Honorable Members of PUPID,

Well, it is already the third week of February and Mardi Gras is upon us. Don’t forget to get some beads!

Just like last newsletter, we still need a Director-Elect, and a symposia coordinator. The Director-Elect will train with me in 2012 and take over as Director for the 2013/2014 biennium. If you can only do it for a single year, then we can look at single terms. In return for the work, you’ll get your ISA Spring and Fall Conference expenses paid by the division.

I encourage you all to listen to some of the fourteen hours of audio from the ISA Automation Week 2011 conference. You can get the links on page 3 & 4 of this newsletter.

This September, the ISA Automation Week 2012 will be at the Orange County Convention Center in Orlando, Florida. If you’ve thought about getting involved with a technical conference and/or writing a paper, this is for you. You can bring the family to play at Disney World while you see all of the latest instrumentation and controls at the Fall conference.

Our division membership has increased from 436 to 450 members with 30 new division members since December. The membership has stayed nearly constant since last January Welcome to all of you new members!

I am also pleased to be able to include Ralph Lunn’s paper and see his presentation for “Energy Improvements At Zellstoff Celgar” from the Paperweek 2012 Conference at month in Montreal.

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 either (251) 454-1200 or 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.
Get a quick overview of the ISA PUPID events for 2011 by going to the Calendar at:
http://www.isa.org/~pupid/2012_PUPID_Calendar.htm

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**PaperCon 2012**
4/22/2012 to 4/25/2012
Sheraton New Orleans
New Orleans, LA
http://www.papercon.org/

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**2012 TAPPI PLACE Conference**
5/7/2012 to 5/9/2012
Grand Hyatt Seattle Seattle, WA USA
http://www.tappi.org/content/events/12place

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**Industry Application Society**
58th Annual Pulp and Paper Industry Conference
The Nines Hotel
Portland, OR
June 17 – 21, 2012
http://pulppaper.org/

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**66th Appita Conference & Exhibition**
4/15/2012 to 4/18/2012
Melbourne Park Melbourne, Australia
http://www.appita.com/

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**2012 ISA FALL LEADERS MEETING**
SATURDAY, SEPT 22 2012 AND SUNDAY, SEPT 23 2012

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**ISA AUTOMATION WEEK 2011**
MONDAY, SEPT 24 2012 THROUGH THURSDAY, SEPT 27 2012
ORANGE COUNTY CONVENTION CENTER
ORLANDO, FL

Come meet your leaders & get involved!

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**ABTCP 2012-45th Pulp & Paper International Congress & Exh**
10/9/2012 to 10/11/2012
Transamerica Expo Center
Sao Paulo, Brasil
http://www.abtcp2011.org.br/ingles/

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This Tuning Tip was excerpted from “” by from.
ISA Members can download this paper FOR FREE from the ISA website.
### Winter 2012

#### LISTEN TO THE TECHNICAL SESSIONS FROM ISA AUTOMATION WEEK 2011

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<td>Wednesday Session 2 (1:30 pm - 3:00 pm)</td>
<td><strong>Session Moderator:</strong> Brad S. Carlberg, P.E.; Invensys; Lake Forest, CA</td>
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### Wireless Track

#### Wednesday Session 3 (3:30 pm - 5:00 pm)

**New Technologies for Wireless Applications**

*Session Moderator: James (Lyn) Givens; Fluid Flow; Mobile, AL*

- **POWERPOINT** | **PAPER** | Energy Budgets of Thermal Harvesting for Powering Wireless Sensors - Burkhard Habbe
- **POWERPOINT** | **PAPER** | The Reliability of Wireless Mesh Networks in Industrial Environments - Brian Cunningham
- **POWERPOINT** | **PAPER** | Ethernet I/O - Jim McConahay

#### Wireless Track

#### Thursday Session 1 (10:00 am-11:30 am)

**Wireless Applications in Robotics, NC Machines, and predictive Maintenance**

*Session Moderator: Vincent LoPresti; Director - Process & Energy; PM Services, LLC; Mobile, AL*

- **POWERPOINT** | **PAPER** | Application of the next-generation emergency stop system utilizing functional safety wireless technology to outdoor life-supporting robots - Kazuya Okada
- **POWERPOINT** | **PAPER** | Wireless enables predictive maintenance for rotating assets - Jim Haza
- **POWERPOINT** | **PAPER** | Why Lord Kelvin Would Love MTConnect - Dave Edstrom

#### Wireless Track

#### Thursday Session 2 (1:30 pm-3:00 pm)

**"Ask The Wireless Experts" Panel**

*Session Moderator: Brad S. Carlberg, P.E.; Invensys; Lake Forest, CA*

- **PAPER** | **POWERPOINT** | Panelists:
  - Dr. Penny Chen Yokogawa; Palo Alto, CA
  - Brad Lazenby – N-Tron Inc; Mobile, AL
  - Wayne Manges – Oak Ridge National Laboratory
  - Jim McConahay – Moore Industries; North Hills, CA
  - David McKay – Wingtip LLC; Kennewick, WA
  - Eric Rotvold – Emerson Process Management; Twin Cities, MN
  - Steven Toteda – VP & GM - Wireless at Cooper Industries Ltd.; San Francisco Bay Area, CA
  - Ian Verhappen – Director at Industrial Automation Networks Inc.; Edmonton, AB

