penetration
- Global sourcing opportunities
- Feedback leading to faster product development and more profitable products
- Ancillary IIoT related products and services
- Reduced travel and sales expense

Water treatment chemicals companies have traditionally been selling a combination of knowledge and product. Sales engineers have fulfilled a service and advisory role. The value added has been process knowledge and the ability to provide the right mix of chemicals.

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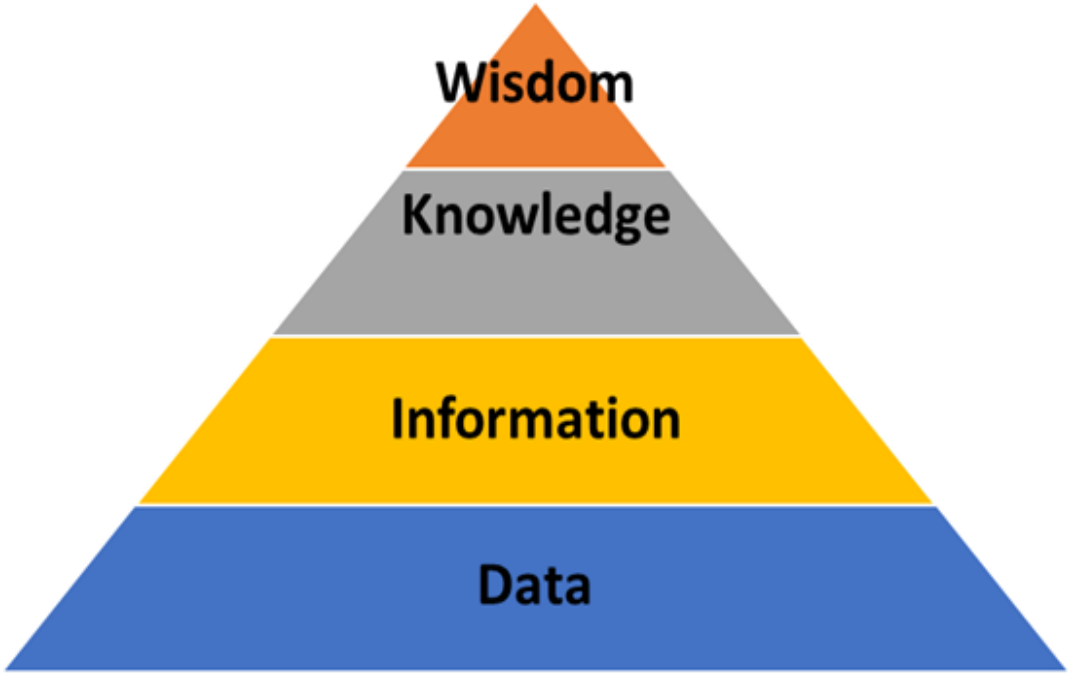
Specific Opportunities

IIoT and Remote O&M can be viewed in terms of a pyramid of bits of data



But in terms of profitability wisdom and knowledge will be even more important than the information and data.

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Leveraging IIoT will Increase Revenues

WTC companies can leverage this in their core WTC and non-core businesses to add revenues of $30 billion in 2025.

Water Treatment Chemical IIoW Empowered IIoT Opportunity		
Category	2025 Revenue $ billions	Percent
Conventional Treatment Chemical Revenue	39	2.8
IIoT Supplemental Opportunity	30	2.2
Sub Total	69	5
Total Specialty Chemical	1400	100

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Large Potential of Specialty Chemical Companies

- The $69 billion is only 5% of the specialty chemical opportunity. For companies such as Suez the larger opportunity is measured in tens of billions of dollars. In the McIlvaine IIoT and wastewater webinar the power of the combination of GE Water with Suez remote monitoring and operation of water and wastewater treatment facilities was demonstrated.
- BASF has an opportunity even larger than that of Suez. In the broadest sense, it is investing heavily in sustainability. As a result, BASF can offer clients improved "sustainability" and not just higher profits. (McIlvaine has developed a simple metric to measure sustainability based on individual life quality impacts (**Sustainability Universal Rating System**). BASF can leverage its IIoT efforts in its manufacturing plants with its WTC IIoT efforts.

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Water Treatment Market by Chemical Type

The core market includes chemicals to treat water, wastewater, steam and slurries. Here is the current market.

WTC Market - $millions	
Subject	2017
Total	27,585
Activated Carbon	772
Chelants	663
Corrosion Inhibitors	6,111
Defoamers	608
Inorganic Flocculants	3,459
Ion Exchange	903
Odor Control	956
Organic Flocculants	4,497
Other	1,389
Oxidizers & Biocides	2,993
pH Adjusters	1,486
Scale Inhibitors	3,748

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Expanding to Process Knowledge

- Pulp and Paper Making is a unique market for many treatment companies. Water treatment chemicals are part of a larger category labelled specialty chemicals or performance chemicals. The market for this broader category is $1 trillion per year. Large players include Dow Chemical, BASF, Bayer, INEOS Group and DuPont.
- The IIoT and Remote O&M market for these major chemical companies is huge. This effort can be combined with the IIoT efforts at their manufacturing plants. BASF has taken a further step and offers industrial wastewater treatment as a service in an area surrounding one of its German plants.

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Major Markets

- The major markets for specialty chemicals are:
  - Agrochemicals
  - Polymers & Plastic Additives
  - Construction Chemicals
  - Electronic Chemicals
  - Cleaning Chemicals
  - Surfactants
  - Lubricants & Oilfield Chemicals
  - Specialty Coatings
  - Paper & Textile Chemicals
  - Food Additives
  - Adhesives & Sealants

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IIoT Already Established

- Treatment chemical companies are already providing remote monitoring services. Nalco has installed more than 1000 3D TRASAR boiler automation systems supported by Nalco 360™ Service, to provide 24/7 monitoring for boiler systems.
- Solenis has its OnGuard controller system also supported by 24/7 remote monitoring.
- GE TrueSense directly measures all three primary chemistries used in cooling water treatment and interfaces with InSight, GE's cloud-based knowledge management solution.
- Kemira SMART chemical treatment of sludge enables the optimization of chemical consumption but also delivers the best dewatering performance. This requires knowledge of the different operational characteristics of centrifuges and belt presses.

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Ancillary IIoT Related Products and Services

- IIoT and Remote O&M is much more than just optimization of treatment chemical use. It is optimization of the entire process. Top management is recognizing this opportunity. Danaher has embraced IIoT with the strategy of embedding its equipment with sensors with the expectation of increased consumables sales opportunities.
- Danaher now owns Pall, Hach and Chemtreat. In the future Hach sensors can be sending data to remote control centers operated by Pall, Hach, and Chemtreat. This will supplement data on the plant which will be supplied by other vendors. The plant and third party O&M providers will be viewing all the remote input. The cloud based system will provide the details which will allow decisions on whether to replace a Pall filter element or just change the Chemtreat chemical dosage to reduce the scale.

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Where should WTC Companies take the Lead?

- The enthusiastic proponents of IIoT tend to downplay the importance of what they call “subject matter expertise”. Mcilvaine thinks that IIoW (Industrial Internet of Wisdom) is even more important than IIoT. In fact, the potential should be viewed in terms of IIoW empowered IIoT. The decision to change chemicals or replace a filter element must be made somewhere. If the filter is purifying condensate in a gas turbine combined cycle plant, one needs to know how often the unit is cycling and also the condition of the boiler tubes. Many plants are upgrading filters due to contamination from ambient air through air cooled condensers.
- It can be argued that the water treatment chemicals division has the process knowledge base to take the lead. In any case those companies with niche experts who understand the processes and the relationship of the product to the process efficiency will be the ones in demand.

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Challenges and Threats

- Need for internal interconnection: In order to maximize the potential WTC companies will need to copy the Buckman example. Process knowledge must be cultivated. Buckman Laboratories led the way in the 1990s with the bestselling book "Building a Knowledge Driven Organization". Sales people posted questions into a company intranet system. The priority of personnel from top management down was to provide answers. Twenty years later this effort can be made much easier and better with IIoW. the scope of each niche expert should become smaller as knowledge expands. This means adding 8% more niche experts each year after the base of thousands of experts is developed.
- Need to interconnect with process and component suppliers. The potential importance of this interconnection was demonstrated at Municipal Flow and Treatment GdPS at WEFTEC.

