Meeting Minutes

Tuesday morning Dec. 12th

*Steam & Steam Power Committee Business Session:*

Dale Lucey (Tolko Kraft Papers) - Chairman
John Graham (B&W Canada) - Secretary
Garth Knowles (Hercules) - Treasurer

- Chairman Dale Lucey opened the meeting with 17 in attendance @ 8:30 am. This is a joint meeting with the Energy Cost Saving Committee who will join at 10:30 a.m.
- Introductions were made around the table.
- Dale reviewed the agenda for this meeting. (Attachment 1)
- Jim Kearns reviewed the minutes as prepared by ECBLRBAC Secretary Walter Bursey of the spring meeting that was held in Quebec City on June 19-22 as a joint meeting with ECBLRBAC. Motion to accept minutes made by Pat Terfloth, seconded by Mike Trivett. Carried.
- Financial report presented by Garth Knowles (Attachment 2). Balance coming into this meeting is $1,231.63. Fees for this meeting will be determined later this morning once full attendance has been determined (later, meeting fee set at $100.00). Motion to accept financial report made by Jim Kearns, seconded by Norm Duke. Carried.
- Garth made mention of the PAPTAC web site that includes The Steam & Steam Power Committee.

*Liaison Reports:*

- **PAPTAC Steam & Steam Power Steering Committee** met last night with 4 in attendance. The minutes were reviewed by John Graham.

- **ECBLRBAC** fall 2006 meeting was held in Montreal (Attachment 3a in English, 3b en Francais). The highlights were reviewed by Garth. Their next meeting will be June 27-28/07 in Halifax and it is suggested that this be a joint meeting with our committee.

- **PAPTAC** report given by Garth. The annual general meeting will be in Montreal on February 5-9/07. The Steam and Steam Power Committee has 5 papers scheduled for presentation on Tuesday morning as follows:
<table>
<thead>
<tr>
<th>Title</th>
<th>Name</th>
<th>Company</th>
<th>EM</th>
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<tbody>
<tr>
<td>Extended Recovery Boiler Runtime Using Smart Sootblowers</td>
<td>Danny Tandra</td>
<td>Clyde-Bergemann, Inc.</td>
<td><a href="mailto:danny@clydebergemann.com">danny@clydebergemann.com</a></td>
</tr>
<tr>
<td>Waterside Cleaning of Recovery Boilers ... Pay Now or Pay Later</td>
<td>Norris Johnston</td>
<td>Hercules Incorporated</td>
<td><a href="mailto:njohnston@herc.com">njohnston@herc.com</a></td>
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<tr>
<td>Effects of SO₂ on Recovery Boiler Superheater Fouling</td>
<td>Honghi Tran</td>
<td>University of Toronto</td>
<td><a href="mailto:tranhn@chemeng.utoronto.ca">tranhn@chemeng.utoronto.ca</a></td>
</tr>
<tr>
<td>Turbine Governor Systems and Steam Plant Stability</td>
<td>Ben Janvier</td>
<td>Enero Solutions Inc.</td>
<td><a href="mailto:bjanvier@enerosolutions.com">bjanvier@enerosolutions.com</a></td>
</tr>
<tr>
<td>Gasification of Bark – Fueling Boilers with Syngas</td>
<td>Virginia Balcom</td>
<td>Nexterra Energy Corp.</td>
<td><a href="mailto:vbalcom@nexterra.ca">vbalcom@nexterra.ca</a></td>
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- **WCBLRBAC** report given by Garth for their Nov. 8-9/07 fall meeting in Vancouver *(Attachment 4).* Their next meeting in the spring will be in Prince George.

- **Atlanta BLRBAC** - no report

- **CBS** report given by John Graham *(Attachment 5)*

- **Energy Committee** – this meeting is a joint meeting with the Steam & Steam Power Committee.

- **Environment Committee** - no report

- **CSA B51** report given by John Graham *(Attachment 6)*

**Safety / Near Miss Discussion:**

- Dale Lucey, Tolko made note of the confined space entry regulations mentioned in the ECBLRBAC minutes. Glenn Litke, Catalyst Paper and Rick Scammell, Scott Paper reported that breaking the plane of the man door is considered "entering" the confined space. New vessels require 24" openings. Tolko had an incident trying to get a hurt man out of the boiler and they had to install scaffolding. Rick Scammell suggests that a preplan be done for all vessel entry / rescue procedures - i.e. rigging and anchors identified and in place.

