Honorable Members of PUPID,

Well, it is already the third week of February and as I write this I am enjoying being back in the good ol’ US of A (from Seoul, South Korea) and trying to stay warm here in Eastern Washington state.

This last November, the ISA Automation Week 2013 was at the Nashville Convention Center in Nashville, Tennessee. If you couldn’t be there, you can listen to the audio and read the Powerpoint presentations and papers by going to the links on the PUPID website. As they say, it’s the next best thing to being there.

Our division net membership has decreased slightly from 432 to 412 members even though we have 20 new division members since last December. Welcome to the new members!

I am also pleased to be able to include BTG’s paper and Powerpoint presentation “Is Conductivity The Best Measurement For Black Liquor Carry Over Measurement?” from the Paperweek Canada 2014 Technical conference that was held in Montreal, Quebec, Canada.

I hope it is an encouragement to you to become more involved with the Division and to enroll more members from the great international pulp & paper community.

Please do not hesitate to contact me at my email brad.carlberg@bsc-engineering.com to discuss how you can help PUPID.

Do feel free to forward the Newsletter to your friends and colleagues who may have an interest in it.
ABSTRACT

Open Loop Method
(Ziegler-Nichols)

The control system is allowed to come to a steady-state condition after the controller is placed on manual. A unit step change next taken on the controller output. The apparent delay time (Td) and the maximum reaction slope (Sm) are measured.

Based upon the following Ziegler and Nichols open loop method equations, the control mode settings are calculated by inserting the proper apparent delay time (Td) and the maximum slope of reaction curve (Sm):

Proportional Controllers

\[ K = \frac{1}{S_m T_d} \]

Proportional Plus Integral Controllers

\[ K = \frac{0.9}{S_m T_d} \]

\[ T_i = 3.33 T_d \]

Proportional Plus Integral Controllers

\[ K = \frac{1.2}{S_m T_d} \]

\[ T_i = 2 T_d \]

\[ T_D = 0.5 T_d \]

where:

- K = Proportional Gain
- Ti = Reset Time
- TD = Derivative Time
- S_m = maximum slope of reaction curve
- T_d = apparent delay time

Calendar of Events

Get a quick overview of the ISA PUPID events for 2014 by going to the Calendar at: http://www.isa.org/~pupid/2014_PUPID_Calender.htm

2014 TAPPI PEERS Conference
09/14/2014 to 09/17/2014
Tacoma, WA USA
http://www.tappipeers.org/

2014 BLRBAC Meetings
Spring Meeting: April 7 – 9, 2014
Fall Meeting: October 6 – 8, 2014
www.blrbac.org

2014 China Paper Technical Conference
9/15/2014 to 9/17/2014
China International Exhibition Center
Beijing
http://www.chinapaperexpo.cn/

2013 BLRBAC Fall Meeting
10/7/2012 to 10/9/2012
www.blrbac.org

2013 China Paper Technical Conference
9/02/2013 to 9/04/2013
China International Exhibition Center
Beijing
http://www.chinapaperexpo.cn/

2014 ISA SPRING LEADERS MEETING
SATURDAY, JUNE 28, 2014 THROUGH TUESDAY, JULY 1, 2014
RALEIGH MARriott CITY CENTER
RALEIGH, NC
Come meet your leaders & get involved!

2014 ISA PROCESS CONTROL & SAFETY SYMPOSIUM
MONDAY, OCTOBER 6, 2014 THROUGH THURSDAY, OCTOBER 9, 2014
WEST LOOP MARriott
HOUSTON, TX

10/7/2014 to 10/9/2014
Transamerica Expo Center
Sao Paulo, Brasil
http://www.abtcp2014.org.br/ingles/
Closed Loop Method
(Ziegler-Nichols)

The Ziegler and Nichols closed loop method in this discussion is referred to as the ultimate method. In this procedure, tune all reset and derivative action out of the controller ($TI = TD = 0$) leaving only the proportional mode. With the controller on automatic, tune the controller gain for continuous oscillatory cycle following an upset. If the gain is too high, the system will be unstable. If the gain is too low, the system will dampen out.

When the system continues to oscillate on an upset, the gain is noted and referred to as the ultimate gain ($Su$). Also, the period of time between cycles is noted and referred to as the ultimate period ($Pu$).

These values are used in the following Ziegler and Nichols closed loop ultimate method equation for controller tuning:

**Proportional Controllers**

$$K = 0.5Su$$

**Proportional Plus Integral Controllers**

$$K = 0.45Su \quad Ti = \frac{Pu}{1.2}$$

**Proportional Plus Integral Controllers**

$$K = 0.6Su \quad Ti = \frac{Pu}{2} \quad TD = \frac{Pu}{8}$$

where:

- $K$ = Proportional Gain
- $Ti$ = Reset Time
- $TD$ = Derivative Time
- $Su$ = ultimate gain
- $Pu$ = ultimate period

*This Tuning Tip was excerpted from “Analog Control Techniques & Tuning (with Ziegler-Nichols)” by Ralph K. Johnson of Bailey*. ISA Members can download this paper FOR FREE from the ISA Pulp & Paper Industry Division website at http://www.isa.org/~pupid/RKJohnson_Tuning_1990.pdf.
**Welcome to the 20 New ISA Pulp & Paper Industry Division Member since December 2013**

<table>
<thead>
<tr>
<th>Name</th>
<th>Name</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gregory Bryant Brooks, Sr.</td>
<td>Ammar Mahmoud Al-Hammad</td>
<td>Lyle Kritzberger</td>
</tr>
<tr>
<td>Grishmita Abhay Deshpande</td>
<td>Luis Crescencio Castro</td>
<td>Shahanshah Manzoor</td>
</tr>
<tr>
<td>Adam C. Hamer</td>
<td>Peter L. Den Hollander</td>
<td>Regina Trapp</td>
</tr>
<tr>
<td>John S. Heller, Jr.</td>
<td>Daniel Dominguez</td>
<td>Diego A. Herrera Cabrera</td>
</tr>
<tr>
<td>Douglas V. Lenz</td>
<td>Alejandro Miltiades Forttes</td>
<td>Jonathan Alexander Lasprilla Abello</td>
</tr>
<tr>
<td>Kolten Michael McClure</td>
<td>Dr. Jonas Gillberg</td>
<td>Rick Van Fleet</td>
</tr>
<tr>
<td>James L. Moles</td>
<td>Prashob Pulparambil Kanikattil</td>
<td></td>
</tr>
</tbody>
</table>

