BLACK LIQUOR RECOVERY BOILER
ADVISORY COMMITTEE

MINUTES OF MEETING
April 6, 2022

OBJECTIVE
BLRBAC's objective is to promote improved safety of chemical recovery boilers and their auxiliaries through the interchange of technical knowledge, experience, and data on past and any future recovery boiler incidents.
Bylaws - 2.1

OFFICERS

Chairman:	**David von Oepen** WestRock Demopolis, AL	Tel: 334-341-7900 **david.vonoepen@westrock.com**
Vice-Chair:	**Frank Navojosky** International Paper Loveland, OH	Cell: (513) 334-9999 **frank.navojosky@ipaper.com**
Secretary:	**Everett Hume** FM Global Johnston, RI	Tel: 401-415-2272 Cell: 413-265-9562 **everett.hume@fmglobal.com**
Treasurer:	**Len Olavessen** LENRO, Inc. Bartow, FL 33830	Cell: 901-573-8343 **olavessen@aol.com**

REGULAR MEMBERSHIP
Organizations operating, manufacturing, or insuring chemical recovery boilers are eligible.

ASSOCIATE MEMBERSHIP
Organizations having a direct interest or role in the safety of chemical recovery boilers are eligible.

CORRESPONDING MEMBERSHIP
Companies residing outside of the United States which finds it impractical to attend meetings on a regular basis because of distance and expenses, but desires to be involved and informed of BLRBAC activities.
Bylaws - 3.1

BLRBAC INTERNET ADDRESS: ---- www.blrbac.net
IRS Employer ID/Tax ID (IRS E.I.N.T./T.I.N.) ---- #13-366-5137

EXECUTIVE COMMITTEE

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Operator Representative
Presently Vacant

BLRBAC SUBCOMMITTEES

AUXILIARY FUEL **Bruce Knowlen, Chairman** International Paper Federal Way, WA Tel: (253) 924-4637 bruce.knowlen@ipaper.com	**BLACK LIQUOR, SAFE FIRING OF** **Vernon Blackard, Chairman** International Paper Roy, MT 59471 Cell: 251-284-3471 vernon.blackard@ipaper.com
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WASTE STREAMS **Paul Seefeld, Chairman** A.H. Lundberg Associates, Inc. Jacksonville, FL Tel: 904-614-6492 paul.seefeld@lundberg-us.com	**WATER TREATMENT** **Tom Przybylski, Chairman** Power Specialists Associates Somers, CT Tel: 860-763-3241 tom.@psaengineering.com

FUTURE BLRBAC MEETINGS

Fall	**October**	**3, 4, 5**	**2022**
Spring	**April**	**17, 18, 19**	**2023**

"Bring Operator(s). Give them a chance to hear firsthand!"
Past Chairman Lon Schroeder
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* **NOTE:** For varying reasons, the previously published meeting dates have been changed at the discretion of the Executive Committee.

BLRBAC has established its own website at: www.blrbac.net

At this website you will find a copy of past Meeting Minutes and the next Meeting Notice. Therefore, each Representative and Associate Representative is asked to inform their people of this WEB site. This is where they can obtain the following BLRBAC documents:

BLRBAC MEETING NOTICE

COVER LETTER General Information

REGISTRATION FORM Will be available on the website with a link to register and pay on line.

SONESTA (formally Crown Plaza) Blocked room dates, pricing, address, hotel phone numbers

SCHEDULE List of subcommittee activities on Monday and Tuesday

AGENDA Reports given to Joint BLRBAC Meeting on Wednesday

OPERATING PROBLEMS Mail/e-mail completed questionnaires to Frank Navojosky

QUESTIONNAIRE The Vice Chairman and he will see that your concerns are brought up and discussed during the Operating Problems session at the next meeting.

These are available at the **BLRBAC INTERNET ADDRESS**: **www.blrbac.net**

BLRBAC Guidelines & Recommended Practices

LEGAL NOTICE

Recommended Good Practice For Design, Operation, and Testing of the Emergency Shutdown System for Black Liquor Recovery Boilers
(Dated: October 2018)

Safe Firing of Black Liquor in Black Liquor Recovery Boilers
(Dated: April 2016)

Materials & Welding Guidelines
(Dated: April 2013)

Safe Firing of Auxiliary Fuel in Black Liquor Recovery Boilers
(Dated: February 2012)

Fire Protection in Direct Contact Evaporators and Associated Equipment
(Dated: February 2016)

Personnel Safety & Training
(Dated: April 2018)

Application of Rotork Actuators on Black Liquor Recovery Boilers
(Dated: October 2005)

Boiler Water Management Guidelines for Black Liquor Recovery Boiler
(Dated: April 2016)

Instrumentation Checklist and Classification Guide for Instruments and Control Systems Used in the Operation of Black 9Liquor Recovery Boilers (Dated: April 2014)

Thermal Oxidation of Waste Streams in Black Liquor Recovery Boilers
(Dated: April 2017)

If you have any questions, contact:

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‡ = **Denotes attendance at last meeting, April 4, 2022**
* = **Denotes a new/replacing member**

EMERGENCY SHUTDOWN PROCEDURES SUBCOMMITTEE
Open – Chairman

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‡Denotes attendance at the meeting in April of 2022.

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‡**Denotes attendance at the meeting in April 2022. Will be updated at future meeting**

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‡Attended 9/16/2020 Virtual meeting. To be updated Fall Meeting 2022

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		.