- Scott Paper’s steam plant just past 2,000 days of no lost time accidents.

- Dale Lucey noted that even though procedures are in place, they are not always followed. Tolko had an issue with rail car movement and setting of the brakes. Do other mills have procedures and if they are not followed what do they do? It was suggested that the offending people be sent home for the day without pay.

- Tony Jones, Aitec Inc. has experienced issues with lockout procedures and the locks being removed by a supervisor. Dale Lucey also reported an issue with locks being removal without authorization.
• Mike Trivett, B&W advised that a B&W Field Service Bulletin will be issued recommending riser and supply tube inspection especially at bends on old recovery boilers. This is related to flow assisted corrosion.

• Glen Litke had a consultant, DuPont Safety Services, come to the mill to review safety as a third party to provide insight to the mill. DuPont gave a presentation at the spring meeting.

• Noted that we should all carry safety procedures back to our own homes as well as at our workplace.

• Mark Wilson, Hercules noted that use of high top safety shoes should be mandatory. Some mills make this mandatory and it is for refineries.
Joint meeting with Energy Committee:

Chairman Dale Lucey reconvened the meeting at 10:30 a.m. with the Energy Committee now in attendance and a total of 34 people (Attachment 7). Introductions made around the table.

Mill/Supplier Updates:

Each supplier and mill representative gave a brief update on their company business activities. Highlights are:
- Cariboo is planning on installing 25 MW turbo generators.
- Catalyst Paper is experiencing a problem with hog fuel shortage.
- Catalyst, Powell River is considering installation of a condensing turbine.

Presentation:

“Extended Recovery Boiler Runtime Using Smart Sootblower” by Danny Tandra of Clyde Bergemann.

Keynotes:
- Existing blowers are high consumption of high pressure steam.
- Flow from nozzle jet is supersonic.
- CFD analysis conducted of jet and platen interface and force of impact.
- More benefit of deposit removal with jet position such that only subsonic portion of jet contacts platen.
- Conventional blower helix travel path does not take into account platen location to optimize the clearing effect.
- Smart Sootblowers have dual motors for independent control of travel and rotation. These can be programmed for the blower to stop and rotate in specific spaces between tube platens.
- Use of low pressure steam from turbine extraction will still be superheated and can save on the cost of pressure reducing stations.
- Most important factor is having the jet produce the required force, comparable to a high pressure jet. To do this, need to increase either the nozzle efficiency or the steam mass flow.
- Can increase nozzle efficiency by making lance tube larger (4”) and nozzles bigger. This produces a longer, bigger jet but with lower peak impact pressure than that of high pressure.
- Tests of a low pressure jet using 18,500 lbs/hr steam is comparable to 18,000 lbs/hr for high pressure blowing using a 3.5” lance tube. A 4” lance tube would use the same steam flow as a high pressure jet.
- Combine low pressure jet design with smart sootblower.
- A long, low pressure jet can reach well through the tube platen spaces. It is easier to remove deposits by blowing from behind them.
- Can program the sootblowers individually.
- Can save on the travel time of the blowers and therefore save steam usage.
Operating Problem Session:

- Les Kosiax, Tembec - Sludge burning:
  Sludge presses handling up to 40% secondary sludge - what kind of machines are available? What results? They have screw presses now.
  Elk Falls have screw presses, get 37% solids, and use a polymer
  - Polymers or flocculants help to get the reduction.
  - Acidification of secondary helps before mixing in the primary
  Stora Enso has a project to mix sawdust with sludge to improve the dewatering.

- Darel Schewchuck, Cariboo - What is used to measure steam flows as accuracy is an issue?
  Conventional use is orifice plates, flow nozzles, or annubars. Accurate flow measurement is becoming more important. It is difficult to create a mill energy balance with inaccurate steam flow readings.
  - Can use a controlled steam dump to check flow measurement. Scott Paper measures all steam flow to all machines and out of each boiler. Also measures, gas input and can calculate steam to verify accuracy.