**Here’s a reminder to the 33 ISA Pulp & Paper Industry Division Members who need to renew their membership**

<table>
<thead>
<tr>
<th>Name</th>
<th>Name</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Jon F. Monsen</td>
<td>Karthick Srinivasan</td>
<td>Manuel Hernandez Fernandez</td>
</tr>
<tr>
<td>Michael S. Moore</td>
<td>Ramgopal Vankina</td>
<td>Tuan Nguyen</td>
</tr>
<tr>
<td>Victor R. Christensen</td>
<td>Ryan Duane Housley</td>
<td>Arnold Proellochs</td>
</tr>
<tr>
<td>James P. Huza</td>
<td>Ronaldo Goncalves Paes</td>
<td>Kevin Anton DeWitt</td>
</tr>
<tr>
<td>Laura J. Pongratz</td>
<td>Mohammed Sufyan Shaikh</td>
<td>Yanyu Duan</td>
</tr>
<tr>
<td>Mark T. Hood</td>
<td>Tiago Donizete De Moraes</td>
<td>Matthew Ernst</td>
</tr>
<tr>
<td>Nathan Camp</td>
<td>Kenneth Schunk</td>
<td>Josep Fontgivell Mas</td>
</tr>
<tr>
<td>Peter J. Luciano</td>
<td>Joaquin Bolado Rodriguez</td>
<td>Mrs. Javier Frias Perea</td>
</tr>
<tr>
<td>Gustavo Marco</td>
<td>Kartikeyan Chellapan</td>
<td>Kevin Persig</td>
</tr>
<tr>
<td>Dr. Vaishali B. Mungurwandi</td>
<td>Carl Allyn Ekblad</td>
<td>Miles Ray Reid</td>
</tr>
<tr>
<td>William Howard</td>
<td>Mike Frias</td>
<td>Michael J. Tucker</td>
</tr>
</tbody>
</table>

**Don’t forget to renew!**
Who’s Doin’ Anything?:

APP chooses supplier for some equipment at huge new Indonesian BHK mill

SINGAPORE, (PR Asia) - Asia Pulp & Paper (APP) has tapped Finland's Valmet to supply some equipment for a 2 million tonne/yr bleached hardwood kraft pulp mill in South Sumatra, Indonesia.

Valmet announced that the APP affiliate that will be running the mill, Oki Pulp & Paper, has ordered Euro 340 million ($463 million) worth of machinery, including two biomass gasifiers, two biomass boilers, an evaporation system, two lime kilns and two pulp dryers.

WASHINGTON, DC, Feb. 10, 2014 (Press Release) - The American Forest & Paper Association (AF&PA) today released its latest web video titled "We Are the American Forest & Paper Association," highlighting their members' commitment to make products valued and relied upon by people around the world in a sustainable manner.

AF&PA represents nearly 90 percent of the paper and wood products manufacturers, which produce recyclable products made from a renewable resource.

"Paper and wood product manufacturers make products that communicate and inform; package and protect; provide shelter and capture life's memorable moments," said AF&PA President and CEO Donna Harman. "Paper and wood products provide value to society and are produced through sustainable manufacturing processes. Our 'We are AF&PA' video tells the story of the people and products of our members, which we proudly represent."

AF&PA members have taken positive actions to improve performance through the association's sustainability initiative, Better Practices, Better Planet 2020, under which the industry has reduced greenhouse gas emissions, improved energy efficiency, reduced water usage, and improved workplace safety. The industry's recycling success story has continued to grow, with more than 60 percent of paper consumed in the U.S. having been recovered for recycling each year since 2009. U.S. papermakers recycle enough paper every day to fill a 15-mile long train of boxcars.

"We are proud to represent an industry with a proven track-record and commitment to sustainable manufacturing, and we hope this video provides a glimpse into who we are and what we represent," said Harman.

Editor's Note: Video available on AF&PA's YouTube channel at http://bit.ly/1npqqnA.

Germany's Körber to acquire software company Werum IT Solutions

HAMBURG, Germany, Feb. 10, 2014 (Press Release) - The international technology group Körber is planning to acquire the company Werum IT Solutions AG, formerly Werum Software & Systems AG, based in Lüneburg, Germany. Werum is the leading provider of software for production control and production monitoring for the pharmaceutical and biopharmaceutical industry. The objective of the acquisition is to further expand the Körber Group's Medipak Systems Business Area. This specializes in inspection and packaging technologies as well as the manufacture of high-quality packaging for pharmaceutical products.

As the holding company of the Medipak Systems Business Area, Körber Medipak Systems GmbH is aiming to use the acquisition to extend its expertise in the cutting-edge market for software solutions in the field of production control and monitoring. Werum is the leading provider of so-called manufacturing execution systems (MES) for the pharmaceutical and biotechnological manufacture of pharmaceuticals. The company shares are held largely by current and former employees. The aim is to acquire 100 percent of the shares.

"We would highly welcome the opportunity to expand our activities in this important future market together with Werum - a company with outstanding technological expertise that is held in high regard by customers around the globe. Software solutions such as the products and services provided by Werum are becoming increasingly important for us as a technology group, and are also highly relevant from a strategic perspective," said the Chairman of the Executive Board of Körber AG, Richard Bauer.

"Within the Körber Group, Werum would be able to benefit from our international focus and broad technological experience. Together, we could develop new, unique products and exploit long-term growth opportunities with a strong international customer base in our field of business," added Gerhard Breu, CEO of the Körber Medipak Systems Business Area.

"In Körber we see the ideal partner who would be able to open up new perspectives for us as well as outstanding development opportunities for our employees," said Hartmut Krome, Chairman of the Executive Board of Werum Software & Systems AG. "Our company will retain its Werum brand and market profile, while at the same time it would be integrated in Körber's strong structures."

The future Werum IT Solutions AG has a total of some 400 employees at ten sites in Europe, the USA, Japan and Singapore. Since its foundation the company grew steadily. Since the early nineties Werum has specialized in software for pharmaceutical and biotechnological companies.

Within the Körber Medipak Systems Business Area, Werum would in future operate as an additional business field alongside the existing fields of Pharma Materials (development and manufacture of high-quality packaging) and Pharma Technology (inspection and packaging machines for the pharmaceutical industry).

Following the purchase of the shares, the acquisition would be subject to the approval of the anti-trust authorities.

Ahead of the planned sale, the original Werum Software & Systems AG was split into two companies. As part of this, Werum Software & Systems OIS AG was founded. This company has around 100 employees and develops and markets software for other sectors outside the pharmaceutical industry (inter alia measurement data management, earth observation and eGovernment). The company Werum Software & Systems OIS AG is not part of the planned transaction, and will continue to operate as an independent company with an independent management team.

Valmet to supply paper machine rebuild at Sappi's Gratkorn mill in Austria

ESPOO, Finland, Feb. 10, 2014 (Press Release) - Valmet will rebuild a paper machine at the Gratkorn mill of Sappi Austria Produktions GmbH in Austria. Valmet's large rebuild delivery will include the modernization of all the main sections of the paper machine and targets to improve end product quality. The rebuilt production line will start-up during the last quarter of 2014.
The order is included in Valmet's first quarter 2014 orders received. The value of the order will not be disclosed. The value of paper machine rebuilds depends on the scope of the delivery. The kind of line level rebuild is typically valued above EUR 20 million.

"Continuous improvement in both, cost and quality is always top of mind for us. We have a strong relationship with our customers and make a point of understanding their needs; this investment will ensure that we continue to meet them," says Max Oberhumer, Mill Director at Sappi Gratkorn Mill.

Valmet's solution for improving the papermaking capabilities on a w d b w p k e p o d a d g e 11 consists of headbox modification, gap former rebuild as well as press section and drying section rebuild. The forming section rebuild with new shoe and blade forming technology will improve the end product quality of coated woodfree paper grades. The modifications in the press section area will boost the runnability and give possibilities to widen the end product basis weight range.