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Competition

- Competition: The treatment chemical companies are potentially facing some pretty stiff competition. Let's says Accenture or Genpact supplies complete digital process management and strategic sourcing systems for all the BHE facilities comprising 7% of U.S power generation and gas transmission. Basic chemicals could be purchased and mixed for all the plants. Genpact is already supplying process management for several Duke wind facilities. If Genpact was contracted with AEP, Duke and BHE it would be purchasing 25% of the U.S. power plant water treatment chemicals.
- The large strategic procurement firms are making a practice of hiring experts from industry. Seven percent of the knowledge workers retire or change jobs each year. However, their expertise is higher than average. As a result, fifteen percent of the industry knowledge is in play each year. A treatment chemicals company can have a knowledge advantage today but lose it tomorrow. On the other hand, a company which adopts a robust IIoW program is not dependent on the knowledge of the few and makes superior decisions with the niche expertise of the many.
- The system suppliers are either customers or competitors. MHPS has remote control centers in the Philippines and Orlando providing support for power plant rotating equipment. A sister company, Mitsubishi Electric is in water treatment. The transition to becoming a strategic procurement source is a goal that many system companies have selected. IIoT and Remote O&M is a springboard to this goal.

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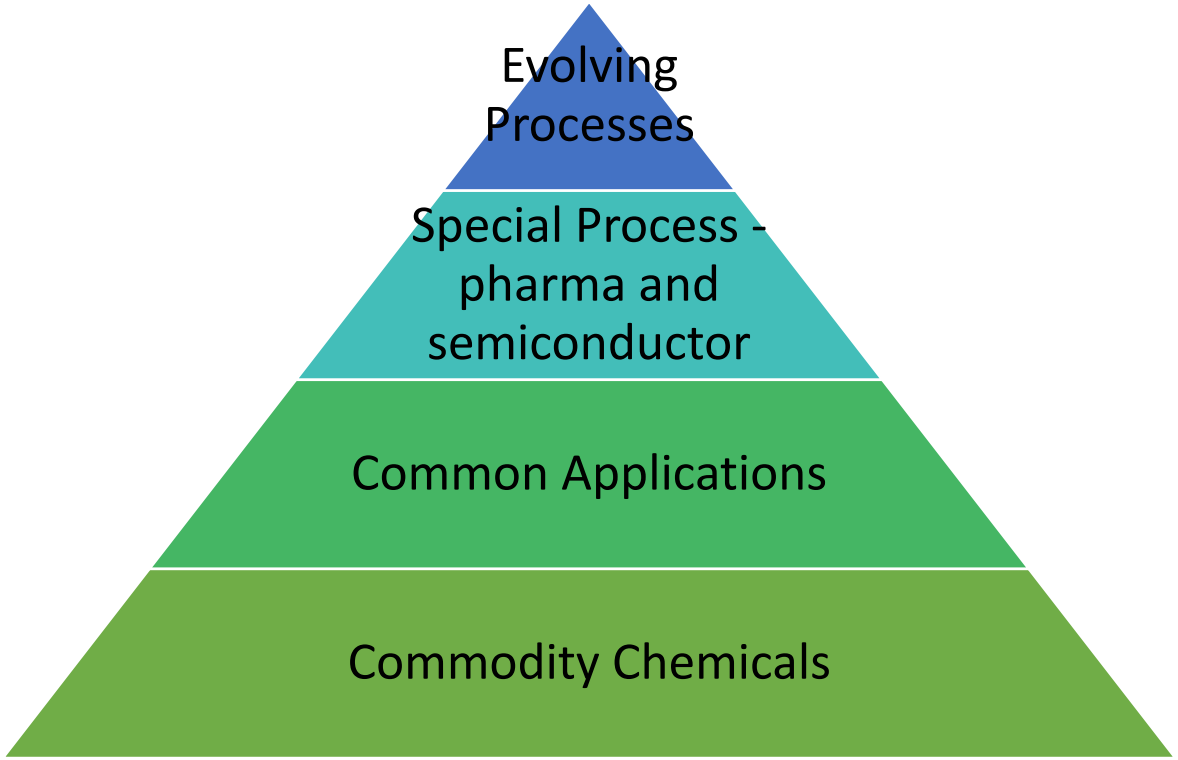
Water Treatment Chemicals Will Generate Large IIoW Revenues

There is a tier of knowledge requirements which greatly impact water treatment revenues. The lowest level involves commodity chemicals which are sold without any unique knowledge about the industries or processes where the chemicals will be used.



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Knowledge Tier

- The highest level would involve knowledge of evolving processes and the potential water parameters that need to be addressed.
- Level two would involve this knowledge for processes as they presently exist. Level three would involve proprietary chemicals for generic processes like cooling tower recycle.
- The top level requires a high degree of industry knowledge that would probably come from a niche expert. The WTC company will have the highest knowledge of the proprietary chemicals to meet the water parameters of paper making or ultrapure water. The question is where does the knowledge best reside. How much should the water treatment chemical company have in house? How much should be provided by outside niche experts? Alternatively, to what extent should the WTC company rely on collaboration.

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Leveraging Chemical and Process Knowledge

- An example is Andritz in paper making. Should Andritz have more knowledge about the right treatment chemical and provide that to the WTC company or should the WTC company talk on equal footing relative to the combined performance of equipment and chemicals?
- Danaher has a powerful combination with the Pall equipment, the Hach instrumentation and the Chemtreat chemicals. They can function at the highest levels with information from Pall about membrane processes. How is this knowledge going to be conveyed? There are four knowledge needs Alerts, Answers, Analysis and Advancement. These needs can be conveyed by printed data posted on an internet site along with recordings. Analysis includes white papers and on line discussions. The alerts can come with blogs or formal Alerts

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Interconnection with Many Groups Needed

- How does IIoW provide the interconnection to the various resources? There is a distinction between connection and interconnection. Connection connotes communication between two parties. Interconnection connotes communication between multiple parties. IIoW needs to interconnect people with relevant printed data and other digital tools but also with other people.
- An operator within a large multidivisional end user needs to communicate with engineering and maintenance as well as people in other divisions. He needs to also interconnect with suppliers, consultants and research institutions. A salesman for a supplier company needs all the above connections plus collaboration with other suppliers. People in a large end user company need to connect with people in other divisions of the same company, suppliers with end users in all the divisions and regulatory agencies, consulting companies and research, educational institutions with each other. Most importantly all the individuals need connection to niche experts. There needs to be niche experts on the process developments, the water parameters for existing processes, the best chemical mix to meet the water parameters from a technology aspect but also experts on the total lowest cost options. The best chemical might be too expensive but an alternative may be the best economic choice.

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WTC Companies are selling Wisdom

- Mcilvaine believes that this expertise should be provided as part of an entire interconnected wisdom network. In fact, the revenue potential for WTC companies is greater in IIoW to enhance IIoT than in the IIoT itself. WTC companies are already selling wisdom. They understand customer processes to a much greater extent than the suppliers of most products. Their margins are already heavily weighted to the value of the knowledge they are leveraging.