#### Wireless Track

#### Thursday Session 3 (3:30 pm-5:00 pm)

**Learn How The Oil & Gas Companies In Saudi Arabia And Northern Alberta Are Using Wireless**

*Session Moderator: Ric McNaughton; Maverick Technologies; Mobile, AL*

- **PAPER** | **POWERPOINT** | Aramco’s environmental monitoring data center - Paul Richards
- **POWERPOINT** | **PAPER** | Server Virtualization Services for Oil & Gas Applications: a User Prospective - Hassan Al Yousef
- **POWERPOINT** | **PAPER** | Wireless Application in Oil Sands Projects - James Wang
WELCOME TO THE 30 NEW ISA PULP & PAPER INDUSTRY DIVISION MEMBERS SINCE DECEMBER 2011

Charlie Ahn
Santiago Aquino Amaya
Mitch Cannington
Jason Dickey
Christopher M. Hurd
Mark Isbell
Maximillian George Kon
Samuel Allen Lipscomb
James B. Russell
Mario Andrei Cologni
Gordon D. Congdon
Prof. Jerker Delsing
Jack M. Griffin, Jr.
Daniel Kolligian
Benjamin N. Page
Michael A. Trombley
Ms. Danielle Valdivia
Jesus Balarezo
Diego Giovanni Cruz Cañenguez
Mauricio Estrada
Larry W. Hammett
Ahmik Bre Hindman
Ms. Sangeetha Jagannathan
Carlos Stanley Luna Rodriguez
Francisco Miguel Martinez Albanez
Dan Poole
Andrae D. Rauch
Ramgowri Shanmugavel
Karthick Srinivasan
Todd Chamney

HERE’S A REMINDER TO THE 32 ISA PULP & PAPER INDUSTRY DIVISION MEMBERS WHO NEED TO RENEW THEIR MEMBERSHIP

Dr. Puya Afshar
Calvin Bolwerk
Jay Capelle
David Chief
Emerson de Oliveira Lanna
Peter L. Den Hollander
Charles D. Enlow
Jesus G. Esquivel, Jesus Esquivel
Dr. Theodore Meyer Garver, Jr.
Terry V. Henry
James P. Huza
Paul Kerestedjian
Casey F. Kick
Shawn Peizhi Lin
Carl A. Lippens
Vaishali B. Mungurwandi
Senthilnathan Mylswamy
Andre Leme De Oliveira
Thomas H. Owen
Diwakar Pandian
Kevin M. Pearson
Jose Jorge Pedreira
Jeff Peshoff
Louis Pasquale Reeves
Stetson Ridley
Hal A. Shaw
Ms. Anne Slabbers
Timothy Spackman
Hiliard Richard Sumpter
Mrs. Mangayarkarasi
Thirunavukkarasu
Matthew J. Uzpen
Mark Whitley

DON’T FORGET TO RENEW!
**Who’s Doin’ Anything?:**

**Wood-fired power plant coming to Alberta**

CALGARY, AB, Feb. 17, 2012 (Market Wire) - Mustus Energy Ltd. today announced that it will be working with Lockheed Martin to build a new 41.5 megawatt biomass-fueled power generation plant in La Crete, Alberta, Canada. The project, which will be developed by Mustus Energy with Lockheed Martin's support in procuring materials, equipment and other required services, will provide enough energy when complete to power over 30,000 Canadian homes.

Lockheed Martin also will manage the construction of the plant, which is planned to commence this spring. The biomass facility is expected to begin commercial operations by the fall of 2013, and will provide base-load electrical power to the Alberta grid. As feedstock, Mustus Energy plans to use the tops of aspen trees that would otherwise be discarded as waste after the trunks are processed into lumber and other products at local mills.

"Adding Lockheed Martin to our team will help ensure the success of this and future similar projects. We are impressed with the level of support and expertise that Lockheed Martin brings to the Mustus team," said Ross Maxwell, chief executive officer, Mustus Energy Ltd.

"The La Crete biomass facility will provide Alberta with a domestic, secure power source, while preserving the environment. Working with Mustus, we will leverage our expertise in project management and complex systems to ensure the successful development of this facility," said Tom Digan, president and general manager of Lockheed Martin Canada.

Canada is a leader in developing and implementing biomass technologies. Six percent of Canada's power comes from biomass, making it the second largest source of the country's renewable energy generation.