  - Rick Reinert, EuroCan advised that orifice plates if they are sharp and in good condition are accurate. Problems can arise with incorrect taps for the differential transmitter. Also vortex shedding devices are available. Upstream and downstream smooth straight pipe and pressure, temperature compensation is critical to accuracy of the flow measurement.

- John Graham, B&W - discussed roof tube tide line observations on horizontal heated tubes and the potential for cracking.

- Dale Lucey, Tolko mentioned that they have erosion and wear on their bark boiler bullnose. Have used shields that need yearly replacement. Last outage used metal spray and will see how this stands up.

Presentation:

"Unique Method to Control Steam and Maximize Condensate Return" by Gilles Lalonde, Lalonde SysThermique.

Keynotes:
- Design condensate systems to remove all the BTU's both latent and sensible.
- Steam usage - use all the latent heat but try to return all the sensible heat back to the deaerator without pumps and without losses.
- Control condensate - keep in a closed loop, use pressure of steam to return the condensate back to the DA without pumps and without loss. Condensate flash from the condensate going into the DA can provide enough steam to operate the DA without additional steam supply.
- Need to control the CO₂ gas that gets into the steam from decomposition of bicarbonate. CO₂ flashes with the steam and dissolves in the condensate. Need to remove non-condensable by using CO₂ traps on the steam side where there is
a phase change. Removal of CO₂ allows the loop to be closed as the corrosion problem is eliminated.
- Can have considerable steam saving on steam production, DA steam usage, increased turbine MW production.
- Less than 1 year payback. Need to do tie-ins at boiler shutdowns. Can be done in stages.

**Energy Saving Opportunities:**

- Pat Terfloth, Hercules - reducing cost of mechanical pulp refineries by reducing energy but maintain pulp quality - ongoing R&D.

- Ed Dylke, Canfor - installed different rotor in pulp screen for more energy efficiency - lowers speed and therefore HP with no change in quality or production throughput. Will need to keep track of any maintenance changes and screen replacement.

- Ray Randall, Pope & Talbot - Aerator basins - new designs can reduce HP usage. These use sub surface aeration and available from the US. Don Olson, Cariboo - has a subsurface lagoon but did not use it for their new lagoon.

- Les Kosiak, Tembec - Alternate energy sources for line kilns or boilers. Is there a practical BTU addition stream to mix into Kraft liquor?
  - Vic Uloth, Paprican – A mill trial using Pet Coke addition - results were promising.
  - Soap addition usually via separate burner.
  - Glenn Litke, Catalyst Paper - Sludge addition to black liquor evaporator inlet, needs excess evaporator capacity. This is not an uncommon practice to use a small quantity. No problems noted with the falling film evaporators.

- Garth Knowles, Hercules – Re Alberta Newsprint, White Court. They have low pressure boilers but ran with only softened water and high blowdown rates of 10-15% without heat recovery. Reverse Osmosis membrane technology system has been installed to produce demineralizer like water quality to lower blowdown rates and save water chemicals.

- RO membrane technology has been slow to catch on in the Pulp & Paper Industry. Membranes with micro filtration can be better than installing a new clarifier.

- Don Olson, Cariboo - looking at heat exchanges using effluent medium. What has been done?
  - Tembec has done heat exchange on the alkaline side and has had fouling issues (1 year cleaning cycle).
  - Not much experience on acid side.
  - Fiber contamination can be a problem.
  - Canfor had problems with a plate type heat exchanger experience.
• Glenn Litke, Catalyst - Condensate return directly to the DA will need filtration.
  - Giles Lalonde advised that Alma had a filtration system to remove iron. When
    new had filters on the traps.
  - Conductivity meters can quickly detect and dump the condensate.
  - Can get dryer coils now made of carbon steel and not copper coils. Copper can
    contaminate the condensate. Replace dryer coils and then remove noncondensibles.
  - Startup on dryers needs to remove all the air to avoid corrosion using a vent trap.

• Les Kosiak, Tembec - Particulate matter in condensate not detected by
  conductivity meters.
  - Garth Knowles, Hercules - Boiler operating pressure will have a big effect
    on what is allowed.