Information about the Sappi Gratkorn mill

Sappi Gratkorn Mill in Gratkorn, Austria is part of Sappi Fine Paper Europe. Annually it produces 950,000 tons of high quality double and triple coated papers which are used for premium quality publications all over the world. Gratkorn Mill also produces 250,000 tons of totally chlorine free (TCP) chemical pulp. The mill employs 1,300 paper industry professionals from production to R&D. About 95% of the mill's production is exported.

The mill operates under management systems consisting of certified Environmental Management System (ISO 14001), Energy Management System (ISO 50001), Occupational Health and Safety Management System (OHSAS 18001), Quality Management System (ISO 9001) and Chain Of Custody Verification from the Programme for the Endorsement of Forest Certification (PEFC(TM)) scheme and Forest Stewardship Council (FSC®)

CirclePrinters invests Euro 4 million at its Oberndorfer Druckerei magazine and catalogue-finishing facility in Austria

AMSTERDAM, The Netherlands, Feb. 3, 2014 (Press Release) - CirclePrinters is pleased to announce a major investment program at its magazine and catalogue-finishing department in Oberndorfer Druckerei, near Salzburg, Austria.

A total of 4 million euros will be invested in the most modern and efficient perfect binding and finishing equipment available in the market. The new line will replace existing equipment and increase the overall plant's productivity in double-digit terms. Along with the new Corona C-15, two Sitma lines with inserting/onserting capabilities, ink-jet addressing and personalization, poly-bagging and shrink wrapping at speeds in excess of 15,000 copies per hour, will be installed at the plant. At the end of each Sitma line, two state-of-the-art Segbert palletizers with mail sorting capabilities will complete this investment project.

The new equipment will be fully operational in the summer of 2014 and will allow CirclePrinters Central Europe to remain one of the most competitive platforms for magazine and catalogue production in Europe.

CirclePrinters Central Europe

This investment completes an ambitious program started in 2013 with the investments made on the retail production capabilities at J. Fink Druck (Germany).

Out of its two locations: J. Fink Druck (Germany) and Oberndorfer Druckerei (Austria), CirclePrinters Central Europe operates six high-capacity web offset presses including two 80-page presses, two 64/72-page, one 48-page press and one 16-page press. This equipment allows any finished product from 4 to 88 pages and therefore represents one of the most complete offerings in the industry. Additionally, CirclePrinters operates a complete binding and finishing unit including; perfect binding, saddle-stitching, shrink wrapping, inserting, inkjet personalization and mailing solutions.

In 2013 CirclePrinters Central Europe counts with 300 qualified professionals and processes around 100,000 tons of paper servicing publishing, retail and mail order catalogue customers in Germany, Austria, Switzerland, France, Netherlands, Denmark, UK and Sweden, among others.

With a turnover in excess of 300,000 euros per employee, an EBITDA margin of 13% on Added Value and around 21 million euros in Equity*, CirclePrinters Central Europe offers one of the most competitive and solid solutions in the industry to its more than 300 customers across Europe.

Great Northern Paper could be revived by allowing owner to sell hydro electricity [From the web]

EAST MILLINOCKET, ME, Feb. 13, 2014 (Bangor Daily News) - Gov. Paul LePage's staff and state legislators met Wednesday to explore allowing Cate Street Capital to partner with the owner of several hydroelectric dams to sell electricity and create new revenue that could help restart the Main Street paper mill.

Democratic and Republican state legislators, government administrators and Cate Street leaders met in Augusta to further refine an idea broached between LePage and mill owner Cate Street Capital two weeks ago, which could result in a bill in 48 hours, said George Gervais, commissioner of the Maine Department of Economic and Community Development.

The bill would lift a state law that since 2002 has allowed dams on the Penobscot River owned by Brookfield Asset Management subsidiary Brookfield Renewable Energy Partners to generate power only for the East Millinocket paper mill, said Patrick Woodcock, Maine's energy director. The dams generate about 48 megawatts, he said.

Bangor Daily News - State seeks to revive East Millinocket mill by allowing Cate Street to sell electricity

Futura-supplied converting line starts up at Forest Papir’s Lábatlan tissue plant in Hungary

LUCCA, Italy, Feb. 14, 2014 (Press Release) - Forest Papir of Hungary has started up a technologically advanced new converting line supplied by Futura. The line was officially inaugurated at a ceremony at the company's Lábatlan headquarters in December.

Dedicated to roll products, the Futura installation comprises the usual key converting elements and includes a JOI embosser. The investment will allow Forest Papir to expand its range of roll products, enhance quality and increase production flexibility.

Originally a trading organisation when founded in 1994, Forest Papir today converts in-house most of the products it sells. This includes branded and private label tissue for both domestic and away-from-home use.

Forest Papir supplies Hungary, neighbouring markets and further afield with toilet tissue, kitchen towel, facial tissue and paper napkins. The company delivers to 19 countries in total.

Forest Papir has a reputation as an innovator, having introduced the 24-roll toilet paper pack to the Hungarian market, as well as the first
WHO’S DOIN’ ANYTHING?: (CONTINUED)

perfumed and coloured tissue in 100-sheet packs. The company also pioneered the centre-feed multi-purpose towel concept for Hungary's retail market.

Waggeryd Cell installs CrillEye measurement, developed by PulpEye and Innventia, at its CTMP mill in Sweden

ORNSKOLDSVIK, Sweden, Feb. 11, 2014 (Press Release) - The first mill installation of CrillEye, developed in cooperation between PulpEye and the Swedish research institute Innventia, has been installed and is successfully running at Waggeryd Cell in Sweden. Important pulp strength properties can now be predicted online, which contributes to a stable pulp quality, quicker grade changes and reduces man-hours for lab tests.

Waggeryd Cell is a privately owned producer of bleached softwood CTMP with an annual capacity of 175,000 tonnes. The production line has three-stage refining, peroxide bleaching and ends with a flash dryer.

The crill measurement is based on comparison of two optically measured surface areas (light absorption). The total area of fibres and crill is measured with UV. The total area of fibres only is measured with IR. The “crill variable”, KFP, is a concentration independent ratio, obtained when the fibre-crill area (UV) is divided by the fibre only area (IR). No image analysis is required, making the measurements extremely fast.

“In reality this means that tear, tensile, burst index, Scott Bond and density can be calculated by this technology,” says Öjvind Sundvall, MD PulpEye AB. “As the CrillEye measurements are online, new calculations can be provided every five to fifteen minutes and less man-hour are required for doing these tests manually in the laboratory. Laboratory tests are only needed for calibrating the CrillEye equipment.”

“We measure crill on all our pulp types and by combining crill data with fibre data, PulpEye provides us with the necessary strength properties online”, says Mikael Nylander, Mill Manager at Waggeryd Cell. “This gives us quicker grade change, which is important as we have a great number of qualities and each quality is unique to each customer. Thanks to CrillEye online measurement we are able to run closer to our targets, which mean energy savings.

“We now have a faster and more accurate quality follow-up and the pulp quality to the customer is defined from PulpEye”, Ulf Karlsson, President at Waggeryd Cell AB adds. “Needless to say, we are very happy with this investment”.

PulpEye AB is an innovative measurement technology company, focusing on online applications and services for the pulp and paper industry globally. Main products are the PulpEye pulp analyzer and the ScanChip chip analyzer. Head office is in Ornsköldsvik, Sweden. Offices are in Ornsköldsvik, Friedrichshafen, Ottawa and Vancouver, Sundsvall and Västerås.