**U.S. Paper Companies May Lose Son of Black Liquor Loophole**

USA, Feb. 10, 2012 (RISI) - Senate Finance Committee Chairman Max Baucus is trying to close the Son of Black Liquor tax loophole that has already provided U.S. paper makers with a windfall of more than $1 billion.

The committee's staff estimates the move would save $2.786 billion over the next four years, which Baucus would use to help pay for highway construction and other infrastructure projects. The staff has not revealed the basis for its calculation, a tricky matter because it requires assumptions about the future taxable income of more than a dozen paper companies.

"Black liquor qualified for the alternative fuel mixture [AFM] tax credit and the cellulosic biofuels tax credit," a news release from the committee noted Friday. "Congress never intended for black liquor to qualify for these credits and, in 2010, prohibited the credit for black liquor sold or used on or after January 1, 2010. This provision would prohibit taxpayers from claiming the alternative mixture credit or the cellulosic biofuels credit on any new or amended returns made on or after February 3, 2012."

The committee is scheduled to discuss the Highway Investment, Job Creation and Economic Growth Act of 2012 tomorrow.

Such companies as Domtar, Weyerhaeuser, and Packaging Corp. of America have recorded or estimated they would record more than $200 million each in cellulosic biofuel producer [Son of Black Liquor] credits for black liquor they burned in 2009. International Paper, the country's largest manufacturer of kraft pulp, could grab an even larger windfall if it returned some of its $2.1 billion in alternative fuel mixture tax credits so that it could claim the more lucrative Son of Black Liquor credits.

But the Baucus provision would close the door on any further payouts. The committee's news release noted that the process of burning black liquor, a pulp byproduct, to generate power "has been used for seventy years to manufacture paper" -- which means manufacturers would have done it anyway even if they hadn't been handed billions in eco-subsidies. In fact, most paper companies never dreamed in 2009 that the black liquor they were burning would qualify for the cellulosic biofuel credits.

"We oppose the retroactive tax increase being proposed to pay for a new highway bill," Donna Harman, President and CEO of the American Forest & Paper Association, said Monday. "The year has closed and companies' tax returns are not due until March 15. Retroactive tax increases are bad tax policy and harm companies that are trying to make investments to get jobs and
WHO’S DOIN’ ANYTHING?: (CONTINUED)

the economy going again.”

Baucus was an early critic of the original black liquor loophole, which provided well over $6 billion in AFM payments to paper companies. But the Montana Democrat went silent on the subject in the summer and fall of 2010, apparently to get Sen. Olympia Snowe (R-Maine) to vote yes on President Obama’s healthcare legislation.

Democrats eventually blocked Son of Black Liquor credits for any of the pulp byproduct burned after Dec. 31, 2009 and used the $23.6 billion in “savings” to help pay for the healthcare bill.

Honeywell to provide Experion MX QCS, Experion Process KCS to Turkish paper manufacturer Kahramanmaraş Kağıt at Kütahya paper mill

ISTABUL, Turkey, Feb. 14, 2012 (Press Release) - Honeywell today announced it has been selected by Kahramanmaraş Kağıt Sanayi ve Ticaret A.Ş. (KMKPAPER) a leading Turkish paper manufacturer, to deploy its Experion® MX Quality Control System (QCS) and Experion® Process Knowledge Control System (PKS) at a new paper mill based in Kütahya, Turkey.

The facility, which is due to be completed in May 2012, will produce de-inked newsprint, as well as printing and writing paper. The Experion® PKS system will support trouble-free startup and maintenance, while the Experion® MX QCS will be used to monitor consistent paper quality using constant measurement of all critical variables to meet the high standards demanded by the customers.

Honeywell Process Solutions (HPS) has been chosen due to its expertise, knowledge and experience in developing accurate, high speed measurement and robust quality control systems. Together, this helps Kahramanmaraş Paper reduce the amount of downtime and scrapage, allowing the company to provide customers with consistently high quality products.

M.Muhammet Ciger, vice president, Kahramanmaraş Kağıt Sanayi ve Ticaret A.S., commented: "With investment budgets tight and demand for quality steep, we needed to deploy a solution with the ability to provide us with the latest technology and state-of-the-art control in one integrated system and at an acceptable price. Honeywell was able to give us that as well as provide strong local service."

Honeywell's Experion systems help Kahramanmaraş Paper produce high quality paper grades using only recycled stock without the need to add virgin pulp. The integrated control system also allows the pulping and papermaking processes to operate at maximum efficiency, optimizing energy and raw material usage.

"Kahramanmaraş is the latest in a line of manufacturers realizing the overwhelming benefits and potential that integrated control systems can bring to their facilities." said Orhan Genis, Vice President Sales, EMEA for Honeywell Process Solutions, "This will allow them to produce high value-added paper grades with recycled pulp using less energy and raw materials and positioning this new facility to be more efficient and profitable."