*Denotes attendance

WATER TREATMENT SUBCOMMITTEE

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‡ Denotes attendance at meeting in October of 2020. (No update for April 2022)

Registration List*

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Harley	Todd	Acuren
Grilliot	Wayne	AF&PA - American Forest & Paper Association

DeBeer	Tom	AIG
Baines	Troy	Airtek Construction
Brandao	Hamilton	Andritz
Liukko	Kari	Andritz
Roppanen	Jukka	Andritz
Torres	Robert	Andritz
Bunner	Ben	Andritz Inc.
Ceravolo	Paul	Andritz Inc.
Imig	Greg	Andritz Inc.
LeBel	Mark	Andritz Inc.
Lowrie	Scott	Andritz Inc.
Miikkulainen	Pasi	Andritz Inc.
Payne	Zachary	Andritz Inc.
Harvell	Daniel	Applied Technical Services
Franks	James	AXA XL Risk Consulting
Hawkins	Scott	AZZ Specialty Welding
Youssef	Simon	B&W/Diamond Power
Edwards	Tom	Babcock & Wilcox
Evans	David	Babcock & Wilcox
Heim	Paul	Babcock & Wilcox
Leibel	Greg	Babcock & Wilcox
Keller	Derrick	Babcock Power Inc.
Larouche	Kris	Bluewater Energy Solutions
Bayse	Mike	Bodman Services LLC
Sargent	Mark	Bodman Services LLC
Clay	Dean	BSI
Call	Fred	Buckman
Edgil	Chad	Buckman
Janeczko	Joe	Buckman
Bekech	Mike	CCA Combustion Systems
Bourassa	Brent	Clearwater Paper
Tripple	Shawn	Clearwater Paper
Jameel	Ishaq	Clyde Industries
Biggs	James	Crenshaw Machine Systems
Norwood	Dan	Crenshaw Machine Systems
Reyes	JC	Crenshaw Machine Systems
Engvall	Johan	Diamond Power Sweden
Burns	Gregory	Domtar
Osborne	Brad	Electron Machine Corporation
Vossberg	C.A.	Electron Machine Corporation
Olson	Brett	Engineered Specialty Product - Gauges
Patrick	Justin	Environmental Energy Services
Tedder	Justin	Environmental Energy Services
Jackson	Dwayne	EnviroVac
Mims	Stephen	EnviroVac
Trung	Thanh	FITNIR Analyzers Inc.
Adhikari	Resham	FM Global
Beaulieu	Andre	FM Global
Britt	Francisco	FM Global
Chaudhuri	Neil	FM Global
Crysel	Scott	FM Global
Hume	Everett	FM Global
Jackson	Mark	FM Global
Labonte	Guy	FM Global

Onstead	Jimmy	FM Global
Paine	Matthew	FM Global
Peckham	David	FM Global
Simard	Maxime	FM Global
Sirros	Jason	FM Global
Tavener	Brian	FM Global
Zamora	Sam	FM Global
Haraga	Rudy	Fornax Services, LLC
Clement	Andy	Fossil Power Systems
Donahue	Peter	Fossil Power Systems
Dooks	Rick	Fossil Power Systems
Harmon	John	GE Steam Power
Schaker	Yoram	GE Steam Power
Philo	Daryl	General Electric
Rushing	Michael	General Electric
Browning	John	Georgia-Pacific
Finnemore	Chris	Georgia-Pacific
Hill	Wes	Georgia-Pacific
Kujanpaa	Olli	Georgia-Pacific
Meadows	Tom	Georgia-Pacific
Morrison	Steve	Georgia-Pacific
Mowery	Jared	Georgia-Pacific
Orender	Robert	Georgia-Pacific
Pritchard	Sara	Georgia-Pacific
Sapp	Kevin	Georgia-Pacific
Heiderscheit	Edward	Global Risk Consultants
Helton	Justin	Green Bay Packaging
Henry	Ryan	Green Bay Packaging
Hubbard	Daniel	Green Bay Packaging
Phillips	Kevin	Integrated Global Services
Afshar	Bryan	International Paper
Byrd	Joel	International Paper
Childress	Susan	International Paper
Chrise	John	International Paper
Cox	Stephen	International Paper
Enriquez	Corrine	International Paper
Frazier	David	International Paper
Greeson	Wesley	International Paper
Gurkin	Grey	International Paper
Johnikin	David	International Paper
Knowlen	Bruce	International Paper
Navojosky	Frank	International Paper
Sarver	Kevin	International Paper
Steele	John	International Paper
Stewart	Dennis	International Paper
Thomas	Chris	International Paper
Thomason	Chris	International Paper
Blair	Michael	IP
Brown	Phillip	IP
Parker	Lane	IP
Spurr	Ian	IP
Giarde	Doug	Jansen Combustion and Boiler Technologies, Inc.
McCabe	Mark	Jansen Combustion and Boiler Technologies, Inc.
Christiansen	Gene	Kadant
Pezzi	Mitchell	KEPS SPG, Inc.
Olavessen	Leonard	Lenro. Inc.
Sweeney	Michael	Liquid Solids Control