Waggeryd Cell AB is a BCTMP producer, wholly owned by ATA Timber AB, a major Swedish producer of sawn timber. The woodchip comes mainly from the saw mills belonging to the Group. Annual production capacity is 175,000 tonnes. The main part is exported, out of which Asia accounts for about 60%. Waggeryd Cell has a net turnover of about 400 million SEK and has 43 employees.

Eindhoven University of Technology develops new process delivering 40% energy savings for paper plant

EINDHOVEN, The Netherlands, Feb. 13, 2014 (Press Release) - Eindhoven University of Technology has signed an agreement with 14 European paper producers to further develop a breakthrough solvent that promises massive plant energy savings.

Developed and patented by professor Maaike Kroon, it is also expected to improve the efficiency of raw materials usage.

“This is a game changer, and it means the paper industry will look very different 20 years from now,” comments Henk van Houtum, chairman of VNP, the Royal Netherlands’ paper and board association.

Kroon discovered that wood fibres dissolve in deep eutectic solvents (DES). He explains that in paper production, vegetable material (lignocellulose), such as wood chips or other biomass, has to be separated into lignine and cellulose.

The cellulose is then used to make paper. The problem is that the two components are difficult to separate - requiring high pressures and temperatures, and hence also energy cost.

The new solvent, which is vegetable-based and biodegradable, for the first time enables wood chips to be dissolved. Furthermore, the new process produces very pure lignine, which the paper industry can use to develop new applications and markets such as making biodegradable plastics.

DES were discovered in 2003 in the UK. They consist of a mix of two compounds which have a much lower melting point than that of the individual components.

Kroon believed that DES would make it possible to dissolve biomass, which formed the starting point for her present work.

Maaike Kroon has been professor of Separation Technology since 2010 in the Eindhoven University of Technology, Department of Chemical Engineering and Chemistry. She was 29 on her appointment, making her the youngest professor in the Netherlands.

Southwest Renewable Energy to reopen former Precision Pellets mill in AZ [From the web]

SNOWFLAKE, AZ, Feb. 14, 2014 (Local News) - While it may not mark the return of the timber industry as such in the White Mountains, the owners of Southwest Renewable Energy have purchased and taken over a wood pellet plant, providing local employment.

The company has three partners, Tracy Wilson, Dan Holderman, and Allen Kauffman.
IS CONDUCTIVITY THE BEST MEASUREMENT FOR BLACK LIQUOR CARRY OVER MEASUREMENT??

BY

NICLAS ANDERSSON, PhD
R & D MANAGER, BTG INSTRUMENTS (SWEDEN)
CAROLINE WILKE, KARLSTAD UNIVERSITY (SWEDEN),
BTG INSTRUMENTS (SWEDEN)

TOM BIAZZO, RICK VAN FLEET, SANDY BENDER-MILLER
BTG INSTRUMENTS (AMERICAS)

ULF GERMGÅRD, KARLSTAD UNIVERSITY (SWEDEN)

PRESENTED AT THE 2014 PAPERWEEK CANADA ON WEDNESDAY, FEBRUARY 5 AT THE FAIRMONT QUEEN ELIZABETH HOTEL IN MONTREAL, QUEBEC, CANADA
Is Conductivity the Best Measurement of Bleach Plant Carryover?

Niclas Andersson¹, Caroline Wilke¹,², Tom Biazzo³, Rick van Fleet³, Ulf Germgård², Sandra Beder-Miller³

1. BTG Instruments AB, Industri gatan 1-3, SE-66129 Säffle, Sweden.  
2. Karlstad University, SE-65188, Karlstad, Sweden. 
3. BTG Americas Inc, 5085 Avalon Ridge Parkway, Norcross, Georgia 30071, USA.

ABSTRACT

Kraft Pulp Mills have struggled with how to quantify black liquor carryover into the bleach plant. Current on-line kappa testing measures only lignin bound to the fiber from a washed pulp sample. The dissolved lignin in the filtrate accompanying the pulp into the bleach plant has been measured in-line by indirect methods such as pulp conductivity, D100 residual measurement or D100 washer brightness. These methods are only surrogates of the true measurement that is needed for D100 Chlorine Dioxide Chemical Control. Conductivity measures inorganic sodium salts. An assumption is made that the inorganic to organic compounds ratio remains stable with the majority of organic material being dissolved lignin. From this conductivity measurement, we infer the amount of dissolved lignin or the organic portion because there is currently no direct measurement of dissolved lignin.

A new sensor has been developed that can directly measure dissolved lignin content in the pulp slurry using a unique principle based on optical measurements. It has the ability to perform the measurement of the dissolved lignin inline even at medium consistency condition. The dissolved lignin concentration is highly correlated to COD and filtrate kappa. The sensor has two major applications: (i) improving efficiency in washing stages, and (ii) optimizing bleach plant chemical charges. Results from several mill trials have shown that the contribution from dissolved lignin in the filtrate portion of the pulp is up to 30% of the total bleach load, i.e. fiber and filtrate kappa number combined into the bleach plant. Correlations between the new sensor and filtrate kappa exceed 0.96 R-Squared whereas; the correlation of conductivity and filtrate kappa is only 0.46. Inaccurate measurement of dissolved lignin would lead to overuse of chlorine dioxide at the D100 stage.

INTRODUCTION:

Bleach Plant Operators have been long been challenged with how to process variable quality pulp entering the bleach plant for the lowest cost. The pulp can have high or low “carryover” which is the amount of black liquor solids entering the plant along with the pulp. The amount of carryover is due to a variety of reasons such as:

- Upsets in brown stock washing in advance of the bleach plant
- Shower flow limitations
- Recovery limitations

The literature has shown that black liquor in the bleach plant adds to chemical costs. Consumption has been expressed as (1):

- 1 kg of chlorine per 1 kg black liquor measured as sodium sulfate
- 2 kg of chlorine per kg of carry-over as lignin
- 0.5 kg equivalent chlorine per kg of total dissolved solids
The best solution is not to send carryover to the Bleach Plant. This is always not possible due to aging washing equipment and the operational considerations cited above. The challenge is to accurately quantify the amount of black liquor accompanying the pulp into the bleach plant. The chlorine dioxide dosage calculated from kappa factor control does not include carryover since it is based on a washed pulp sample. Operators have employed a variety of methods to account for the dissolved lignin since it is the first to consume the chlorine dioxide dosed at the Do stage. Measuring conductivity at the end of the brown stock washing or incoming to the bleach plant has been used as indicator of pulp cleanliness due to its low cost and ease of use.

There is a flaw in using conductivity as an indicator of carryover. Conductivity is based on the measurement of the ionic sodium species in the liquor, inorganic phase. Conductivity does not directly measure the organic phase, the dissolve lignin. It is assumed that the inorganic/organic phase remains constant so a relationship can be built between the conductivity and dissolved lignin. In short time frames this ratio assumption is good enough but over time it is believed that the relationship does not hold up. This is due to changing white liquor concentration (TTA/EA), liquor to wood ratios in digesters, the extent of delignification in the digester, wood species changes and other seasonal effects.