Papcel starts installation work for project at OOO Suchonskiy CBK's Sokol mill in Russia

LITOVEL, Czech Republic, Feb. 14, 2012 (Press Release) - It is one of the greatest projects of the company PAPCEL ever. At the end of the year 2011 we started necessary installation works on the customer’s premises. Early in November 2011 the paper mill in Sokol commenced preparatory works connected with erection of the PM machinery in the stock preparation plant - the low-consistency vertical pulper LCV-50 with the equipment intended for cleaning of its chest. Already in September 2009 the company PAPCEL signed a contract with the paper-and-pulp concern OOO Suchonskiy CBK in Sokol on displacement and reconstruction of a paper machine from Canada producing printing papers before reconstruction. The signed contract comprised also delivery of a new stock preparation line covering the PM capacity that should reach 162 tpy after reconstruction and that should produce flutings and liners with substance ranging from 90 to 200 g/m². The concerned paper machine is provided with two wires where the bottom wire is 5 065 mm wide and the PM operating speed is 650 m/min. The project itself is to be financed through an export credit by the ČEB bank where its total financial volume amounts to 29,6 mio. EUR. The company PAPCEL is a general supplier of machinery. In addition to that, it provides also complete services connected with the given
projecting, i.e. initial documents for on-site installations, engineering services, such as primary engineering, on-site commissioning and guarantee tests. The PM and stock preparation lines shall be installed in a reconstructed hall on the paper mill premises. Necessary building works shall be provided by inland building firms and the company PAPCEL shall be responsible for complete building supervision.

In December 2011 we finished our job in connection with the PM disassembly in Canada. The last assembly groups shipped were bulk cargos, i.e. a headbox and a rewinder. In total we shipped goods and equipment in 125 containers. Necessary demolition works in the PM hall finished in the second half year 2011 were followed by works connected with cellaring and PM basement. The company PAPCEL dispatched the last machines for stock preparation already early in 2012; the largest-size position was the hydraulic headbox intended for the top layer. The final works in connection with assembly of the remaining stock preparation equipment should go on during the first quarter 2012. The final on-site installations in the PM hall should be commenced in the second half year 2012.

**ABB signs five year agreement to manage maintenance and improve efficiency of Nampak Corrugated’s Rosslyn Paper Mill in Pretoria, South Africa**

ZÜRICH, Switzerland, Jan. 26, 2012 (Press Release) - ABB, the leading power and automation technology group has signed a five-year, ABB Full Service® contract with Nampak Corrugated, to manage maintenance and improve overall efficiency at the company's Rosslyn Paper Mill in Pretoria, South Africa. Under the agreement, ABB will manage all maintenance operations at the paper mill to improve equipment efficiency and increase production output while reducing operating costs. 62 Nampak maintenance employees transferred to ABB when the contract took effect on December 1, 2011.

Nampak is Africa's largest packaging company, manufacturing a diverse range of paper, plastic, metal and glass packaging products. The Rosslyn mill manufactures recycled based paper for a variety of corrugated packaging products, supplied by Nampak's Corrugated operations.

Under the agreement, ABB will manage all maintenance to improve productivity and equipment reliability at the mill, and retain and develop all existing maintenance staff and management. ABB will train the staff in pulp and paper industry-specific predictive maintenance and management practices. In addition, ABB will provide process optimization, energy consulting, equipment lifecycle services at the site, as well as manage all third-party subcontractors and suppliers.

"ABB Full Service agreements make business sense in terms of increasing efficiency in operations, and help to further develop skilled maintenance personnel in world-class practices," said Veli-Matti Reinikkala, head of ABB's Process Automation division. "These agreements provide an exceptional win-win situation for all involved, and allow the customer to focus on their core business while getting the best performance out of their process."

The agreement formalizes a joint vision in which ABB manages maintenance at the Rosslyn facility, while Nampak Corrugated Paper Mills strengthens its strategic focus on growing its core operations.

"We are not only looking forward to improved maintenance processes and practices, but the performance guarantees will ensure the relationship is a true partnership with the parties working closely together to improve operations, and value is added in a much wider context than pure maintenance services”, said Christiaan Burmeister, Managing Director of Nampak Corrugated.

This is ABB’s largest Full Service contract to date in South Africa. The new contract complements more than 100 ABB Full Service relationships with customers in the paper, metals, mining, chemicals, and oil and gas industries worldwide.
WHO’S DOIN’ ANYTHING?: (CONTINUED)

Metso to supply containerboard machine to Kipaş Kağıt Sanayi İşletmeleri in Kahramanmaraş, southeastern Turkey

HELSINKI, Feb. 10, 2012 (Press Release) - Metso will supply Kipaş Kağıt Sanayi İşletmeleri A.Ş with a containerboard machine for their new mill site in Kahramanmaraş in southeastern Turkey. The start-up of the new machine is scheduled for 2013. The value of the order is approximately EUR 80 million.

Metso's delivery will comprise a complete high-technology board machine. "The new machine will utilize gap forming technology which enables a higher production speed and production efficiency ratio for board machines," says Area President Hannu T Pietilä from Metso. In addition, Metso's extensive automation package will comprise process, machine and quality controls.