• Dale Lucey, Tolko - Evaporator contaminated condensate now going to sewer. What
  can be done with it?
  - Dale Schewchuck, Cariboo - if less than 1000 COD could use it in the
    brown stock washers. COD measures the organics.
  - Les Kosiak, Tembec - need to review volume and the heat content to
    determine if it can be used.

• NRCan web site that has boiler efficiency calculator. Also their newsletter is
  informative.

• Les Kosiak, Tembec - comment on oil flow measurement using mass flow
  meters.
  - Tolko uses wedge flow meters.
  - Mass flow meters have better turndown measurement.

• Energy Committee - Have an annual award for Energy Savings. This year's winner was
  Canfor for a rotor project, 2nd prize to St. Mary's Paper and 3rd prize to Minas Pulp. There is an
  opportunity for all mills to send in an application for the award for energy savings in their mills.
**Presentation:**

"Gasification of Biomass as a Fuel Source for Lime Kilns" by Paprican / Nexterra / Weyerhaeuser presented by Mike Towers of Paprican.

**Keynotes:**
- Lime kiln fuel consumption average is $2 per oven dried ton of pulp produced.
- Kilns need high heat input from good quality fossil fuels.
- In Europe CFB Gasifiers have been used for biomass to produce a syngas for the lime kilns. They dried the fuel to less than 20% moisture and had hammer mills for fuel treatment upstream of the CFB. High capital costs, contaminants in flue gas.

**Nexterra's System:**
- Wet hog fuel feed untreated to a maximum of 55% moisture
- Fixed bed updraft gasifier
- Underfeed system - low gas velocities - low emissions
- Produces clean low temperature syngas
- 5:1 turndown
- Fuel flexible

**Technical Concerns:**
- Flame Temperature - high moisture in syngas will reduce flame temperature.
- Syngas has low heating value - 1/10th of NG, therefore will be a high volume.
- Ash in syngas can have an effect on lime and white liquor but very minor.
- Design needs the temperature in the char zone of the bed to be kept below the ash slagging temperature i.e. to cool it. Use steam cooling to produce a lower volume syngas with a higher heating value and use a wet ESP.

There is a demonstration Project at Weyerhaeuser, Kamloops to replace 50% of fossil fuel use in the lime kiln. It is a 60,000,000 BTU/hr. system with 2 gasifiers at 30,000,000 BTU/hr. each due to physical size limit. In 2007 pilot plant testing will be done. If successful, a decision will be made to implement at full scale on the lime kiln in 2008.

- Cost of biomass will have an impact on the payback. $20/ton hog fuel will give about 1-1/2 year payback.
- Sludge is too high in moisture to maintain required bed temperature.
- Goal is to replace 50% of kiln heat input with the syngas.
- Saint Mary's Paper is looking at Syngas firing into existing Power Boilers.
Wednesday Dec. 13th

Chairman Dale Lucey reopened the meeting at 8:30 am with 30 people in attendance.

**Boiler Manufacturer's Update:**

**Alstom:**
Jim Kearns presented "Energy Savings Potential in Biomass Boilers:
- ≈ 290 bark/wood fired boiler in North America with > 200,000 lbs steam/hr.
- Opportunities for Energy Saving.
- Optimize Combustion System - OFA upgrade, reduce leakage, control of air quantity.
- Modify or retrofit grates, control of undergrate air.
- Pressure part changes - enlarge plan area and volume.
- Effects: reduced carbon heat loss, reduced carryover, lower CO, lower excess air, improved gas temperature and velocity distribution, lower erosion/corrosion/fouling, more uniform bark coverage on grate.
- Upgrades: different fuels, air system, grates, burners.
- Fuels: Bark, Sludges, Coal, TDF, NCG's, Gas, Oil.
- Overgrate burners: To enhance combustion on grate & increase heat in lower furnace where it is needed. Can use an economical fuel.
- Increased efficiency, more steam from bark, save expensive auxiliary fuels, decreased ash disposal costs due to lower carbon loss, decreased fan HP, lower erosion rates, decreased particulate and CO.
- Tubular AH or Economizer added surface to improve efficiency.