Sodium measured in the pulp leaving the brown stock washers has also been used to evaluate cleanliness of the pulp entering bleach plant. This test is reported to the bleach plant operator who will factor this result into how much extra chlorine dioxide must be added to account for dirty pulp entering the bleach plant. Sodium does not consume chlorine dioxide but the dissolved organic component carried over in the pulp does. Stromberg, Fig 1, has shown that at the same saltcake loss, the dissolved organic component can vary up to 4 times when compared between several mills. The organic component, or dissolved lignin, can be quantified by Chemical Oxygen Demand (COD) or Filtrate Kappa. Until recently, there were no on-line sensors to measure these parameters. The operator would run COD on a periodic basis and relate to an in-line conductivity meter. COD tests are time consuming and take several hours to complete. The test results are reported long after the pulp condition was sampled and the operator is left to guess at the amount of additional chemical to add to the incoming pulp at the Do.

Figure 1. Stromberg: Washing for Low Bleach Chemical Consumption (2)
EXPERIMENTAL

Inline Dissolved Lignin Measurement

The strong light absorption of the lignin molecule in the UV-VIS (ultraviolet and visible) region due to its aromatic structure is well known and it is employed in currently used technology for automatic fiber lignin content measurement typically expressed as Kappa number. It can also be used for determination of dissolved lignin by light transmittance measurement. However such a measurement can only be performed on a filtrate i.e. without fibers and can thus only be conducted on a pure filtrate stream where the fibers have been filtered off. The hereby presented new sensor for measurement of the concentration of dissolved lignin however employs a unique principle capable of resolving the filtrate’s light absorbance in the presence of pulp fibers. As shown in Figure 2 using a small measuring volume the time periods corresponding to measurement of only the filtrate portion can be identified and used to calculate the light transmittance and absorbance, and subsequently to determine the dissolved lignin concentration.

![Diagram](image_url)

*Figure 2. Probe with measuring gap (left) and principle signal extraction (right) of new dissolved lignin sensor.*

A common understanding is that determination of lignin should be performed in the UV. Under the assumption that the absorbance measured by the new sensor is directly related to the dissolved lignin concentration, no calibration is required unless for scaling into e.g. filtrate Kappa number using one reference sample only (see next section). Furthermore assuming that the Chemical Oxygen Demand (COD) correlates with the dissolved lignin concentration, one can choose scaling into COD output, again using only one reference (COD) sample. Hence the sensor is operative principally immediately after installation.

Filtrate Kappa number Measurement

So-called filtrate Kappa number has been used as a measure of the concentration of dissolved lignin of the filtrates. This parameter has thus been used for calibration and follow-up of the performance of the new sensor. The filtrate Kappa number method is very similar to the standard (fiber) Kappa number method of Tappi and SCAN but uses a certain volume of filtrate as the basis and thus
provides filtrate Kappa number per ml of filtrate (compared with Kappa number per gram of fiber). In order to relate to the fiber Kappa number, and to calculate the total Kappa number (fiber + filtrate Kappa number), the consistency of the pulp is used for weighing the two sources. In a feed to bleach position the total Kappa number can be expressed as the total bleach load. However, this assumes that the permanganate consumption is a relevant measure of the remaining bleaching chemical demand for both the fibers and the filtrates.

RESULTS AND DISCUSSION

The presented work was focused on mill studies but some basic laboratory trials were also made to verify the principle of the new sensor, and to understand the characteristics compared with current technologies used in mill applications.

Laboratory Investigations

In order to understand how currently used technologies are affected by the content of inorganic matter in the studied black liquors, changes were made of the NaOH and the NaCl concentrations in mill filtrate samples.

According to Figure 3, it can be seen that the conductivity and refractive index show a significant dependence on the chemical additions. It should be noted regarding refractive index that very small absolute changes occur in general and a difference of only 0.0010 units corresponds to half of the total range of filtrate Kappa number variations for the laboratory samples taken (being 4-10 filtrate Kappa number units in this position; pre-O2). The new sensor for dissolved lignin, as expected, was practically unaffected by the chemical additions; less than 0.5% relative to the range of variation of the filtrate Kappa samples.

![Graphs of Refractive Index and Conductivity against pH and NaCl concentration](image)

Figure 3. Effect of pH (left) and addition of NaCl (right) to mill pulp samples on refractive index and conductivity.

Mill Investigations

The new sensor has been installed in several pulp mills and in different positions. Two cases are described in the following.

Case 1. Brown stock washing control. This softwood sulfite pulp mill has nine batch digesters which feed a single blow tank. Depending on the pulp grade the digesters can yield between 18 and 24 batches per day, over a large Kappa number range. Pulp is pumped from the blow tank to a
horizontal belt washer. The consistency of this pulp feed is controlled by a consistency controller which manipulates the flow of dilution water.

Figure 4 shows data from the new sensor versus the corresponding filtrate Kappa number for a brownstock washing installation. It is clearly seen that there is a very good linear correlation between the sensor signal and the filtrate Kappa number. Thus, it is possible for the pulp mill to regularly obtain information on the amount of dissolved lignin in the pulp slurry. Combining this information with the liquor volume per ton of pulp and production rate it is possible to calculate the dilution factor (DF) in this fiber line position.

Figure 4 also shows the new sensor signal vs. COD for the same fiberline position and also on this case there is a linear correlation. Thus it is possible to replace the tedious, costly and environmentally problematic COD test with the signal from the new sensor.

The mill uses the value of the dissolved lignin to modulate the wash water applied to the brownstock washing system. The dissolved lignin value is also indicative of a certain final product specification. This allowed the mill to maintain final product specification for numerous grades of pulp produced at the mill as well as optimize the liquor solids to the spent liquor recovery system (4).

![Graph](image)

**Figure 4. Filtrate Kappa (per mL, filled symbols, left axis) and COD (mg/L, circles, right axis) vs. the new sensor's raw signal output. Data from case 1.**

**Case 2: Feed to bleach carryover measurement.** The inline sensor was installed before a wash press prior to the D₀ stage of a softwood kraft pulp mill, at a pulp consistency of 4-5%. Figure 5 trends the sensor output during a period of 70 days, scaled to filtrate Kappa number, along with laboratory reference data (69 samples). The fit between the sensor trend and the reference data is very good. This is also seen in Figure 6, showing both filtrate Kappa number and COD vs. the sensor's raw signal, both with correlation coefficients $r^2$ above 0.97. The variability of the dissolved lignin concentration is also quite remarkable. Assuming an average pulp consistency of 4.5% and a filtrate density of 1 g/ml, one filtrate Kappa number unit (i.e. per ml filtrate) corresponds approximately to a Kappa number of 21 on fiber basis i.e. even more than the fiber Kappa number which typical level is indicated in Figure 7.
Figure 5. A 70 day trend of the new sensor predicted and laboratory determined filtrate Kappa number of the pulp. The Data is from case 2.

Figure 6. Filtrate Kappa number (per mL, filled symbols, left axis) and COD (mg/L, circles, right axis) vs. the new sensor’s raw signal output. The Data is from case 2.
Figure 7. Pre-$D_0$ fiber Kappa number vs. time (days), indicating typical variability. The data is from case 2.