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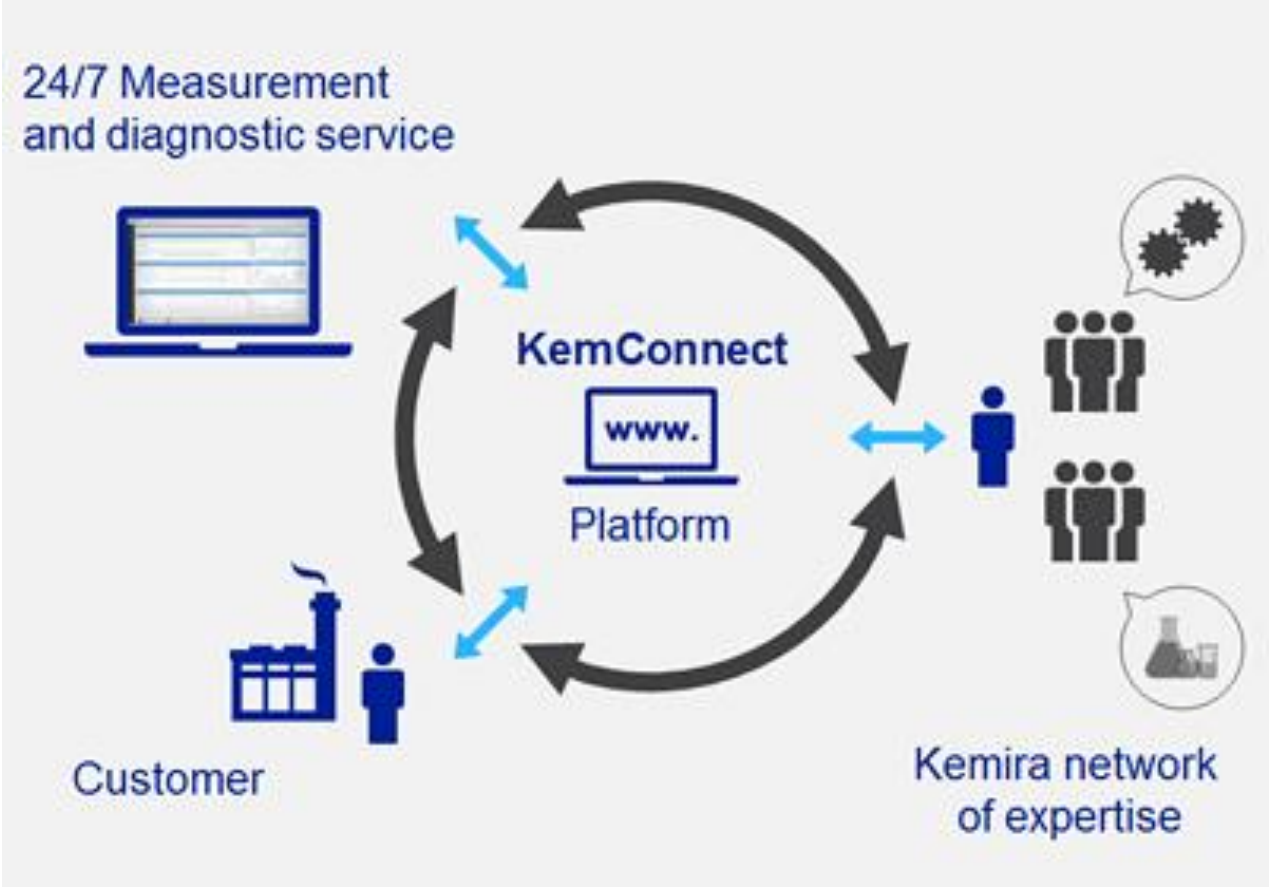
Kemira offers Remote Monitoring with Expert Support

Kemira control and monitoring connects smarter process management to a global network of application specialists, chemistry know-how and the right products and technologies. It allows real-time process follow up and ensures that the chemical additions are at the optimal level.
Kemira KemConnect is the basic foundation for Kemira's smarter process management in all applications.

This includes remote monitoring of odors, wastewater, water, and sludge



Kemira has Remote Monitoring and Control for both Water and Wastewater

Waste Water

- Environmental protection has been in focus for many years and clean water is scarce in many places. Waste water treatment plants are operating at high capacity and automated solutions are becoming more important in waste water management.
- Kemira has developed a solution for automatic chemical addition system for chemical precipitation processes to measure turbidity and the total amount of suspended solids from different process streams. With this information coagulant and polymer additions can be automized meaning improved and more stable waste water quality and cost efficiency.
    - Suspended solids, COD and color removal measurement
    - Sludge dewatering/chemical dosing management
    - Remote control and monitoring
    - Injection systems for improved chemical mixing
    - ATP test-kits
    - Platform for customer case analysis and diagnostics

Raw water

Kemira has developed a system that can measure dissolved organic compounds, suspended solids and color from raw water streams. With this information chemical dosage will be at the optimum level all the time and less surprises are expected with the raw water quality.

- Remote control and monitoring
- Injection systems for improved chemical mixing
- Platform for customer case analysis and diagnostic

Sludge handling

. The most important issues in sludge dewatering are dryness, dewatering speed, filtrate quality and malodor control. Kemira has developed specially tailored control algorithms to ensure optimal sludge dewatering.

- Sludge dewatering/chemical dosing management
- Suspended solids, COD and color removal measurement
- Remote control and monitoring
- Injection systems for improved chemical mixing Platform for customer case analysis and diagnostics

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Kemira solves Wastewater Problem with Flow paced Dosing and Real Time Monitoring

Village Creek's wastewater flow averages 100 million gallons per day, and initial sludge flows to the Renda Environmental dewatering facility averaged 1,000 gallons per minute. In late 2014, the Renda facility started to suffer from deteriorating dewatering performance. Cake solids were wetter and malodorous than before, which led to increased hauling costs and complaints by the residents due to the odor. Additionally, struvite started to build up in the sludge grinders and on the belt filter presses, increasing the maintenance costs.

Kemira introduced a flow-paced dosing of chemistries to account for variances in the sludge flow. A real-time total solids meter was installed prior to the coagulant application point for an option to dose the chemical on a pound per dry tonne of sludge basis with the sludge flow taken into account. A second real-time monitoring device was placed after the iron salt feed to dose the polymer accordingly.

- Kemira Application Manager Tafadzwa "Tee" Mariga notes that the client's problems were due to the Village Creek wastewater treatment plant starting to receive sludge that contained poly-aluminum chloride from smaller local wastewater treatment plants. In this situation, the sludge held more water than earlier, when the local plants had used ferric sulphates.
- "Our team came to the conclusion that the best solution was a combination of appropriate chemistry and SMART technology. It is the specific combination and way of dosing inorganic coagulants, in this case an iron salt, with the organic flocculant (polymer) that resulted in an improved dewatering performance, odor control and struvite control," notes Tee
- "Our technologies allowed for the plant to dose chemicals as per demand. This SMART chemical treatment of the sludge enables the optimization of the chemical consumption and always delivers the best dewatering performance, even if the input sludge properties vary over time."

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Improvement in Solids Dewatering by 5 Percent

The solution proved to be very effective, and results were quickly available.

- “The beauty of dosing the right chemistry combination with a controlled program is that you see the benefits quickly. The belt press cake went from being sloppy to crumbly once the chemistry went through the system. It worked like magic,” Tee recalls.

Showing significant improvement, the site increased the belt press cake solids by 5%. Renda’s hauling costs were remarkably decreased, considering that the drier sludge cakes made it less expensive to transport them. In addition, struvite build-up on belt presses was reduced, which diminished the maintenance costs. Since the start of this SMART dewatering, Renda has had no odor complaints, which is saving the company significant costs as each odor complaint reported costs at least $2000.

- “The advantage of the value-added program is that the chemistry combination allows the selection of some benefits over others. For example, Renda had an option to keep the polymer dosage the same and the coagulant allowed them to increase their belt press throughput by at least 20%. This enables savings in labor, electricity and equipment run time.” Tee concludes.

- Other benefits included reduced belt press filtrate ortho-phosphate levels (over 90%). The belt press filtrate is returned to the head works of Village Creek and so this reduction has had a positive effect on the overall plant treatment process. The plant managers claim that they have witnessed improved settling rates in their primaries and that they are treating less water. The improved filtrate quality has also qualified Village Creek to sell their reuse water to the local airport for machine cleaning.