Vandenburg	Gordon	Liquid Solids Control
Seefeld	Paul	Lundberg
Gobin	Nick	Marsh
Hanson	Glenn	Metso:Outotec
Gannon	Jim	Nalco Water
Mesamore	Mike	National Boiler Service, Inc
Lewis	Jason	ND Paper
Bazarow	Jeff	New Indy
Shimer	John	New-Indy Catawba
Bucher	Wayne	Noram Engineering
Gaedtke	Jacob	Packaging Corp of America
Hartford	Alexander	Packaging Corp of America
Taylor	Jim	Pactiv Evergreen
Dilworth	James R	Pixelle Specialty Solutions
Forry	Jeffrey P	Pixelle Specialty Solutions
Przybylski	Thomas	Power Specialists Assoc., Inc
Doyal	Ashley	ProcessBarron
Powell	Russell	ProcessBarron
Downey	Don	Purolite
Lemen	David	Purolite
Reintjes	John	Reintjes Services, Inc.
Czaczkowski	Eric	Resolute Forest Products
Ford	Mike	RMR Mechanical Inc
Roberts	Cullen	RMR Mechanical Inc
Rogers	Ben	RMR Mechanical Inc
Roy	Bob	RMR Mechanical Inc
Boudreau	David	Sappi Fine Paper
Fredrickson	John	Sappi NA
Sullivan	Eugene	SHB Power Plant Engineering
Power	Stacy	SMS
Bito	Rudolf	Smurfit Kappa BE
Franco	Daniel	Smurfit Kappa Colombia
Crowe	Ben	Solenis
Holloway	Scott	Solenis
Abramczyk	Bernard	Southern Environmental, Inc.
Sullivan	Sean	Southern Power Sales
Bruce	Mike	Sylvamo
Stephens	Lisa	TAPPI
Wise	Carl	Thompson Industrial Services
DeStefano	Frank	Three D Team
Ruiz de Molina	Eladio	TTS, LLC
Macaulay	Charlie	TUV SUD Global Risk Consultants
DiCorpo	David	Vaisala
Henderson	Ricky	Vaisala Inc
Hamalainen	Arto	Vaisala Oyj
Koivula	Kimmo	Vaisala Oyj
Pyorala	Keijo	Vaisala Oyj
Conner	Travis	Valmet
Gadai	David	Valmet
Henke	Sarah	Valmet
Morrison	Dan	Valmet
Weir	Cameron	Valmet
Yoder	Jeremiah	Valmet
Cray	Ron	Valmet Spare Parts
Baird	James	WestRock
Coyne	Joe	WestRock
England	Darron	WestRock

Golson	Cobb	WestRock
Krekeler	Daniel	WestRock
Marshall	Thomas	WestRock
Mosley	Brandon	WestRock
Moyer	Scott	WestRock
Schwerdtfeger	Robert	WestRock
Shirley	Allen	WestRock
Stewart	William	WestRock
Tavares	Alarick	WestRock
Tjaarda	David	WestRock
von Oepen	David	WestRock
Wiggins	Sammy	WestRock
Langstine	Bob	Zeeco, Inc.

MAIN COMMITTEE MEETING

1.0 Introduction – (David von Oepen – Chairman)

Good morning, again, hope everyone had good time last night. Welcome to 2022 BLRBAC main committee meeting. I think you're being here in order cost you sometime in an effort to get here and in time away from work. Have a good week this week actually participation good interaction BLRBAC thrived over the years from in-person meetings. I'm glad were back is been two years now since we've been back meeting together. So it's good to be back. Thank God we had a very very good week. With that, will carry on business this morning will open up the main committee meeting. So now it's officially open. This meeting, just like every other meeting we have here is in strict compliance with the BLRBAC antitrust policy as a summary of the policy. Just please remember that all BLRBAC main and subcommittee meetings including the session are held to the strict compliance the BLRBAC antitrust statement and policy discussion involving price pricing policy and any restraint on competition are not allowed. Looking at the number of member companies present I will declare we do have a quorum for today's meeting will begin this morning with some introductions ofthe executive committee. My name is David Von Oepen, the Pulp and Paper Recovery Manager for Westrock at the Demopolis Alabama mill. I'm also the chairman of the executive committee. Frank Navojosky International Paper's technology group and the vice chair of the executive committee. Everett Hume FM Global chief engineers group and the executive secretary, Len Olavessen, executive committee treasurer, with Lenro Inc. Jimmy Onstead insurance representative with FM Global. We will move into old business.

2.0 Old Business

ACCEPTANCE OF THE FALL2021 MEETING MINUTES – David von Oepen

The meeting minutes for the Fall 2021 BLRBAC Session have been posted on the Website. I am sure that everybody has taken a look at it. Does anyone have any comments regarding the Fall 2021 Meeting minutes? Can I

get a motion to accept the minutes? We have a motion. Do I have a second? Anybody opposed? Alright, the Fall 2021 Meeting minutes have been approved and accepted as posted. Thank you very much.

Is there any other Old Business to bring to life? If not, we will move on to New Business where we well get an update on new members and representative changes.

3.0 New Business Report (Everett Hume)

I have a short report because we don't have any new members to report on. We didn't have any before us for the executive committee for this meeting. What we are trying to do is update our database so we have the membership regular and the alternate from the member companies as well as the associate members who are attending. So what I would ask of our companies that are here today is, that you go back your company's and find out your primary and your alternate are, go on the website to the change in status and update that form either email it to me here or send it by snail mail. The addresses on the form so we can get that database updated with proper emails for contact. We are getting a lot of bounce back on the emails are sent out for notifications meetings. We just don't have an accurate database of who is responsible for letting their companies know when the meetings occur. I ask all of you since you're here, you obviously got emails or you saw it on the website. Most of the time, that information will be posted frequently the website as of the last two years, if you've noticed, is now a very current living document. It's not stale so you'll see notices. This is as much as we know when we know it, they get posted as soon as we know something so the meeting and meeting updates are in fact posted on the on the lead page and meeting registration links and up on the website a little different than the old-fashioned way that Barbara used to do it.