The main part of the order is included in Pulp, Paper and Power's first quarter 2012 orders received and the automation package in Automation's first quarter 2012 orders received.

The delivery will comprise an 8.6-m-wide (wire) high-technology board machine including an approach flow system, air systems, machine pulpers, a broke collecting system, chemical systems, a steam and condensate system, a ropeless tail threading system, machine clothing as well as mill engineering.

The new PM 1 will be equipped with an OptiFormer roll and blade gap former as well as a WinDrum Pro high-capacity belt-bed winder. The production speed will be 1,500 m/min. PM 1 will produce fluting and testliner grades out of 100% recycled fiber. The annual production capacity will be approximately 400,000 tonnes.

Family-owned company Kipaş Kağıt Sanayi İşletmeleri A.Ş is a subsidiary of Kipas Holding A.S. of Kahramanmaraş, Turkey. Through the reorganization of the group's companies in 2005 Kipas Holding is formed of numerous subsidiary companies with 27 mills and over 6,000 employees.
ENERGY IMPROVEMENTS AT ZELLS OFF CELGAR

RALPH LUNN, SENIOR PROCESS ENGINEER, ZELLS OFF CELGAR

JIM MC LAREN, ENERGY COORDINATOR, ZELLS OFF CELGAR (NOW RETIRED)

ABSTRACT: TO UTILIZE WASTE STEAM AND CAPITALIZE ON OPPORTUNITIES PROVIDED BY A NEW INTEREST IN "GREEN POWER", ZELLS OFF CELGAR OF CASTLEGAR B.C. EMBARKED ON A SERIES OF PROJECTS DESIGNED TO SAVE STEAM AND ELECTRICITY, AND UTILIZE THESE SAVINGS FOR POWER PRODUCTION. STEAM SAVING PROJECTS USING A "PINCH" ANALYSIS WERE IDENTIFIED, AND THESE IN COMBINATION WITH THE CAPTURE OF WASTE STEAM DROVE THE DECISION TO PURCHASE AND INSTALL A 48MW, DUAL INLET CONDENSING TURBINE. THESE PROJECTS, ALONG WITH OTHER STEAM AND ENERGY SAVING INITIATIVES, ARE NOW CONTRIBUTING IN A SIGNIFICANT POSITIVE WAY TO THE ECONOMIC VIABILITY OF THE ZELLS OFF CELGAR PULP MILL.

KEYWORDS: ENERGY, STEAM, PINCH, TURBINE, SAVINGS

PRESENTED AT THE PAPERWEEK 2012 CONFERENCE JANUARY 30 – FEBRUARY 3, 2012 AT THE FAIRMONT QUEEN ELIZABETH HOTEL IN MONTREAL, PQ CANADA
BACKGROUND

In February of 2005, Mercer International Inc. purchased the Celgar Pulp Mill, adding to their two other bleached Kraft mills that they already owned in Germany. One of the first things that was done was to compare or benchmark the three mills, and one of the biggest differences was found to be in energy costs. Whereas the German mills were both making money on energy, Celgar was not. The primary reason for this difference was the type of power generating turbine at each location. Both German mills had condensing turbines, which meant that they could recover much more of the available energy from the steam than was possible at Celgar. At the same time, Celgar was also venting approximately 20 t/h of excess steam on a continuous basis, a consequence of only being able to use as much steam as the process required. See Fig. 1 below.

![Steam Balance Diagram](image)

**Fig. 1 – Steam Balance at 475,000 ADMT/y**

The obvious answer was to use the excess waste steam to power a new turbine and generate additional green power. But how large should the turbine be? While it was known how much excess steam was available at existing rates and how much would likely be available at future rates, there was a strong belief that even more steam was available, given better energy management techniques and strategies. In addition, it was known that with some modifications, the existing wood waste boiler could be made to produce more steam as well.

*American Process* of Atlanta, Georgia was thus hired in 2007 to perform a “Pinch” Energy Analysis; basically a study to determine the best way to manage hot and cold streams within a facility in order to use less steam in the process and make more steam available for power generation. Process data was collected to develop a mass and energy balance of the mill; this was used to make a model of the mill for a thermal Pinch analysis. This showed that there was a *theoretical* opportunity to reduce the mill’s steam consumption by 104 t/h, and an initial project list was made that identified potential savings of 61 t/h of steam. This, when added to the amount of steam being vented, had the potential to power a 20 MW condensing turbine. See Fig. 2 below.
To achieve the potential that was described by American Process, several significant changes were identified. They included upgrades to the existing wood waste boiler, new heat exchangers and piping, and revised operating strategies. By looking forward to future production rates, and with all of the recommended changes in place and functioning as planned, as well as a change to a dual inlet turbine, it was determined that there was the potential for a 45-50 MW condensing turbine, considerably larger than the 20 MW unit initially identified. See Fig. 3. Preliminary engineering was started in June of 2007 to develop a capital cost estimate for the Mercer Board of directors, and in April of 2008, an order was placed for a 48 MW dual inlet condensing turbine, sized to allow for future growth and future energy projects. Delivery was scheduled for September, 2009.
PROJECT IMPLEMENTATION