The sensor was also installed after the wash press before the $D_0$ stage where the inlet pulp consistency to the stage was 8-10%. The filtrate Kappa number on laboratory samples varied between 0.06-0.23 with an average of 0.16 (per ml). At 9% consistency this corresponds to an average of 1.6 Kappa number units on a fiber basis, i.e. approximately 10% of the total Kappa number or bleach load. However, the variability of the filtrate Kappa number corresponds to approximately +/-1 Kappa number unit (on fiber basis) which must be considered significant relative to the fiber Kappa number variability. Based on data for fiber Kappa number variability in this position, approximately 1/3 of the total bleach load variability originates from the filtrate Kappa number variability, i.e. carryover, and subsequently approximately 2/3 from the fiber Kappa number variability.

Practical implications of the current results, scope of further studies:

- The conditions determined in a pre-$O_2$ position show filtrate Kappa number averaging at 7 and ranging between 4-10 (Kappa number units per ml filtrate) for laboratory samples. With 10% consistency this filtrate Kappa number corresponds to 63 Kappa number units on fiber basis (ranging 36-90). The target cooking Kappa number is 30 at this mill.

The findings from studying the pre-$O_2$ position, where evidently most of the ‘total’ Kappa number (i.e. permanganate consuming compounds) are in the filtrate portion of the pulp, also requires further investigation. Even though chemistry is quite different, such high levels imply it will affect the conditions.
CONDUCTIVITY VERSUS COD

Tests were conducted in a Scandinavian mill prior to Oxygen delignification to demonstrate the relationship between COD, Filtrate Kappa and Conductivity, Figs 8 and 9.

The weak correlation is shown to be slightly over 0.40 for COD versus conductivity. The industry has long accepted the relationship carryover expressed as COD potentially will consume 1 to 1.5 of chlorine dioxide. The economic impact using this relationship on a 1000 ton per day mill with 350 operating days and chlorine dioxide at $1.00 per kilogram would result in $350,000 additional chemical costs per year.

Figure 8: Pre O2 Delignification data from Scandinavian Mill

Now consider that an inaccurate quantification of COD is used in the kappa factor control strategy at the Do stage. The simple linear relationship shown in figure 2 will over estimate the amount of COD 67% of the time and under estimate the amount of COD 33% of the time. This will lead to a misapplication of additional chlorine dioxide. A similar weak relationship holds for Filtrate Kappa expressed on a per gram basis and conductivity. Because of this inaccuracy using conventional sensors, the new sensor will have a payback of 2 months compared to a conventional conductivity measurement.

Figure 9: Pre O2 Delignification data from Scandinavian Mill
The COD and Filtrate Kappa tests were compared to the in-line dissolved lignin transmitter, Figs 10 and 11. The correlation was very strong and well over 0.90 R-Squared. A single point calibration was required to relate the UV absorbance signal from the dissolved lignin transmitter to the desired laboratory test.

Figure 10: Dissolved Lignin Transmitter predicting COD

Figure 11: Dissolved Lignin Transmitter predicting Filtrate Kappa
CONCLUSIONS

The key conclusions based on the present study are as follows:

- An inline sensor for dissolved lignin has been validated in laboratory and mill trials in several mills and positions from pre-O2 to pre-D0. The sensor’s correlation with dissolved lignin as filtrate Kappa number and COD is very high.
- The sensor operates inline in the pulp stream, at LC and MC conditions. It is principally pre-calibrated and requires only one sample for scaling for desired output.
- The investigations using the sensor have revealed that the dissolved lignin in the filtrate has a significant share of the total Kappa number and that it contributes to a large part of total variability thereof.
- The sensor can be applied for washing control, i.e. for optimization of the use of wash water with respect to e.g. energy consumption in evaporation and pulp cleanliness. In a mill application the sensor output is used as a valuable tool for modulation of dilution factor and the overall control of the brown stock washing system.
- The sensor can be applied for control of charging of bleach chemicals. Together with the fiber Kappa number the total bleach load can be calculated for optimizing process performance.
- According to the present findings the dissolved lignin is likely a key process parameter but so far not possible to measure inline for control purposes. The new sensor for dissolved lignin opens up for new opportunities in optimizing fiberline operation.
- The new sensor directly measuring dissolved lignin in the filtrate is a more accurate and reliable measurement for process control purposes than other current technologies e.g. conductivity and refractive index.

ACKNOWLEDGEMENTS

The excellent cooperation with Honeywell is acknowledged in Case 1, “Brown stock washing control” for developing and implementing the APC solution.

References

1. Pulp Bleaching, Principles and Practice, Dence and Reeve, pp 583-584 (1996)
Is Conductivity The Best Measurement For Black Liquor Carry Over Measurement??

Niclas Andersson, PhD
R & D Manager, BTG Instruments (Sweden)

Caroline Wilke, Karlstad University (Sweden), BTG Instruments (Sweden)

Tom Biazzo, Rick van Fleet, Sandy Beder-Miller
BTG Instruments (Americas)

Ulf Germgård, Karlstad University (Sweden)
Traditional Process Control
Kappa + Conductivity

- O2 Delignified Pulp
- Unbleached Fibers
- Black Liquor
- Fiber Bound Lignin
- Inorganic Compounds Na⁺ Salts
- Kappa Analyzer
- Conductivity
Black Liquor Adds to Chemical Costs

• Consumption reported as:
  – 1 kg $\text{Cl}_2$ per 1 kg black liquor measured as sodium sulfate
  – 2 kg of $\text{Cl}_2$ of carry-over as lignin
  – 0.5 kg equivalent $\text{Cl}_2$ per kg of total dissolved solids
How Can WE Directly Measure Dissolved Lignin??

- O2 Delignified Pulp
- Unbleached Fibers
- Black Liquor
- Fiber Bound Lignin
- Kappa Analyzer
- Dissolved Lignin

??????
Measuring Lignin

• Degree of delignification – (Kappa Number): the only pulp parameter measured on-line.

• Control process conditions
  – Temperature, pH, OH⁻, ClO₂

• Kraft SW cooking K=30, example:
  – Wood 27% lignin (o.w.)
  – Pulp ~5% lignin (o.p.), i.e. ~2.5% o.w.
  – ⇒ 90% delignification
DLT: A New Sensor for Measuring Carry Over

- O2 Delignified Pulp
- Unbleached Fibers
- Black Liquor
- Fiber Bound Lignin
- Dissolved Lignin
- Kappa Analyzer
- DLT
Filtrate Kappa Measurement Principle: UV Absorbance

- Lignin has strong absorption in UV (-VIS)
- Wavelength not critical
  - Lignin dominant in UV-VIS
- Output directly proportional to DL
- DL quantified as Filtrate Kappa (or COD)
  - Per ml filtrate
  - Can be recalculated to “gram fiber basis” with consistency
Applications for Dissolved Lignin Measurement

1. Sulfite & continuous digester recirculation
2. Pre O₂ Delig
3. Brown Stock washing
4. Do feed
5. Board machine head box
6. Waste water
Example of Conductivity Correlations:
Samples taken prior to $O_2$ Delig

\[ y = 8.419x - 3.3738 \]
\[ R^2 = 0.4096 \]
Example of Conductivity Correlations:
Samples taken prior to $O_2$ Delig
Conductivity = Organics + Inorganics

Assumption: Organic to inorganic ratio is constant.