Any questions on that at all? Seeing none that completes my report/

4.0 Executive Committee Report (David von Oepen)

We met yesterday as committee in a closed session. We discussed the budget as Len just did by changes in BLRBAC how we operate, since Barbara and Frank have retired. Len mentiond we have Metro connection they've got a very very great job. We have been very pleased with their professionalism and how they handle the meeting registrations. We are dealing with the new hotel organization since the last time we had a in-person meeting, so we were looking for ways to reduce our costs also increase participation as Len mentioned. We discussed that and some of the other topics as Everett talked about was getting our email contact list up to date as well as the member companies voting members getting that list up to date. That is Everett mentioned we do every meeting, we plan to have registration link out for the meeting about six weeks in advance of our normal meeting time which is the first part of October and the first part of April so six weeks prior that if you don't get a notification you go to the website BLRBAC.net and look for a registration link there for the meeting. We are having our meeting on October 3rd, 4th and 5th of this year for the fall meeting and its gonna be our 60th anniversary so executive committee looking to do something special to celebrate the 60th year of BLRBAC. Also, the executive committee would like to recognize John Andrews all the good work is done at on the ESP subcommittee be the chairman for over 21 years John hase done an excellent job for us. He has resigned his position and that we have nominated Frank Novjowsky to be the ESP subcommittee chairman. May have been mentioned before, we also like to recognize George Bodman in his contributions to BLRBAC. George has always given us a lot of good technical information as well as some colorful comments in their actions over the years. George has passed away and we would like to recognize George Bodman. Also focused on filling positions in executive committee, looking for treasurer. Len is graciously told us he's going to resign in the next year or so were trying to find a person to fill the treasurer position. Also, the operating company representative, were looking for one of those as well.

So we should be filling those positions here shortly. With that we closed the EC meeting and we will go ahead and move on into subcommittee reports will start with auxiliary fuel report.

5.0 Treasurer's Report (Len Olavessen)

Okay, our checking account balance as of today is $30,289.27 were in the black. Our estimated income from this meeting is $55,200, which means our total assets are $90,289,27. Our anticipated expenses from this meeting are going to be approximately $57,000, which means our costs are going up. For example, generally speaking, since 2019, which was the last face-to-face our costs are going go up about 50%, so we got to look at registration fees and that kind of thing in order to stay in the black. We are handling things a little differently now, we are using a company called Metro Connection to handle the credit card registrations and that costs money. The young lady that you all got your badges from, is a Metro connection employee because we don't have Barbara and Frank anymore, so our expenses exceed our income for this meeting by $1800. So moving forward, our costs are going to go up even more because we are under contract from 2019 for the 2022 meetings over where benefiting from some cost control for 2022 that's not going be there 2023. We're going to have to look at higher participation levels to help cover some of that costs or were going to have to raise registration fees to cover the increasing cost and it's not a minor 10% increase. It's going to be more like 50%. So that's the reality of where we are. For this meeting we had fairly typical spring meeting numbers. We had a total of 184 paid registrations 145 were advanced, and 39 were at the door. We had a lower participation from offshore we had essentially five offshore attendees from Sweden, Columbia, South Africa and Finland. That's about half of what we normally see. So our participation numbers for the fall we typically see somewhere around 220, but we get that money and we actually gain a little bit on our retained funds moving forward. We benefited in 2020 and 2021, from having a good enough cushion in our checking account to cover costs and because of the disruption and we shrank that down to about $30,000 which is not even one meeting cushion. It's about half a meeting cushion so we would like to build that up to one meeting cushion. So again we get increase participation, we won't need to raise rates. If we stay where we are going to have to raise rates. The executive committee discussed yesterday and were going to tweak the fall to advanced $300 and at door $350, instead of flat $300 both at door and advanced. This is to tweak it a little bit, and I'm going to be very busy over the next 2-3 months getting quotes for 2023 meeting and budget and then the executive committee will be discussing where we go for 2023 as far as costing kind of thing but I will encourage you to get more people to come because if they come we don't need to raise registration rates, we can hold them there. Right now, we are the least expensive option if you compare us to TAPPI and AF&PA and we like to stay there, but we can't do that at the current attendance rate. Any questions, that's a lot of information in a short span any question. (Not heard question). We discussed that a little bit. Not really sure what were going to approach. We are going to hold things down we are going to try to encourage folks like you with larger corporations to try and talk it up a little bit and go from there. But I'm not sure there's a whole lot that we can do up here, it's more grassroots we are going to try and hold costs down we are pretty tight on money and negotiations, but the industry has seen a 50% increase. I've got a daughter who arranges conventions within the veterinary medicine in her last two conventions which were this year, she came in 50, 60% high than what she did last year so it's you were not being picked on, this is reality that gives you something to work with. Okay, anybody else. We are anticipating a financial shock that we will need to deal with in 2023. David von Oepen added that we will do some grassroot campaign from larger companies to get more participation.

6.0 Secretary's Report (Everett Hume)

As a reminder, the old site BLRBAC.ORG has been shut down, so remember to update any saved sites to WWW.BLRBAC.NET for current information. All information will be placed on this new website going

forward.