Prior to the start of detailed engineering, a second study by American Process was commissioned in the spring of 2008 to get the most accurate design values for the project. As a result of this, the steam savings prediction was revised down to 36 t/h. This was primarily a result of process modifications in the digester that changed how much heat the model predicted was actually available, as well as a significantly reduced dilution factor in the bleach plant Eop stage which also reduced the heat available there. With a 48 MW turbine on order, it was recognized that there would be capacity for additional energy projects in the future.

The three components including the new turbine, the upgrades to the wood waste boiler, and the complete suite of pinch projects together became known as the “Green Energy Project”. The benefits that were presented to Zellstoff Celgar management, the Mercer Board of Directors, and the community in the spring of 2008 included the following:

- Additional power generation
- Cooler effluent, which would reduce the community odour that resulted from spray cooling
- Use of wood waste to feed the power boiler, helping to solve a regional over-supply problem
- Elimination of “regular” steam venting, making for a quieter local atmosphere

Approval to proceed was given, a contract proposal was made to BC Hydro for the sale of surplus power, and detailed engineering was begun in June of 2008. Poor world markets for pulp, combined with a plummeting availability of external funding, meant that the project had to be stopped in May of 2009. Announcement of the Federal Government’s Pulp & Paper Green Transformation Program (PPGTP) one month later allowed the project to restart, although a 6 month delay ensued as the program got underway. In December of 2009, the project was underway again; work continued through 2010, and all the projects were substantially complete and online by late September of 2010. The three main energy components of the project were as follows:

1. New Condensing Turbine & Generator
   - 48 MW, Shin Nippon dual inlet condensing turbine
   - Compact design (based on experience in marine applications)
   - Short delivery and fast commissioning time
   - Good references, met all required specifications
   - Competitive pricing
   - Brush electric generator
   - Turbine and generator both met their design performance
   - The new turbine functions well in parallel with the old turbine, at least in part because of a new steam header control system that was installed.

2. Power Boiler Upgrade (expected steam production = 54.4 t/h)
   - Lower furnace upgrade to membrane walls
   - Furnace height increased for better combustion and heat recovery
   - New vibrating floor with 6 under-grate air zones
   - Over-fire air system added
   - New dry ash handling system, ash silo annex
   - Dust collector upgrade
   - The capacity of the power boiler has improved substantially, but it is not yet at design rates.
   - Hog fuel quality has been found to be a significant variable impacting its performance.
3. Pinch Projects

<table>
<thead>
<tr>
<th>Pinch Project Description</th>
<th>Steam savings estimate from model, t/hr</th>
</tr>
</thead>
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<tr>
<td>- Lo-solids filtrate in Digester</td>
<td>8.5/5.2</td>
</tr>
<tr>
<td>- Flash steam on chip bin</td>
<td>6.3/3.3</td>
</tr>
<tr>
<td>- Warm and hot water projects</td>
<td>24.0/10.0</td>
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<tr>
<td>- Recovery Boiler demin water pre-heating</td>
<td>8.0/11.8</td>
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<tr>
<td>- ClO₂ pre-heating</td>
<td>6.7/5.8</td>
</tr>
<tr>
<td>- Pulp machine air pre-heating</td>
<td>7.5/0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>61.0/36.1</strong></td>
</tr>
</tbody>
</table>

**Pinch Project Details:**

Pinch 1 (by-pass lo-solids filtrate from cold blow cooler, 5.2 t/h saving predicted)

Hot filtrate (90°C) from the blowline pressure diffuser filtrate tank was pumped through the cold blow cooler (CBC) where it was cooled to about 65°C, and then used to cool and wash the pulp at the bottom of the digester. Some of the cooled filtrate, however, was also used as a radial wash in the digester, which meant it had to be heated up as high as 160°C. The cooling and re-heating of this portion of the filtrate was very inefficient, and the obvious solution was to take off the required hot filtrate prior to the CBC, and put it directly into the radial wash lines. With the purchase and installation of a new pump and piping, this was completed in May of 2008, and immediately resulted in the steam savings that were predicted. See Fig. 4 below.

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**Fig. 4 – Project to bypass Lo-Solids Filtrate around CBC**
Pinch 2 (maximize the use of flash steam in the chip bin, 3.3 t/h savings predicted)

The chip bin uses a combination of fresh and flash steam to pre-steam the chips. If flash steam is used, fresh steam is saved. It seems that it should be an easy thing to replace the fresh steam with flash steam, but it turns out to be not that simple. Most chip bins are a source of “intermediate” strength non-condensable, foul smelling gases, or NCG’s, and it is often a challenge to keep the collection system for these gases in service 100% of the time. This is because for reasons of safety, when gas concentrations rise, it becomes necessary to vent the gases, and the culprit is usually felt to be the flash steam.