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Improving online monitoring and alert systems

By **Magesh Muthumani and Darren Robinson**, Buckman

INTRODUCTION

Modern pulp and paper manufacturers require online monitoring and alert systems to support their operations. Automation allows for the quick and reliable control of processes and chemical dosing. Having a web-based customer portal and data dashboard interface not only gives customers access to vital information regarding operations, it also enables chemical-supplier field-based personnel to identify operational gaps and provide potential solutions. Buckman has introduced its OnSite unit in more than one hundred customer sites. This interface along with EZe Monitor® was created to meet specific customer needs for up-to-date operational

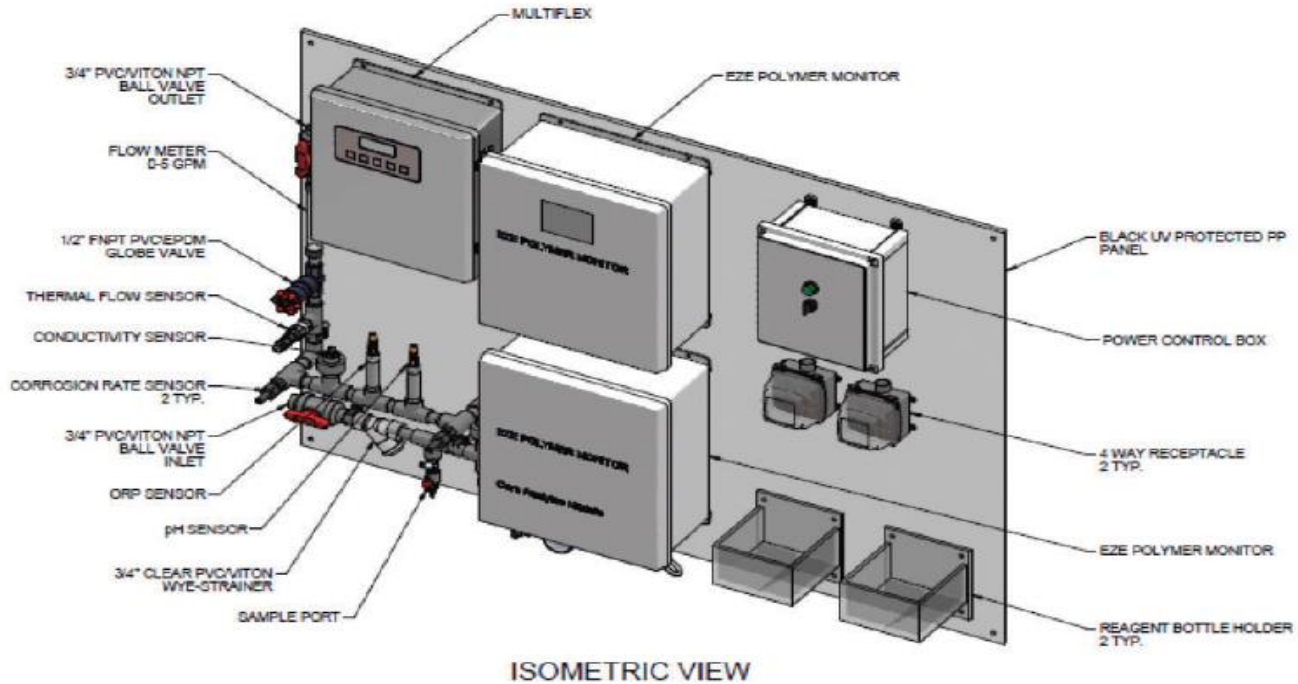

Figure 1. *Isometric view of EZe Monitor® and its components*

Compared to conventional corrosion monitoring techniques, EZe Monitor's advanced design uses electrochemical technique, such as linear polarisation resistance (or LPR).

INTEGRATING EZE MONITOR® AND BUCKMAN ONSITE®

EZe Monitor can be equipped with several different types of online process controllers (data collection devices). The devices are typically connected via cellular modem, or in some cases may be connected to the customer's network. It couples a powerful multi-I/O platform with analytical sensors and extensive communications technologies. These flexible configuration options make setup and configuration easy and fast.

Automation System Layout

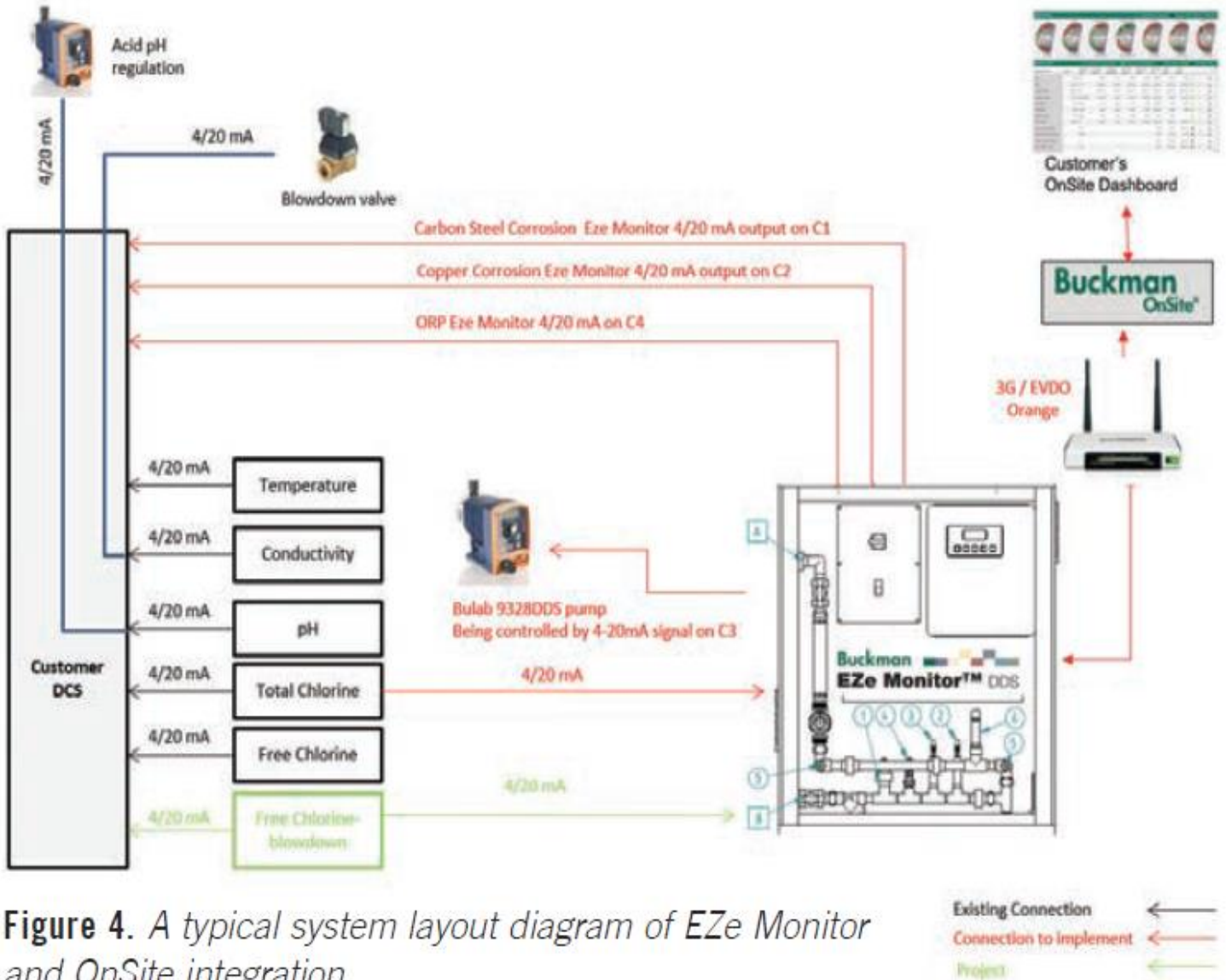

Figure 4. *A typical system layout diagram of EZe Monitor and OnSite integration*