Unfortunately, we continue not to have a paid professional secretarial service so there will be some impact on the speed at which documents are completed and uploaded. Please be patient.

MEMBER COMPANY ACQUISITION

MEMBERSHIP COMPANY STATUS CHANGES – None at this time.

*{**Secretary's Note**: The Company Membership List posted on the BLRBAC website may be out of date and not reflecting all the mergers, acquisitions, and name changes that have occurred. Anyone who sees something that needs changing should bring it to the attention of the BLRBAC Chairman*

7.0 SUBCOMMITTEE REPORTS

7.1 AUXILIARY FUEL REPORT – Bruce Knowlen

The meeting began at 1:09 PM EDT with the BLRBAC's antitrust statement. Over the course of the year since our last meeting, some members had communicated that they were leaving the group. Attendance was taken of members and guests. There were 6 of the 9 members present with about 12 guests. We discussed the purpose of this subcommittee and encouraged any interested to consider becoming members to assist us in our efforts.

The minutes of the last meeting, held on March 16, 2021 were read and accepted.

A general report on the subcommittee was presented since this was the first face-to-face meeting in two years. We discussed the need to resume efforts to update our document to ensure we were presenting similar direction as other BLRBAC subcommittees. The existence of BLRBAC documents was also contrasted to other codes and guidelines indicating the importance of BLRBAC to deal with the unique needs of recovery boilers.

At this meeting, we especially wanted to encourage participation and urged all to raise questions, concerns, and situations that our subcommittee could address. All should be aware that these could be send by email at any time, and not wait for the next BLRBAC meeting.

A discussion began, prompted by the minutes, on the operation of Auxiliary Burners and the permissive logic as it related to flame detection. Several situations were reviewed to address the problems of false flame detection, the differences in detectors (e.g., IR versus UV), the characteristics of various fuels, and the application of ignitors to this problem. The productive discussion appeared to help refocus the group on the subcommittee's subject matter.

There was a call for any new business. No new topics were identified. Therefore, the agenda shifted to resume work on a past topic, spout torches. We continued this discussion, occurring a year ago, because we had received additional information - an email relating to a soda boiler with solid smelt spouts. It required torches that were fixed and continuous. Our concerns for all torches was the design and approach in use to ensure their operation was coordinated with the states of the boiler and logic that also controls our aux burners. We discussed the significance of dead-man type valves or the interface to the BMS for safety.

Another topic from a prior meeting was raised on the absence of a high gas pressure trip on the ignitor fuel train. We were being asked why other standards included a trip on high pressure but we did not have one in our example schematic. (See SFAF figures 6 and 9.) The group present included two burner vendors that provided details on ignitors. It was apparent that this omission might be a change to be considered. A good amount of discussion occurred but the addition of this trip element was not resolved. The group decided to continue this at the next meeting and analyze the need more thoroughly.

We will meet in the Fall of 2022 hoping to continue the momentum generated in this session. This will include requests received to approve new subcommittee members.

The meeting adjourned at 03:36 PM EDT.

7.2 ESP SUBCOMMITTEE REPORT – Frank Navojosky

(See ***Appendix I*** – Incident List and ***Appendix II ESP Presentation***)

CLOSED MEETING
The ESP Subcommittee met in closed session on April 4th, 2022 with 10 members represented.
2 regular members were absent and sent fill-ins. Paul Heim of B&W filled in for John Kulig of B&W and Mark Lebel of Andritz filled in for John Philips of Andritz.

The meeting was called to order by Vice Chair Frank Navojosky of International Paper Company and began by reviewing the Anti Trust statement.

The minutes of the previous October 4th , 2021 meeting were then approved.
A discussion was held for approval of posting on the BLRBAC website the consolidation of all of the BLRBAC learnings since the Spring 2005 session as compiled by Dean Clay subcommittee Secretary. The team unanimously approved this request. Frank Navojosky had previously obtained informal executive committee agreement prior and will formalize the Agreement in the executive committee meeting on Tuesday.

In the last meeting we discussed wording around Hydrostatic testing in sections 3.3 and 3.4 after an ESP and this wording was reviewed and proposed additional wording was captured to reflect performing a hydro test following ESP to ensure previous defects were not aggravated to failure by the ESP. The order of the sentences in section 3.4 will be reversed also to more logically follow the sequence of events.

It was discussed that the revised guideline discussing the bypassing of Overloads and Torque limits internal to an ESP drain valve actuator has been posted for public comment and has gone to the Executive committee for approval and has been approved. This revised document will be posted on the Website.
28 North American incidents and 1 International Incident were reviewed.

NEW BUSINESS

Frank Navojosky quickly reviewed a presentation regarding RB Explosions and some case studies that may be beneficial to present in a future meeting. It was agreed that this may be beneficial and Frank would discuss this with the Executive committee for their thoughts.
OPEN MEETING
The Subcommittee met in open virtual session on Tuesday morning April 5th, 2022 with 10 members represented and about 130 guests. During the open session, the Subcommittee reviewed 28 incident

reports from North America and 1 International Incident that had been submitted since the Fall 2021 meeting. Of the 28 incidents, there were no Smelt Water Explosions and no Dissolving Tank Explosions reported during this session. Five (5) of the reported leaks were classified as critical incidents and 23 were non-critical incidents. Of the 5 Critical incidents, 3 were found during hydro and two were discovered during operation. An ESP was performed in both of the incidents found during operation. There was one smelt spout leak.
The basic definitions of Explosions, Critical Incidents and Non-Critical Incidents were revised by the Executive Committee in September 1999.