The two objectives of maximizing flash steam use and minimizing community odour can thus be at odds, which begs the question - how can flash steam use be maximized, while at the same time, ensure that NCG venting does not occur? Since 2008, various control strategies and new temperature/level sensing equipment have been tried, each with varying degrees of success. Every winter, when the chips contain more volatile components and a greater quantity of steam is necessary for the cold chips, gas concentrations rise and venting occurs more frequently. This is an area where further steam savings can and need to be achieved.

Pinch 3 (Fibreline warm and hot water, 10 t/h predicted)

Pinch 3 involved several different projects; all related to the Fibreline warm and hot water systems. The intention was to raise the temperature of the hot water tank from 64°C to 72°C, and raise the temperature of the warm water tank from 32°C to 46 °C. The project list included the following:

- larger cold blow cooler (CBC); change cooling medium from cold water to warm water, generating hot water instead of warm water.
  - Some of the requirements for the new CBC included competitive cost, fast delivery, compact size, low filtrate side pressure drop, and a low likelihood of plugging
  - A wide gap plate and frame exchanger was chosen, along with a large “X valve” that allows the filtrate to change direction on a regular intervals to prevent fibre build-up in the exchanger.
  - The heat exchanger has generally worked well, although changing process conditions in the digester has meant that it occasionally does not provide sufficient cooling.
  - Extremely high fibre quantities in the black liquor has resulted in the heat exchanger plugging once; the unit was disassembled, cleaned, and returned to service.
- same white liquor cooler (WLC), but change cooling medium from cold water to warm water, generating hot water instead of warm water.
  - Digester process changes have resulted in it being no longer necessary to cool the white liquor, so no savings were seen here.
- same black liquor cooler (BLC), but change cooling medium from hot water to warm water, generating hot water instead of “really hot” water.
  - This was completed and is in service.

- replace cold water on #1 PM showers with warm water from Fibreline
  - This was completed and is in service.
- Replace cold water make-up on pulp machine warm water tank with Fibreline warm water
  - This project was partially completed by removing cold water make-up and replacing it with warm water.
  - A restriction in the warm water pump / piping that supplies the machine room, however, currently limits how much water can be sent over.
- Pressurize digester and bleach plant condensate
  - Condensate recovery has significantly improved, but it was determined that there-use of the condensate within the Fibreline provided similar overall thermal benefits to pressurizing and recovering it back to the boiler, so this project was not implemented.

Pinch 4 – Recovery Boiler Demineralised Water Pre-Heating (11.8 t/h predicted)

The initial concept was to use a 2 stage heating system; the first stage picking up heat from the Eop filtrate and a second stage picking up heat from the turpentine condensing system. The use of the turpentine system was rejected by the mill for three main reasons:

- The extreme consequence of any contamination of the demineralised water by foul condensate.
- The highly variable nature of the heating source on the condenser (which is flash steam that is not being used on the chip bin)
- Assuming Pinch 2 was successful (flash steam on chip bin), then the amount of heat available from the condensers would be small.
The use of the turpentine condensers was thus rejected and a larger Eop filtrate heat exchanger was recommended to maximize the heat recovery from that location. This was completed and is now in service. Less heat is recovered here than anticipated, however, because the temperature of the Eop stage is not as high as was anticipated. Continuing problems with a steam mixer have meant that this bleaching stage operates roughly 12°C cooler than planned, with the result that there is that much less heat in its effluent, the source of heat for the demineralised water.

**Pinch 5 – Chlorine Dioxide (ClO₂) Heat Exchanger**

This project had the potential to save roughly 6 t/h steam. Reference checks on several ClO₂ heat exchanger installations, however, were not positive, with several sitting idle for various reasons. In addition, the use of D₀ filtrate as the source of a heating medium is more problematic at Celgar because there is not a D₀ filtrate tank or pump like there is at many mills. Safety concerns inherent with the heating of ClO₂ increased the complexity of the project further, and with escalating costs it could no longer be justified.

**ADDITIONAL ENERGY PROJECTS**

In addition to the Green Energy Project, several other energy related initiatives have been undertaken at the Zellstoff Celgar pulp mill. Some of the more significant of these included:

- Installation of 7 high efficiency medium consistency (MC) pumps in the Fibreline
- Retractable seals on the old turbine (TG2)
- Shutdown of a 600 hp MC pump

**Installation of 7 high efficiency MC pumps in Fibreline:**
While the MC pumps in the Kamyr Fibreline were state of the art when installed in 1993, advances in fluid dynamics allowed the development of more efficient pumps that can do the same job with less power (or do more with the same power). The improvements were enough (roughly 15% predicted) to justify the purchase of 7 new MC pumps. The power savings were different for each pump due to the specific operating conditions (flow and pressure), but the net result was a power savings of 11,050 GJ/y.