Buckman Controllers Configured with OnSite

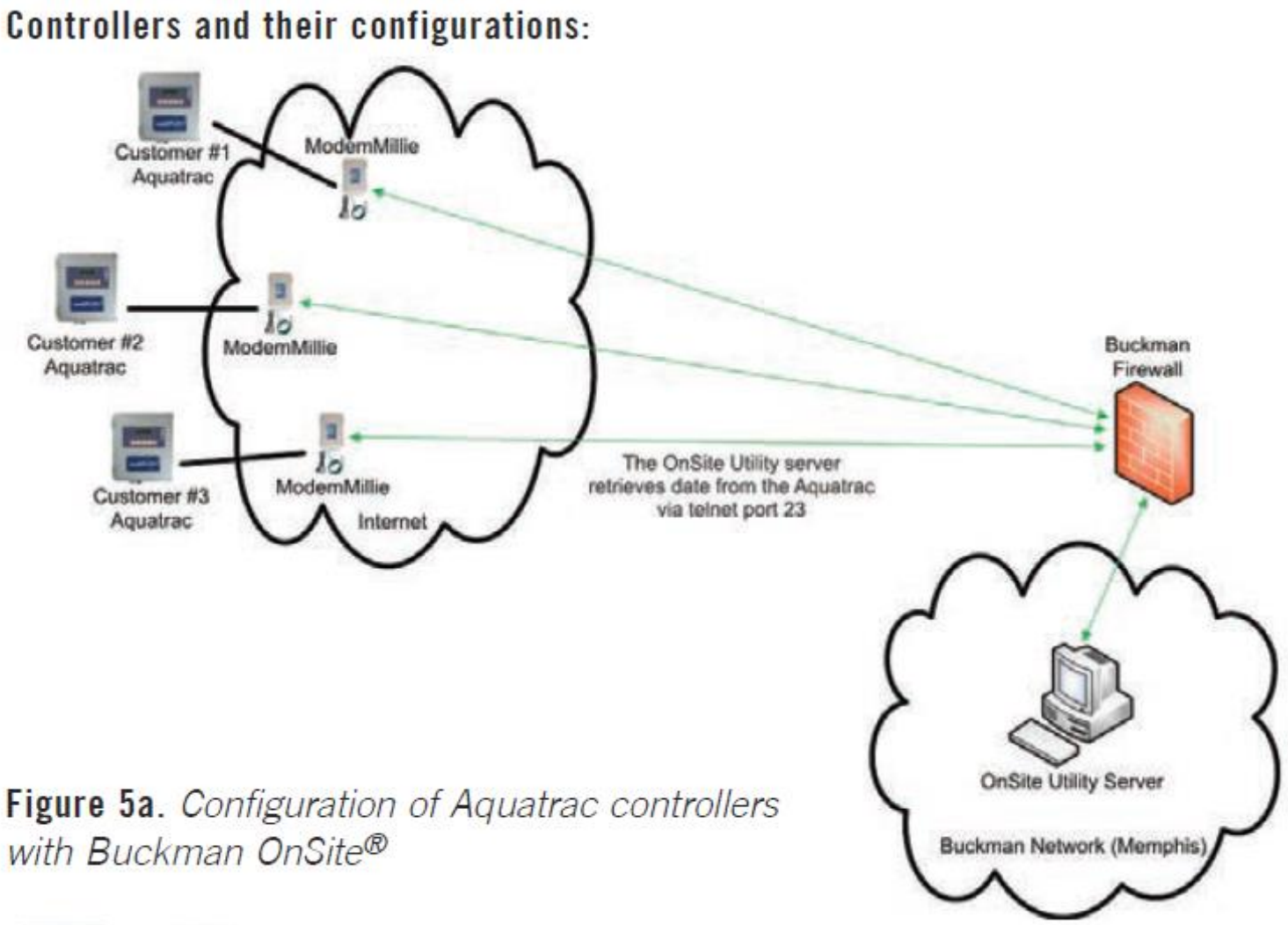

Figure 5a. *Configuration of Aquatrac controllers with Buckman OnSite®*

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Buckman combines Chemistry and Equipment Knowledge at Ponderay Newsprint

- Ponderay Newsprint Company, located in Usk, Wash., utilizes a unique strategy of combining chemistry and mechanical equipment to concentrate, treat, and remove TMP white water extractives in the pulp mill to reduce chemical costs, increase sheet strength and maximize paper machine production
- Recently, a significant mill wide step change was observed in the process when the strategy of super-clarifying the TMP white water at the Krofta DAF clarifier was implemented. The Krofta has proven to be a valuable process tool, not only for improving the efficiency of the TMP water lock, but also helping the mill achieve energy, water, and fiber loss sustainability goals.
- A Krofta DAF Clarifier was recently configured into the TMP process in an effort to chemically treat and purge the extractives from the extractives-rich TRP pressate stream. A fiber recovery screen was added to scalp the usable fiber and minimize fiber loss at the Krofta . This project has provided a way to reclaim fiber and heat (energy) while reducing water usage helping the mill meet sustainability goals. Prior to the TMP water lock and Krofta implementation, the mill relied primarily on a polymeric pitch control program, which has been reduced significantly providing chemical cost saving.

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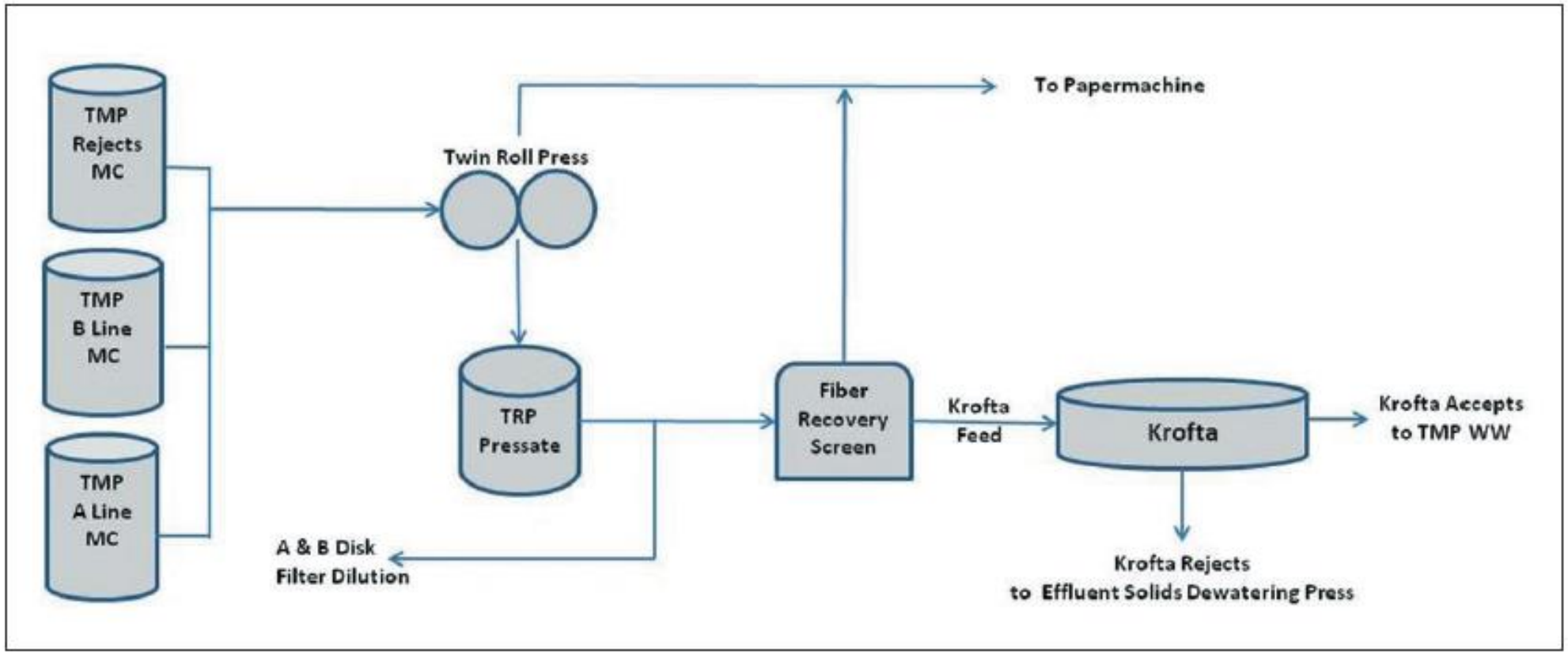
Optimizing Flotation with Remote Chemical Adjustment



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Kurita Example – Coordinating Automation with Products and Services

- Kurita defines IT sensing technology as the foundation of solutions provided to customers, and visualizes the water treatment status using its original system to provide services for the remote monitoring of customers' water treatment conditions. The purpose of these services is to monitor the water treatment conditions and effects of treatment on a real-time basis with customers at their sites, and to share information about water treatment issues that need to be addressed together so that Kurita can quickly implement more beneficial solutions to all the issues customers face.

- Kurita analyzes the water quality of target facilities on a daily basis and reports the analysis results to customers. It launched a new water treatment management service called "S.sensing," with the aim of building higher value-added systems for customers by visualizing the water treatment effect more directly.
- It will realize optimal water treatment in real time with a system that combines Kurita's original core technologies for measurement, analysis, control, and monitoring by installing the sensing equipment in the plant facilities of customers.