They are summarized as follows:

Explosions: Only if discernible damage has occurred. This does not include incidents where there is only evidence of puffs or blowback alone. With the new emphasis on damage, more attention will be given to the extent of damage and the amount of downtime for the damage repair (as opposed to total downtime that includes other activities).

Critical Incidents: All cases where water in any amount entered the recovery unit (or could have entered) forward of isolating baffles (and therefore would be a similar criterion to the need to perform an ESP). This includes leaks of pressure parts of all sizes. Since small leaks often wash adjacent tubes to failure, this category is important to our learnings.

Non -Critical Incidents: Those cases that did not admit water to the boiler cavity defined above.
Appendix I contains a summary of the incidents reviewed during the meeting

7. **SUBCOMMITTEE REPORTS** – (Cont.)

7.3 FIRE PROTECTION IN DIRECT CONTACT EVAPORATORS REPORT

Stephen Cox

Meeting started at 8:00 am Central Time

Attendees (as best determined):
1 attendees

Reviewed anti-trust document

Introduction:
-Review of Agenda

Role Call of Members: with 1 of 5 present
Stephen Cox present
The other 4 committee members were unable to attend due to other commitments.

Review of Minutes:
Minutes from Spring 2021 session were read
-Motion to accept (Stephen Cox). Second (Stephen Cox). Carried: Minutes Approved.

Recent Events:
-None submitted prior to meeting
-None submitted during meeting.

Agenda topics for discussion were held
Public comment review of the suggested language changes has yielded no comment and will be presented to the Executive Committee for approval for vote at general session.

New Issues:

No new issues noted.
No new topics for Spring 2022 discussion.

Questions and Comments:
Q:. None
A:.
Plan for next meeting:
The next meeting will cover any issues between now and the next session which is typically in the spring. The planned meeting will be Spring 2022. Recruitment of sub-committee members will be focus for upcoming period.
Submittal of events is requested to further discuss during upcoming committee meetings.
Adjournment:
Motion to Adjourn.
Adjourned 8:34 am Eastern Time.

7.4 INSTRUMENTATION REPORT –John Browning

There were 19 meeting attendees, 8 committee members and 11 guest.
Starting the meeting by reviewing the BLRBAC anti-trust statement.

Reviewed list of current I&C subcommittee member in an effort to update membership list.

reviewed previous list of discussed items including bed cameras, BMS life cycle etc. Member voted to except the meeting minutes as read.

Today's agenda included continuing discussion from our last meeting.

- Reviewed Rotork actuator issue

The members and guest had a detailed discussion about the Rotork actuator issue and shared concerns that the issue was not adequately been addressed by Rotork. Member Bruce Knowlen suggested that the I&C committee create a document from our committee to share with BLRBAC users perhaps posted on the BLRBAC web site to notify actuator uses of this issue.

Reviewed Rotork's fix but opinion is it falls short of what our committee expected and in our opinion the design of the solution was not fail safe.

- Drum level team to re-schedule planned WebEx meeting,

Drum level team members mentioned that we have to get back together to complete create of the drum level document, 2019 was the last time we made significant progress on completing this documents.

- Need revisions to I&C section 4.3

I&C document needs to add and submit low water flow alarms for DCEs to reflect what is in the DCE document.

- I&C technician qualifications

Committee members believe we voted on and sent for approval the document for I&C Technician qualifications, Requires follow-up with Dave Avery / Executive committee.
New discussion points:

- Cyber security for RBSS.

Discussed cyber security and the threat of instruments that may have remote wireless connectivity features.

Other industries have recent experiences where control systems were accessed with impact to the business.

Recommend adding additional narrative to our document to provide additional guidance.

- Precipitator tripping on MFT, as required by NFPA-85. Bruce Knowlen mentioned alternative logic that would shutdown TRs only on loss of fans / low airflow, and therefore the potential for combustible mixtures due to lack of supplied air flow.
- Furnace water wash spool pieces permissives and trips interlocks. The members and guest continued the discussion after the morning break and reviewed the SFBL RGP figure 5 which shows BL header wash spool switch can initiate a trip.
- Members and guest discussed smelt bed cameras, cleaning and retracting mechanisms and proper maintenance. Monitoring the bed is important to safe operations.

We discussed that our current document indicates bed cameras to be Class II (recommended but not required). SFBL and ESP documents have several references to knowing the size of the bed. Discussed the possibility of changing the classification from a 2 to a 1. Will proposed change to executive committee.

- Meeting included discussion about maintaining steam drum gauge glasses and how these types of devices require routine maintenance. Bicolor drum level gauges. Best to replace all glasses at one time, not one at a time. Some may opt of regular change out of unit which would be sent out for complete rebuild and testing as compared to inhouse repairs that may have exposure to frequent failures because only some components are changed out where perhaps it's best to change out all components, washers etc.
- Discuss supply chain and sourcing issues. Raw material, supply issues, and shipping may have an impact on maintaining plants and capital projects. Various DCS and PLC components, along with valves are becoming more and more difficult to get. Leadership should be made aware of the supply chain challenges to properly prepare and maintain the plants.
- Discussed various methods to measure dissolving tank density.