**Retractable seals on Turbine/Generator #2**

TG2 was a vintage 1993, 52 MW extraction unit that was most recently refurbished in 2006. As a steam turbine ages, the seals wear, and steam leakage results. Retractable seals have the ability to compensate for wear, rotor vibration, and rotor irregularities, and operate at a “zero clearance” when closed, all with the objective of maximizing the turbine efficiency.
With a predicted efficiency gain of 2.7%, the justification was relatively straightforward, in theory resulting in an additional 0.81 MW more green power for the same amount of inlet steam. The new seals were installed along with a scheduled turbine rebuild in the spring of 2011, and the isentropic efficiency of the turbine was seen to increase from 81.6% to 84.7%. See Fig. 5 above. There is no doubt that some of the gain was due to the rebuild itself, but a significant portion is likely a result of the new seals. A better indication of the results may be the turbine performance over time, as the retractable seals should be able to maintain the efficiency currently seen, even as the turbine experiences wear.

**Shutdown of a 600 hp water pump**

The original objective of this 2 pump system was to preferentially use combined condensate over hot water for use on the final stage of brownstock (post-O2) washing, which at the time consisted of medium consistency pressure diffusers. See Fig. 6 below.
This was done by having a high pressure pump on the condensate tied into a lower pressure but higher volume pump on the hot water. When the pumps curves are combined, the result is that the high pressure Evaporator condensate pump is preferentially used up to about 80 L/s, after which the hot water pump starts to contribute (about another 100 L/s at full production). See Fig. 7.

In 2005 a wash press was installed in the pre-bleach position, adding another stage of brownstock washing, which necessitated that the counter-current washing now begin there instead of at the pressure diffusers. Because the press discharges at approximately 30% consistency, it was no longer necessary to supply 180 L/s of wash flow; in fact only 70 L/s was required for the same dilution factor. This meant that the hot water pump was doing very little on a continuous basis. See Fig. 8.
A trial was performed to determine exactly how much the hot water pump was contributing. This involved shutting the pump down, and it showed it was only supplying 10 L/s at typical operating conditions, which the combined condensate pump was easily able to provide. Electric current readings were taken for the two pumps, and they showed the current dropping on the hot water pump from 72 amps to zero when it was stopped, while the current of the condensate pump increased only marginally when it had to pick up the additional flow.

A small flow of hot water to the decker wire wash showers was addressed by a short tie-in that was completed during an area shut down. Check valves were used to ensure condensate did not contaminate the hot water tank.

Discussions with Operations personnel identified one significant risk - plugging of wash nozzles on the press if the condensate pump stopped, since there would no longer be an on-line back up source of water. Interlocks were thus added that would have the Fibreline pump start back up automatically if the condensate pump went down.

**HOW TO MAINTAIN THE BENEFITS?**

Like many projects, in some ways the installation of the equipment is the “easy part”. The long term challenge is how to maintain hard fought benefits that can quickly disappear when attention is diverted elsewhere. The mindset at most Canadian pulp mills is to first produce pulp, with power and other revenue streams looked at as side benefits. At Celgar, we have had 50 years to get good at reporting pulp production, pulp quality, and put in place all the systems that support these indicators of success. We don’t yet have 50 years experience in being a power producer.

The challenge now is to make power generation a critical component of the mindset, so that decisions are made around the mill with not only pulp production in mind, but power production as well. For this to be effective, monitoring tools need to be put in place, targets established, and a good understanding of the cause and effect that operational decisions have on power developed. This final statement describes a system that is in many ways much more complex than pulp production. When one part of the mill slow down, the impact on pulp production is obvious and visible.

When a power or steam saving project is identified, however, it rarely can be compartmentalized enough to apply the benefits that are evident on the surface to the actual result that will be seen, because the results usually “leave the compartment” and have effects in other areas. It is similar to hot air from a house furnace leaking out of a duct – some of the heat doesn’t go exactly where it was intended, but is still goes into the house. So the net loss is not equal to the heat that leaks out of the duct, just in the heat that is lost in the inefficiency of having it not go exactly where planned.

Modelling thus becomes very important. It was used to develop the initial list of projects, and it is used to monitor changes that occur in a typical operation. The complexity of the model, however, almost requires someone who can use it full-time to be certain of the results. In addition to modelling, we have developed energy and power targets, and have begun to develop monitoring tools to help evaluate day to day changes.

Energy has taken on a new role and heightened importance at Celgar Pulp. It is no longer just a by-product of the recovery cycle that supplies the mill’s power, but now a critical portion of the mill’s revenue generation. The projects described in this paper have significantly increased the profitability of the mill and made it better able to weather the inevitable downturns that occur as part of the market pulp cycle. Because of the capacity of the turbine, the mill is also well positioned to take advantage of additional energy related projects that will increase this revenue stream further.
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