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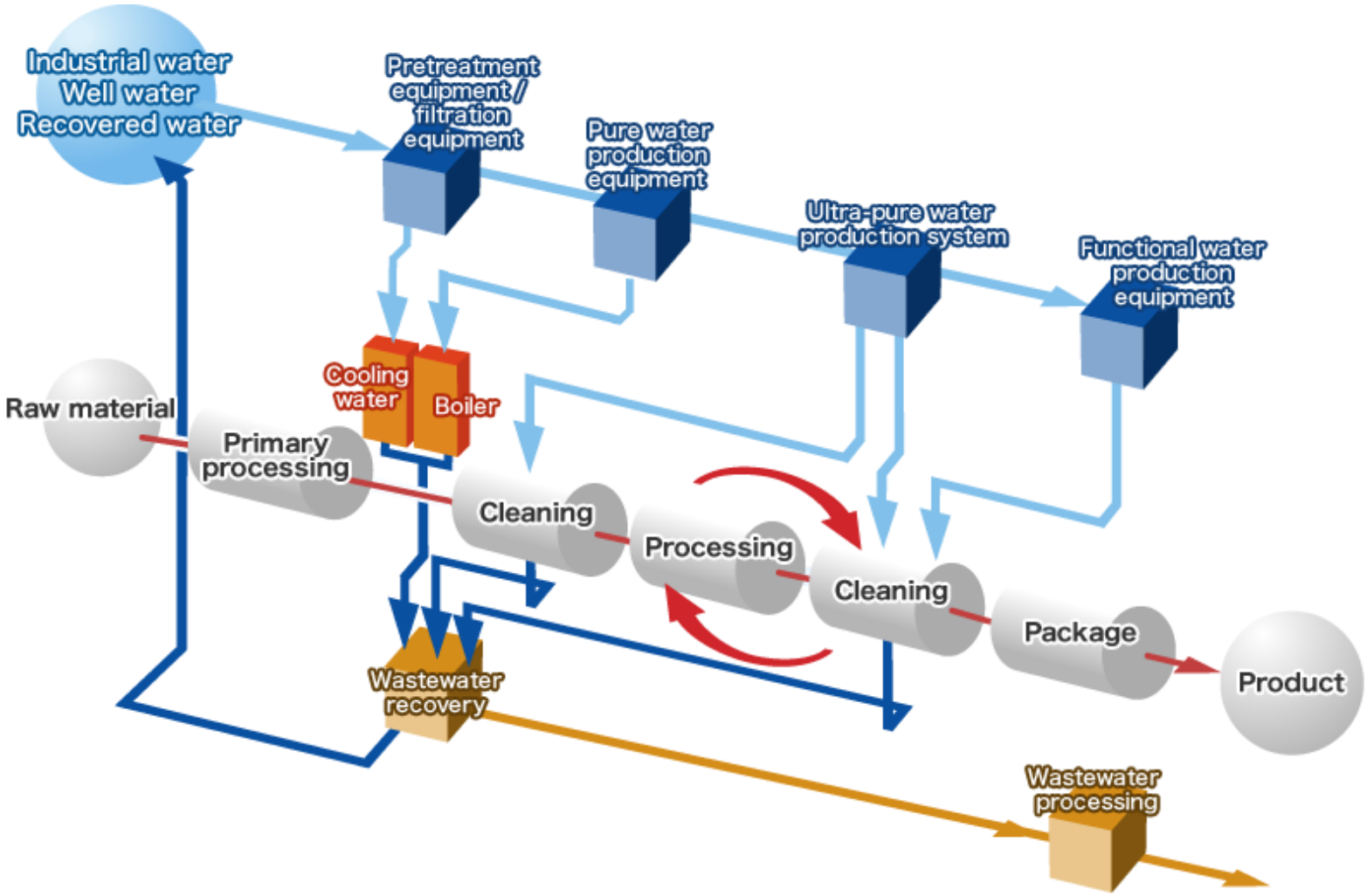
Kurita Supplies the Chemicals Dictated by IIoT System

- With this system, it controls and optimizes chemicals injected in response to changes in water quality on a real-time basis at the target facilities where water treatment chemicals are used, based on the automatic analysis of the effective density of chemicals and the water treatment effect, along with conventional services to monitor data such as water quality, the amounts of the chemicals injected, and the remaining amounts of chemicals. The items of measured data are instantly transferred to Kurita's server, allowing it to check the water treatment management status as needed from a computer, a smartphone, or a tablet terminal connected to the Internet.
- Kurita will promote higher-quality solutions, such as the ex-ante prediction of problems, the realization of more efficient water treatment specifications, the improvement of productivity, and the reduction of the environmental impact by sharing various kinds of information with customers through the S.sensing services. This information includes items such as the status and effect of water treatment management, the operation data of water treatment facilities, and trends of other temporal changes. The diagram below provides the components in a system providing ultrapure water for liquid crystal display manufacturing.

Kurita System



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Suez could become the IIoT UPW Leader

- Suez has the opportunity to become the leader in ultrapure water IIoT and Remote O&M. It is acquiring GE Water who has the ultrapure water technology while Suez is remotely monitoring facilities around the world from a center in France. For manufacturers of pharmaceuticals GE Water now offers water treatment, reactor cleaning, USP/UPW production, process fluids treatment and pharmacopoeia monitoring instruments. Its purchase of Sievers many years ago makes it a leading supplier of TOC and other water quality instrumentation.
- The former GE Betz who is a major provider of chemicals for ultrapure water will also now be part of Suez. This group has a large staff of sales engineers who are providing a service as well as sales role. In the future with more IIoT and Remote O&M onsite service will be diminished.

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Danaher Optimistic About IIoT Potential

- Danaher is bullish on IIoT. It sees multiple opportunities in the recurring revenue sector. Examples of recurring revenue include consumables and services in diagnostics and life sciences, and across Pall Corp.'s operations.

- The opportunity facing Danaher comes from embedding more software in its equipment, thereby spurring increased consumables sales and keeping customers engaged with Danaher's services. Moreover, analyzing data from customer usage of equipment can create valuable opportunities for the company to modify its customer offerings.

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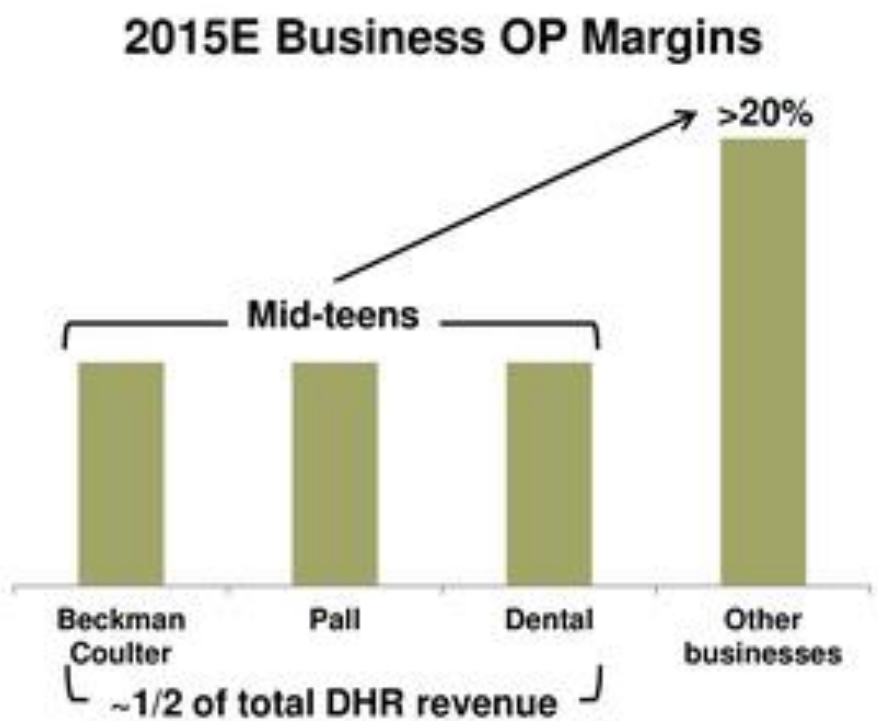
Danaher's Opportunity

	Revenue	Recurring Revenue*
Water Quality	$2.0B	55%
Product ID	$1.6B	40%
Life Sciences	$2.5B	50%
Diagnostics	$4.9B	80%
Pall	$2.8B	75%
Dental	$2.8B	60%
Danaher	$16.5B	60%

All revenue figures are aggregate for FY 2015E.
*As a percent of 2015E sales.