7.5 MATERIAL & WELDING REPORT – Mike Blair

In person session:

The Materials and Welding (M&W) Subcommittee met in person Open Session on Monday morning 4 April 2022.

The meeting was opened with a review of the BLRBAC Anti-Trust Statement.

Attendance

Four members attended. There were 19 guests. Four guests expressed interest in becoming members.

Members

4/16 members in attendance
We did not have quorum to open the meeting, so no formal business was conducted.

Discussions

Reviewed minutes from last meeting just to refresh our memory of what was covered.

We instead had informal discussions among the group concerning:

- Crack repairs by welding when crack depth is below ASME minimum wall thickness. Question from Maxime Simard, FM Global. This branched into discussions about weld overlay repair, SACC internal cracking, etc.
- Membrane cracking in furnace floors and potential repairs. Question from Maxime Simard, FM Global. Discussed the need to determine root cause before making repair, i.e. floor compression, membrane overheating, weld quality (full thickness weld or shallow weld)
- Over-penetration of butt weld cap passes at clad-carbon steel transition lines.

Presentations

Michael Blair (IP Technology) made a presentation *Over-Penetration of Butt Weld Cap Passes* in order to spur discussion and to get a sense of how frequent this has been seen.

No other issues being raised, session was closed at approximately 10:15 eastern time.

7.6 PERSONNEL SAFETY REPORT – John Fredrickson

The Personnel Safety Sub-committee met in an "open" session on Monday, April 4, 2022. There were 5 (out of 9) committee members plus approximately 20 guests in attendance during the meeting.

Representation at our meeting by regular members and guests included original equipment manufacturers Andritz, and B&W. Service Providers attending were 3-S Team. Representation from FM Global attended the meeting. Operating company representation was present at this meeting with representatives from Georgia-Pacific, International Paper, SAPPI NA, Clearwater Paper, PCA, Pixelle, Resolute, Smurfitt Kappa, New Indy, and WestRock. Other representation included, AF&PA.

The BLRBAC anti-trust statement was read. All attendees introduced themselves and their affiliation.

Contact information for all committee members in attendance were confirmed or updated as needed.

New committee members – Alexander Hartfield – PCA

A sign-in sheet was passed around for a record of attendance and contact information.

A sheet to capture topics of discussion from members/guests for group participation was sent around but none were officially submitted.

The minutes of the last meeting (April 2021) were read, discussed for clarity, and approved by the Committee.

A working session with committee members and guests was held to review progress on SIF tasks in the recovery area and to agree on the next steps for the committee to take. The following were agreed next steps by committee members in attendance.

1. The committee will continue down this path as proposed and consider adding a few other SIF potential tasks that were suggested by attendees. (updated in the working document for review)
2. A section covering some basic thermal risk training should be considered to aid in the initial safety training for folks assigned in the recovery area. Jeff Bazarow will provide some assistance on this.
3. West Rock and GP continue to offer staff level support for any tasks that may come up during the next phase of this work.
4. The committee will solicit lessons learned from recovery personnel injuries (in the past or recent) to be reviewed, discussed and shared during the October meeting. The intent is to increase awareness of how folks have been injured around the recovery area so we can prevent it from happening to others. If this is successful, and members are interested in continuing this, it may become a standing agenda item each meeting.

- Open Discussion – With the time remaining, a number of ad hoc topics were discussed and experience and lessons learned were shared. Topics included (not all):
  - In aging RB's, make sure you are checking the structural integrity of your elevator shafts. Severe corrosion has been found when inspections have been done.

- Aging electrical devices (failing unexpectedly) in the systems that control, power and communicate between critical systems in the recovery area have been a problem at some facilities. Doing a thorough review of the age of critical components and assuring they are being tracked and tested is worth considering.
- The importance of refresher training was discussed and a some companies reported using internal SME's to mentor/train new team members. Other things like boiler specific vendor training for port rodders, etc. has helped get their teams back up to speed.

- The meeting ended at 11:50 am.

- Next BLRBAC: October 3-5, 2022

There were no requests for clarification or interpretation in the last six months.

In closing, we are always welcome to new committee members who can participate in any capacity even if you can only attend meeting intermittently.

7.7 PUBLICITY & NEWS REPORT – Matt Paine

We continue to advertise for meetings by posting web posting events on industry website calendars such as TAPPI, Pulp and Paper Canada, Paper Age and also continuing with the cross-promotion program with TAPPI advertising for events on each other's websites. Any questions.

7.8 SAFE FIRING OF BLACK LIQUOR REPORT – Sarah Henke

Open the meetings. Both Closed and Open.

1. Reviewed BLRBAC Anti Trust statement. Both closed and open meeting.

2. Introduce members and guests. 10 committee members present in the closed Meeting. 53 total in the open, 42 guests in the open meeting and 11 committee members.

3. Reviewed and approved the Fall 2021 minutes.

4. Review any open items brought up to the subcommittee before the Fall 2021 Meeting.

Items brought up last meeting.

- Continue discussions from Fall 2021 meeting (Refer to minutes).

- Reviewed revisions to large tube leak logic discussion.
  - High pressure should always close the feed water valve.
  - Concerns on the pressure (+2 in wc). And when it is too high the boiler does not trip.
  - Alarm should be high priority and recurring.
  - High priority on the main page.
  - Decided that the Power Point from David Boudreau should be sent to the members or discussion in the fall. It was based on the 2016 document.
  - Discussed four similar incidents that happened before which is why the logic was changed.