- Impacts on Conductivity
  - Kappa out of digester
  - Liquor-to-Wood ratio
  - White liquor charge
  - Wood age and other disturbances
Case 1: Brown Stock Washing

- Sulfite dissolving pulp, large Kappa range
- Belt washer, multi-stage, 2% Cs
- Used as key control variable in Advanced Process Control

- COD specification, grade dependent
- Controls DF
- DS to recovery

Graph: Filtrate Kappa (per mL) & COD (mg/L) vs. sensor signal

- Filtrate Kappa (per mL)
- COD (mg/L)

R² = 0.9496

R² = 0.9501
Case 2: Feed to Bleach
Background and Trend

- Bleached SW Kraft pulp
- Before wash press before $D_0$ stage, 4.5% Cs
- To monitor washing performance upstream
Case 2: Feed to Bleach Close-up

- 2 week data
Case 2: Feed To Bleach Correlations

- Large variability
- Excellent correlation with Filtrate Kappa number and COD
- Filtrate Kappa = 1 per ml corresponds to ~21 Kappa units on fiber basis, i.e.
- “per gram fiber” (4.5% Cs)
Case 2: Feed to Bleach after Wash Press

- Filtrate Kappa = 0.16 (1/ml)
  - Corresponds to 1.6 Kappa units on fiber basis at 9% Cs
  - Average Fiber Kappa = 13.0
  - Bleach Load = 14.6
  - Filtrate Kappa ~11% of total Bleach Load...
Case 2: Feed To Bleach After Wash Press

- ...but 1/3 of total Kappa variability:

- To be investigated:
  - ClO₂ consumption of Dissolved Lignin (calibrate sensor to ClO₂ demand)
So, Is Conductivity Good Enough?

There is a flaw in using conductivity as an indicator of carryover.

• Conductivity is based on the measurement of the ionic sodium species in the liquor, inorganic phase.
• Conductivity does not directly measure the organic phase, the dissolved lignin.
• It is assumed that the inorganic/organic phase remains constant so a relationship can be built between the conductivity and dissolved lignin.
Comparing Dissolved Lignin vs. Conductivity

Dissolved Lignin Transmitter Predicting COD

\[ R^2 = 0.9225 \]

Conductivity Vs. COD

\[ y = 8.419x - 3.3738 \]

\[ R^2 = 0.4096 \]
Comparing Dissolved Lignin vs. Filtrate Kappa

Dissolved lignin Transmitter Predicting Filtrate Kappa

Filtrate Kappa vs. Conductivity

$R^2 = 0.9659$

$R^2 = 0.4625$
Effect of pH and Sodium Salts on Measurement Technology
What does a Poor Correlation Cost Mills?

- The weak correlation is shown to be slightly over 0.40 for COD versus conductivity.
- The industry has long accepted the relationship of carry over expressed as 1 Kg COD will consume 1 to 1.5 Kg of chlorine dioxide³.
- The economic impact using this relationship on a 1000 ton per day mill results in a 2 month payback for new sensor vs. conductivity.
Conclusions

• New inline sensor for dissolved lignin validated in several mill trials
  – Very high correlation calibrated for Filtrate Kappa and COD
  – Low and medium consistency applications
  – Pre-calibrated

• Brown Stock washing control
  – Balance e.g. evaporation energy need and pulp cleanliness

• Bleach chemicals control
  – Kappa: Total = Fiber + Filtrate
  – Dissolved lignin major contributor – large variability

• Results suggest dissolved lignin is a key parameter
  – Opportunities for optimized operations
Acknowledgements

• The **Knowledge Foundation** for financial support
• **Honeywell** for cooperation in Brown Stock washing case
Thank You for Your Attention!
**PRODUCT SHOWCASE: ADVANCED FLOW TECHNOLOGIES IMPROVE PRODUCTIVITY**

By

**HELENE CASELLAS, PRODUCT MANAGER, ROSEMOUNT FLOW, EMERSON PROCESS MANAGEMENT**

Selecting and installing the right technology for effective flow measurement in mill processes reduces variability enabling improvements in plant performance and productivity.

Mill operators are constantly looking for ways to improve plant performance and productivity against a background of high energy costs and environmental sustainability. In a highly competitive market it is increasingly important to maximise production by closely monitoring production processes to ensure that they are operating at maximum efficiency. By deploying advanced measurement and control capabilities, process variability and unscheduled downtime can be reduced and maintenance costs minimized.

Many processes in the pulp and paper industry rely on the stable and accurate measurement of flow. However, the industry poses special challenges for instrumentation, including noisy stock flows, aggressive chemicals, abrasive materials, and high process temperatures. Selecting and installing the right technology for individual applications is therefore critical for effective flow measurement in the mill environment.

Figure 1 - Emerson’s E-Series flow meter can be connected wirelessly to IEC 62591 (WirelessHART) networks
Magnetic flow meters are widely used

Figure 2 - Using a higher drive frequency increases the signal to noise ratio providing a stable output

Process noise

Noisy stock flow is caused by fiber impinging on the magnetic flow meter electrodes resulting in unstable control and excess variability. In applications like pulp stock slurries, the properties of the process fluid can lead to an unstable output from the flow meter. If the flow meter output is driving a valve, this will cause excessive travel in the valve's position as it tries to keep the flow rate steady at a set point. This results in increased valve wear and a greater need for maintenance. Adding damping may make the output look stable, but the flow meter's response time to actual process changes is compromised, making it slower to respond to actual process changes. The end result of excessive damping can be a very inconsistent, out of control process. While the flow meter output and valve travel may be indicating steady process flow conditions, they may just be hiding what is really happening which could be an increase in process variability.
To overcome this problem, instead of increasing the damping, some flow meters allow the user to change the characteristics of the device, for example by using a higher coil drive frequency. In many noisy applications, this has the effect of providing a stable output and maintaining a fast response time.

**Selecting the right materials**

The harsh chemicals used in the pulping process, such as caustic and high concentration bleach chemicals, combined with high process temperatures and abrasion due to pulp stock solids, provide unique challenges for magnetic flow meters. Selecting the best liner and electrode materials is critical to extending operational life and minimizing the issues associated with meter failure.

Teflon is the most commonly used liner material in the mill due its good resistance to chemicals and abrasion. Electrode materials can be matched to provide corrosion resistance for the specific chemicals. Beyond basic material selection, the mill can take additional steps to significantly extend meter life in the most challenging applications.

The most aggressive applications in the mill maybe black and white liquor, where the combination of high temperatures and harsh chemicals can drive permeation in Teflon liners. As there is a trend within mills to increase production and efficiency by increasing temperature, an increase in the incidence of permeation is being observed.

Permeation rates can be affected by temperature gradients where the heat moves from the hot process fluid towards the ambient surroundings, driving fluid permeation. Resistance to permeation can be increased by selecting the correct Teflon resin, manufacturing the liner in a manner that increases resistance, and increasing its thickness. Most flow meter manufacturers offer a choice of liner materials and can advise on compatibility with different media.

The importance of ground wiring

To ensure a magnetic flow meter performs accurately, it is important that it is correctly grounded. Improper grounding and wiring is the number one cause of magnetic flow meter issues. This can occur in new installations where the magnetic flow meter is not properly referenced to the process and in existing installations where corrosion, for example caused by an aggressive environment, results in deterioration of the electrical ground wire. Poor grounding allows electrical noise to be picked up by the sensor electrodes and consequently affects the signal to noise ratio and the stability of the transmitter output.