United by resilient business models with significant room to improve through DBS

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Danaher Hach Liquid Particle Counter with Remote Monitoring

Particle monitoring and control of ultrapure water (UPW) are becoming more and more critical to a growing array of manufacturing industries. Advances in precision manufacturing technologies such as flat panel display (FPD) and hard disk drive (HDD) components, require that contaminant particles in process fluids be measured to levels as small as 0.1 µm.

- The Anatel Ultrapure-100 Particle Counter is a compact 2-channel (4-channel optional) liquid particle counter designed for analysis of ultrapure water monitoring applications. It is built around a robust 0.1 µm liquid particle sensor.
- The Ultrapure-100 contains flow control, particle sensing, signal processing and analog output electronics as well as a microprocessor based command/control communications system all in one assembly.
- **Remote control option** The Ultrapure-100 can be controlled remotely from a host computer via an RS-232 serial port (the protocol is factory set). The communications protocol used is either ASCII or SECS-II Standard. The factory default for the Ultrapure-100 is RS-232 communications with ASCII protocol.
- **Hot water monitoring application** For hot DI water monitoring applications, the ANATEL Ultrapure-100 is a proven solution and is rated to 80o C.

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Danaher - Met One Facility Monitoring Systems integrated with Enterprise Information Systems

MET ONE facility monitoring systems are scalable on-line particle monitoring solutions based on open architecture communications that integrate easily with preferred systems. The full suite of remote and portable air particle counters feature full ISO 21501 compliance and 21 CFR Part 11 compliant data management software.

- MET ONE will manage the design and install of your particle counting facility monitoring system
  MET ONE offers project management, system definition and design, software customization, validation, and installation services.
- MET ONE facility monitoring systems will integrate into your existing legacy systems
  Integrate its instruments with an existing Enterprise Information Systems, LIMS, or Building Management System.
- MET ONE gives you on-site service
  Large industry global network of local service offices with fully compliant on-site service for instruments, including full ISO 21501-4 calibrations. the service agreement programs provide proactive pre-scheduled on-site calibration and maintenance services, including discounts for any repairs.
- MET ONE facility monitoring solutions eliminate data silos within multiple systems
  Eliminate validation, maintenance, and upgrades for multiple monitoring systems Eliminate multiple reports by including non-viable particle data with all other production data.
- MET ONE compliance services
  SOP development assistance for manual monitoring Full validation documentation packages for automated systems URS planning Validation documentation packages (Installation Qualification/Operation Qualification) Validation testing process and final sign-off assistance.
- MET ONE offers a full suite of environmental sensors and system accessories
  Relative humidity and temperature sensors Air velocity sensors Differential pressure sensors IO modules connect to existing sensors, door switches, tool interrupts, etc. Ethernet switches, touch-screen NEMA computers etc. Distributed vacuum systems Distributed DC power systems Multi-function alarm modules

Met One is part of the Beckman Coulter group which in turn is owned by Danaher. The IIoT commitment of Danaher is reflected in the next two slides.

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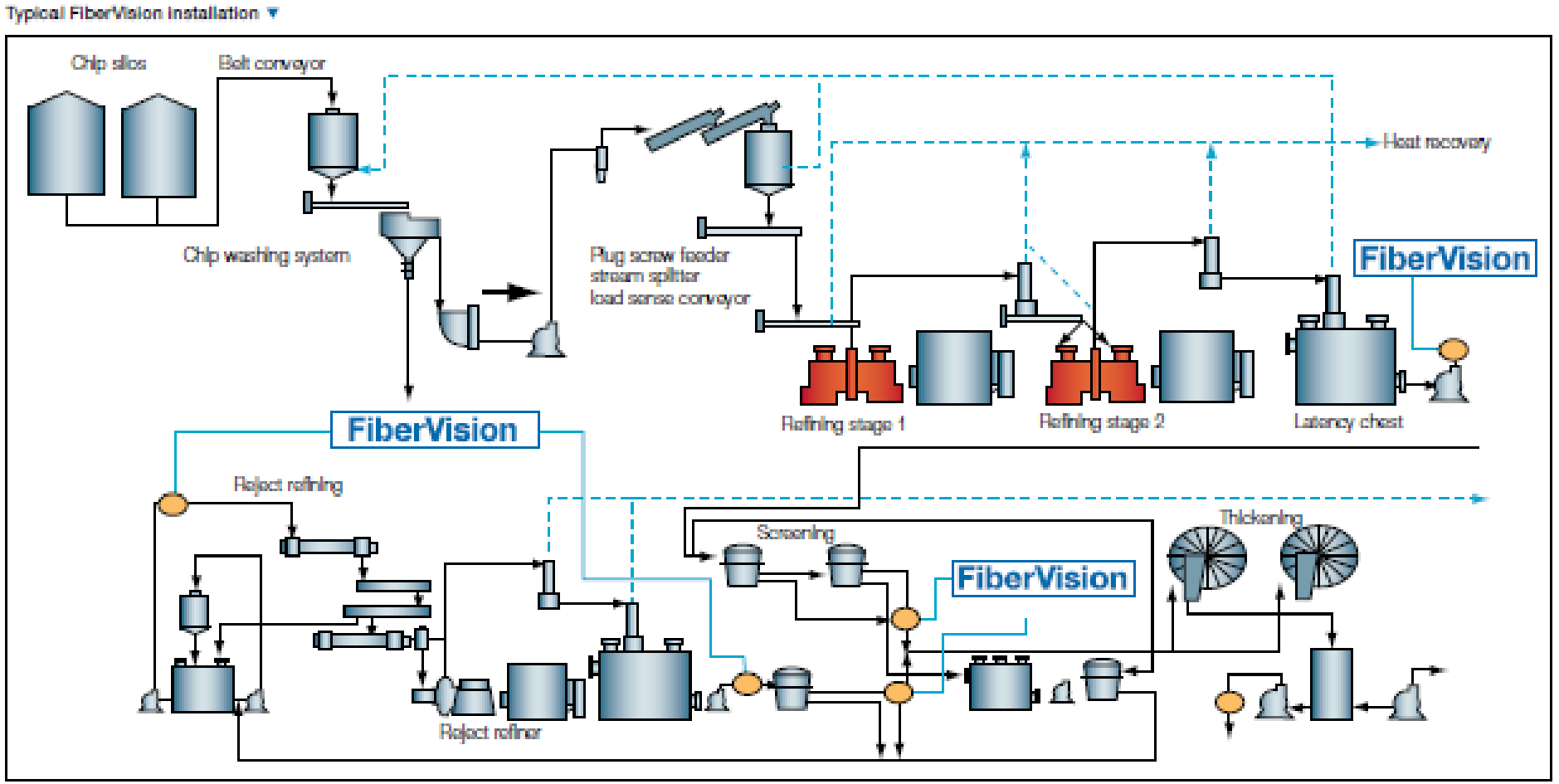
Andritz Automation provides Remote Monitoring and Control for Pulp and Paper Plants

Andritz Automation instruments, helps operators achieve the best information about their operations. Better information means better control and the resultant benefits.