**B&W:**
Mike Trivett, B&W Vancouver Office on "Advanced Planning":
- Expect large increase in boiler orders coming in next 10-15 years.
- Tube material prices have increased by 2-1/2 times since 2003. Stainless has gone up even more.
- Deliveries have increased significantly.
- Projects will be impacted - longer lead times, higher costs, may require preordering of material.
- Emphasis need for longer term planning now.

**Presentation:**

"Heat Exchanger Evaluation - Case Studies and a bit of Theory", by Bruce Der of AH Lundberg Systems

Keynotes:
- Typical equations used, film coefficients, fouling factor, wall resistance, typical heat transfer coefficients, pressure drops.
- Reasonable velocities of 5-6 fps, 5-10 psi pressure drop.
- Reviewed case histories of heat exchanger redesigns.
- Need to involve experts in providing correct design data for heat exchange specifications.
Presentation:

"Converted Hog Fuel Power Boilers - Performance and Optimization", by Vic Uloth of Paprican.

Keynotes:
- Recent boiler conversions - 2 coal fired to hog, Dutch oven to pulverized wood.
- Consideration of Recovery Boiler conversions to hog.
- Boiler conversions - budge issues, how much reuse of existing equipment?
- Review of 3 actual conversions:
  A - 1995 conversion from traveling grate.
  B - VCG conversion from Rec. Boiler.

Performance:
A - 95% MCR - 10% C in flyash, 4% O₂, particulate 5-60 mg/m³
B - 79% MCR - 25-63% C in flyash, 4.3% O₂, particulate 36 mg/m³
C - 80% MCR - 47% C in flyash, 5.37% O₂, particulate 72 mg/m³

Boiler A: Costal Hog - salt laden - issue with dioxin emissions.
Boiler B: Increased the OFA.
Boiler C: Balanced Spout distribution air pressures
  More UGA to get ratios in better balance
  UGA temperature is low, no tubular airheater
- Aspect ratio (height of furnace from grate to bullnose / grate diameter) of 2.5 or greater recommended for grate fired boilers.
- Ash reinjection can be done but has high capital and maintenance cost vs. small efficiency gain.

Presentation:

"Prince George Pulp Cogeneration Project", by Ed Dylke of Canfor

Keynotes:
- Objective - Produce 100% green energy electricity to displace all purchased electricity.
- Wood is from the equivalent of 3 sawmills and they fire black liquor.
- 60 MW Mitsubishi Dual Extraction/Condensing Turbines.
- Modified 2 Recovery Boilers.
- 2.4 million lbs Recovery Boiler, B&W original conversion to low odor to 3.2 million lbs/day firing 75% solids. Andriz did Recovery Boiler Conversion.
- Other Recovery Boiler converted to Power Boiler #2 with VCG grates by Alstom.
- Extraction 165 psi and 65 psi from turbine – all steam from Power and Recovery boilers go to the turbine.
- Wood feed system uses Kamengo moving hole feeders - variable speed reclaim.
  - Located upstream at pile - then 800’ belt to boiler.
  - No return from boiler house, no surge bin.
  - 10 min. time delay of feeder reclaim speed rate to boiler.
- Ash System - Changing rotary seal valves to double dump in order to lower air
ingress.
- Ash conditioner - controls water by looking at temperature.
- 4 VCG vibrating grate stoker modules installed.
- Use 600 psi steam to SCAH - no tubular AH, just an Economizer.
- Had to install new steam separators in the boiler drum to get turbine steam quality.

**Next Meeting:**

This was a joint meeting between The Energy Committee and The Steam and Steam Power Committee and we would like to get feedback from the attendees. The Energy Committee’s next meeting is in Montreal.

The Steam and Steam Power Committee’s next meeting will be June 27 & 28/07 in Halifax as a joint meeting with ECBLRBAC. We are looking for suggestions for presentations.

Fall 2007 meeting location not set yet - possibly Victoria B.C.
Future meeting planned for Grand Prairie AB.

Meeting adjourned @ 1:30 pm.

Tour of the PG Pulp Cogen facility took place in the afternoon.