One way to resolve this issue is to use a flow meter with a built-in ground/wiring fault diagnostic as found in Emerson’s Rosemount E-Series Magmeter. This works by specifically looking at the signal amplitude at frequencies of 50 Hz and 60 Hz which are the common AC cycle frequencies found throughout the world. If the amplitude of the signal at 50 Hz or 60 Hz exceeds 5 mv, the diagnostic alert will activate indicating that the ground and wiring of the installation should be carefully examined. The diagnostics can be accessed through the meter’s Local Operator Interface, downloaded to a portable device, or viewed using asset management software which allows trouble shooting from a central control room.

Figure 3 - Rosemount 8700 magnetic flow meter has helped to increase paper production by 1.5% at Norske Skog, Styria mill

**Meter verification**

Certain applications require regular calibration of flow meters and traditionally this means that the measuring device has to be removed from the line to be calibrated. During this time a spare meter is installed so that the process can continue to operate while the original meter is being verified. This process often incurs third party costs and results in lost production.

As an alternative, there are now magnetic flow meters that have the ability to carry out a self-verification test - alerting the operator when the calibration drifts outside set parameters.
Summary

Magnetic flow meters are widely accepted as the primary flow technology used in the mill, however problems such as noisy stock flows, aggressive chemicals, abrasive materials, and high process temperatures means that selecting and installing the right technology for individual applications is critical.

Powerful diagnostics in the latest generation products and features such as meter self-verification make magnetic flow meters easy to install and use. The accurate and reliable data enabled helps users better manage their production processes by increasing availability, reducing maintenance and operating costs, and improving product quality.

Case study

A good example of where a pulp and paper manufacturer has benefitted from correctly selecting and installing advanced magmeter technology is at Norske Skog in Styria, Austria.

Norske Skog had installed a magnetic flow meter in the basis weight flow line at its production plant. The mill was experiencing instability in the output from the flow meter which meant it was unable to reliably run its basis weight control loop in automatic mode. Even with the damping applied in both the meter and the control system, there was still too much noise to control the speed of the basis weight pump effectively.

In addition, the heavy damping meant that the system was very slow to respond to changes to the process. For example, after pipe cleaning operations with a caustic soda solution, it would take up to 20 minutes for the meter to respond to a change in flow rate. The manufacturer of the flow meter was unable to provide a solution to combat the noise issue.

To compensate for the unstable signal from the basis weight flow meter and ensure the final paper product met quality specifications, the basis weight set point had to be set higher than the desired target point.

Following discussions with Emerson Process Management, Norske Skog installed a 16-in. Rosemount E-Series magnetic flow meter with the high process noise diagnostic on a trial basis. After installation, the high process noise diagnostic indicated a low signal to noise ratio at 5 Hertz. By changing the coil drive frequency to 37 Hertz, the noise was significantly reduced and within an hour of operation, there was enough confidence in the stability of the signal that automatic control of the loop was restored.

By reducing the measurement variation, the customer is now able to more accurately control the process and this has resulted in reduced raw material usage and cull, helping to increase paper production by 1.5%.
LETTERS TO THE EDITOR

Send your comments on this newsletter to me at brad.carlberg@bsc-engineering.com or post a message to the ISA PUPID Technical Discussion Forum List Serve & “get something started”!

You can reach the site at http://www.isa-online.org/cgi-bin/wa.exe?A0=PUPID or by going to the PUPID or the main ISA websites and looking for the “ISA Technical Divisions”
L I N K S  T O  R E L A T E D  W E B S I T E S

ISA PULP & PAPER WEBSITE
http://www.isa.org/~pupid/

ISA PULP & PAPER TECHNICAL DISCUSSION FORUM
http://www.isa.org/scripts/lyris.pl?enter=pupid&text_mode=&lang=english

ISA TECHNICAL CONFERENCE SESSION SCHEDULE
http://www.isa.org/Template.cfm?Section=Conferences_and_Exhibitions&template=taggedpage/conferencesbydate.cfm&icid=61

PULP & PAPER RESEARCH INSTITUTE OF CANADA
http://www.paprican.ca/

TAPPI
http://www.tappi.org/

PIMA
http://www.pimaweb.com/

AMERICAN FOREST AND PAPER ASSOCIATION
http://www.afandpa.org/

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
http://www.nspe.org/

SWEDISH ROYAL INSTITUTE OF TECHNOLOGY
http://www.pmt.kth.se
http://www.hit.fi/English/

HELSINKI UNIVERSITY OF TECHNOLOGY
http://www.hut.fi/English/

TECHNICAL ASSOCIATION OF THE AUSTRALIAN AND NEW ZEALAND PULP & PAPER INDUSTRY (APPITA)
http://www.appita.com.au

AUSTRALIAN PULP & PAPER INSTITUTE

ISO STANDARDS TECHNICAL COMMITTEE LIST

ISA STANDARDS COMMITTEES LISTSERVER
http://www.isa.org/shellcgi/lyris.pl?site=isa&page=topic&topic=standards+committees&text_mode=0&lang=english

Q U I C K I E S

ISA PULP & PAPER TECHNICAL DISCUSSION FORUM
Anybody (not necessarily an ISA or PUPID member) can subscribe to the PUPID Pulp & Paper Technical Discussion Forum. To subscribe, go to the PUPID homepage at http://www.isa.org/~pupid/, select "Pulp & Paper Technical Discussion Forum" in the pick box, click "Go", and enter you email address and a password.

ISA EMAIL ADDRESS FOR ALL MEMBERS
Any ISA member can register for a free email address and online mailbox. If you set it up, your ISA email address will be yourname@member.ISA.org. To register, go to http://www.isa.org/membership/benies/, and follow the registration instructions.

ISA PUPID CALENDAR
Get a quick overview of ISA PUPID events for 2002 by going to the Calendar at:
http://www.isa.org/~pupid/2002_PUPID_Calendar.htm
## WORLD CORNERS

### CANADA CORNER
Nothing from anyone there this time!

### CENTRAL & SOUTH AMERICAN CORNER
Nothing from anyone there this time!

### FAR EAST CORNER
Nothing from anyone there this time!

### FROM THE LAND OF THE MIDNIGHT SUN
Nothing from anyone there this time!

### EUROPEAN CORNER
Nothing from anyone there this time!
2012 Pulp & Paper Industry Division Officers

Director
Brad S. Carlberg, P.E.
BSC Engineering
brad.carlberg@bsc-engineering.com
(251) 454-1200

Past-Director
Paul Burnett
(203) 482-3553
paulburnett@att.net

Director - Elect
vacant

Education Chairman
Patrick J. Dixon
Dixon Process Automation Services, Inc.
PatJDixon@DPAS-INc.com

Advisor
Richard E. Britton, P.E.
Retired – International Paper
richardbritton1@comcast.net
(251) 342-0998

Advisor
Larry E. Wells, P.E.
CCSA, LLC
cxwllc@bellsouth.net

Paper Review Coordinator
vacant

Environmental Chairman
vacant

Secretary / Treasurer:
Vacant

Programs / H&A:
vacant

Standards & Practices
vacant

ISA Pulp & Paper Industry Division
P.O. Box 12277
Research Triangle Park, NC 27709

ADDRESS CORRECTION REQUESTED