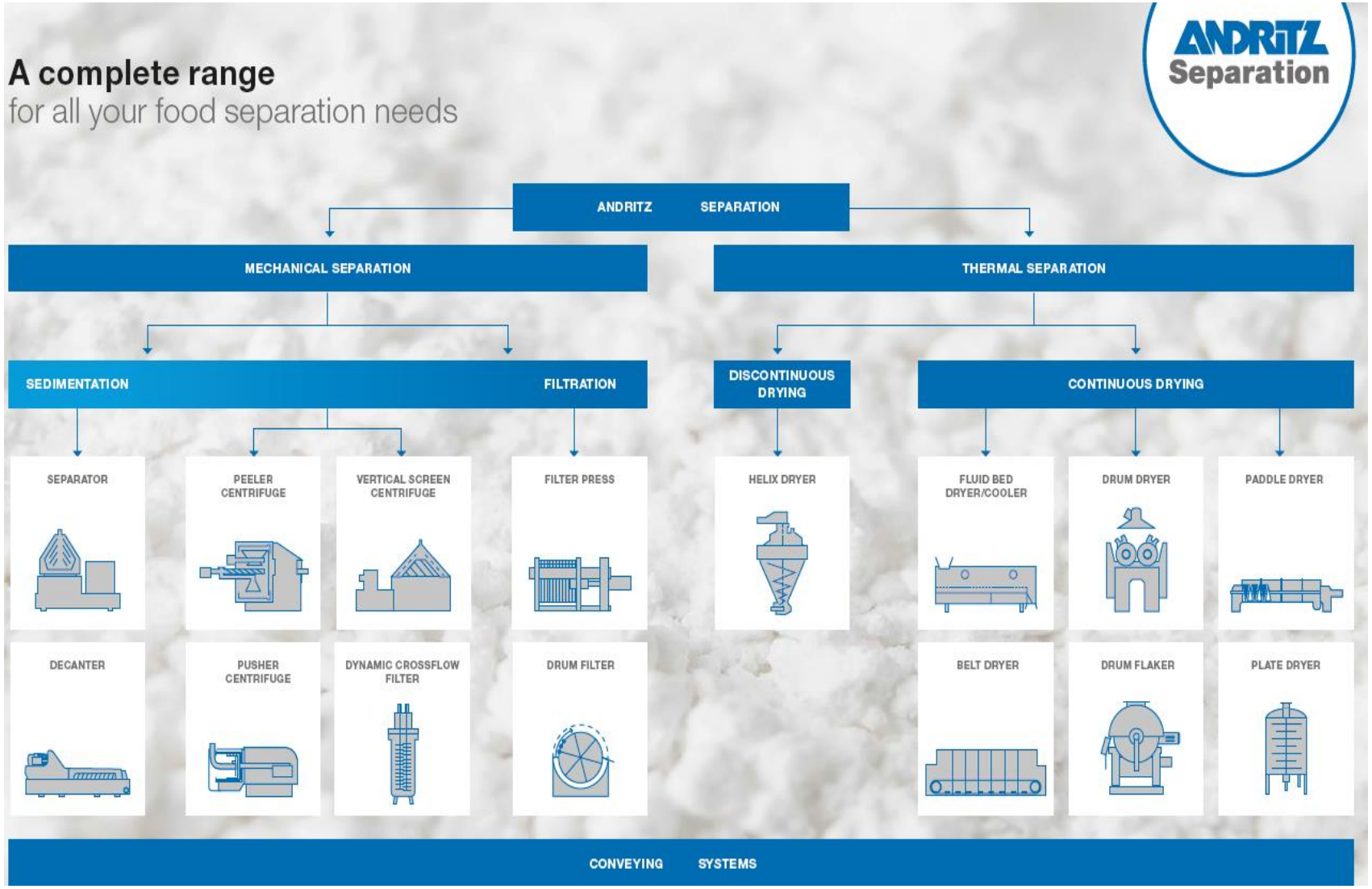
- Control and measure crucial parameters in key pulping process areas
- Reduce energy consumption
- Improve frequency of measurement
- Minimize equipment wear and tear
- Achieve more consistent operation
- Produce higher value products

FiberVision is a state-of-the-art online sensor that helps pulp operations reduce specific energy consumption, achieve higher value product, improve frequency of measurement and decrease down time.

Andritz Fibervision Applications in Paper Processes



Andritz



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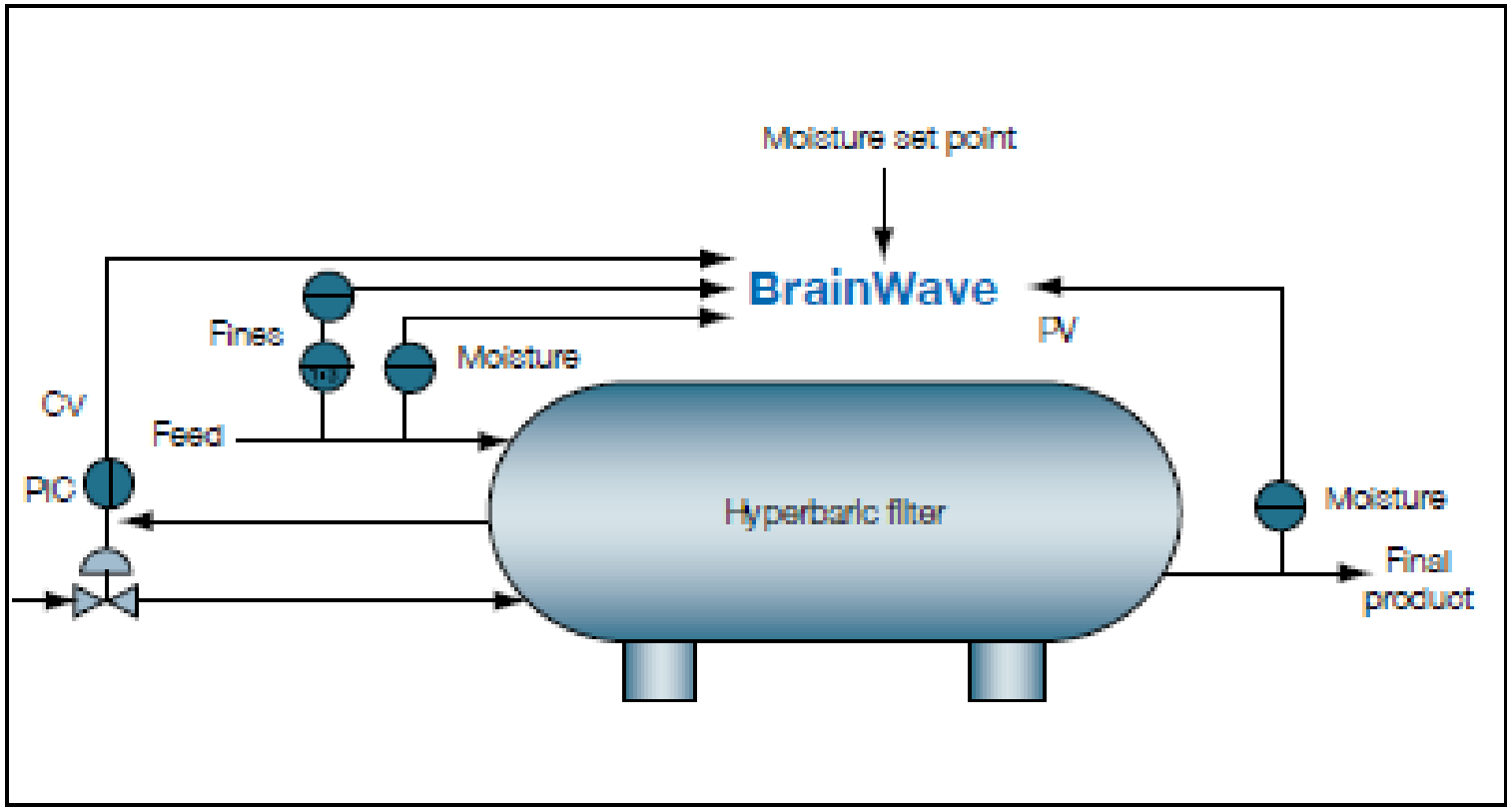
Andritz Brainwave Hyperbaric Filter Control System

One of the main issues in hyperbaric filter control is the over-drying of product, which can increase energy consumption. BrainWave accounts for transport delay times as product moves through the filter to the online moisture measurement sensor. Further improvements to control are possible by monitoring incoming moisture content, either on- or offline, and including this in the control strategy as a measurable feed-forward.

Schematic of moisture control system with BrainWave HB filter



This allows BrainWave to make control corrections as soon as the incoming moisture changes, instead of waiting for the exiting moisture to respond. BrainWave is also able to reduce spikes in air pressure, which cause increased wear and excessive maintenance on equipment. BrainWave accomplishes this by stabilizing the measured moisture content at the filter exit by continuously adjusting air pressure

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