- Reviewed revisions to the spout cooling water leak watch outs.
    - Added monitor/alarm the valve position.
    - Added an increase in conductivity for a vacuum system.

- Review revisions to DT explosion venting requirements.
    - Revisions to the venting requirements. From operating companies need more discussion. The DT diagram wording can be changed.
        - Add adequate agitation and the rest of the changes were discussed.
        - Page 82 deleted the sentence that starts with "Existing.
        -

- Reviewed the furnace wash permissives on page 32. Everyone was in agreement that the edits are more clear now.
    - This includes edits to Figures 2, 3, and 5.

- Reviewed figure 1 and changed wording to include adequate agitation.

- Went over Len Ericksons comments about 6.4 BL Offline testing and TAPPI Test requirements.
    - On the TAPPI test clarified the calibration versus standardize.

5. No open item discussion from members.
    - Any new items will be discussed.
6. Open discussion from guests
    - On the furnace large tube logic trip it was asked if there should be a time delay on the alarm. It was noted it should be mill dependent.
    - Question was asked around the scrubber bypass damper and if it should or should not be considered for explosion relief. The committee's stance is NO and it is written in the document. The scrubber relief door is to protect the scrubber. It can seal itself shut due to buildup. It is too far away from the dissolving tank to provide adequate relief.
    - What is the definition of adequate mechanical agitation?

7. No Explosion videos…None to show this meeting.
    - Would be good to have some for the fall.
8. Open meeting was closed.
9. 11 members met again to vote on the document since a quorum was reached. The revised document was approved for review by the executive committee.
10. Finished the Closed meeting.

7.10 WATER TREATMENT REPORT – Tom Przybylski

- The water treatment subcommittee met in open session for morning and afternoon sessions. There were 9 of 14 subcommittee members in attendance along with 14 guests

- Norris Johnston, Buck Dunton, John McGraw, and Ray Cassel have retired and are no longer on the subcommittee

- Steve Morrison will be moving to ESP subcommittee. In his place, Peter Fogg and Nick Wildey will represent GP starting in the Fall. Frank DeStefano from 3D Team has returned to the subcommittee, and Ben Crowe from Solenis has also joined the subcommittee.

- The session started with a review of the BLRBAC antitrust statement.

- Meeting minutes from last spring were amended and then approved.

- The morning session consisted of a final review of the entire chemical cleaning section. This resulted in additional minor edits. These edits included adding metric equivalents to references in SI units. We clarified guidance on tube samples that are removed for both analysis by laboratories, and for dissolution testing by the chemical cleaning contractor. The environmental section was expanded for clarity and emphasis. Guidance on start-up following a chemical cleaning was also expanded for clarity.

- Following the edits to the chemical cleaning section, the subcommittee voted to approve this document for submission to the executive committee.

- The remainder of the morning was spent returning to production of the testing and sampling section. The discussion in the morning focused on sample conditioning to ensure representative and timely data.

- The afternoon session continued with discussion about conductivity meters. Cation conductivity was clarified to explain that this references cation exchange column equipped meters rather than conductivity meters on demineralizer units

- Guidance on interference of glassware when performing silica tests was added.

- Starch detection in condensate was once again discussed. We elected to omit Total Organic Content as a potential means of detecting starch, since it is not utilized in the paper industry due to instrument cost.

- There was discussion about what sort of guidance to include in this section as there are already technical documents from TAPPI, ASME, and ASTM. We agreed that we would only highlight key points, while referencing the supporting documents

- A final discussion point involved instrumentation placement relative to the sample location. Some guidance was added to instances where one instrument is used to sample multiple samples.

- The meeting was adjourned at 3:20PM

8.0 AMERICAN FOREST & PAPER ASOCIATION RECOVERY BOILER REPORT – Wayne Grilliot (See ***Appendix III*** – Slide Presentation)

The American Forest & Paper Association (AF&PA) Recovery Boiler Program was established in 1974 to help identify the root cause of recovery boiler critical incidents and explosions. The AF&PA Recovery Boiler Program assists companies in improving the safety, integrity, and reliability of recovery boiler operations. Recovery Boiler Program membership is open to all companies that operate recovery boilers. Program activities are funded by member company dues.

The Recovery Boiler Program is under the direction of a Steering Committee which includes Karl Morency (Georgia-Pacific), Frank Navojosky (International Paper), Jeff Wagoner (International Paper), and Wes Hill (Georgia-Pacific). The Steering Committee sets Program priorities based on Member Company Input, BLRBAC Incidents, and Industry Needs

The Recovery Boiler Program provides a forum for companies to develop information to help evaluate Safe Operating Procedures, Organization and Training, Maintenance Programs, Specifications and Construction, and Research & Development Programs. Documents developed by the Program include Reference Manuals, Audit Guidelines, Best Practices, Training Aids, Checklists, Textbooks, and Studies. The Program sponsors R&D projects for Safety Improvements and Process Improvements. This helps drive improvements in Safety, Operations, Maintenance, and Recovery Boiler Integrity.

The AF&PA Recovery Boiler Program has two (2) Standing Subcommittees. The Operation & Maintenance (O&M) Subcommittee is Co-Chaired by Frank Navojosky (International Paper) and Wes Hill (Georgia-Pacific). The Research & Development (R&D) Subcommittee is Co-Chaired by Karl Morency (Georgia-Pacific) and Jeff Wagoner (International Paper). Subcommittee Membership is made up of Representatives from the Member Companies.

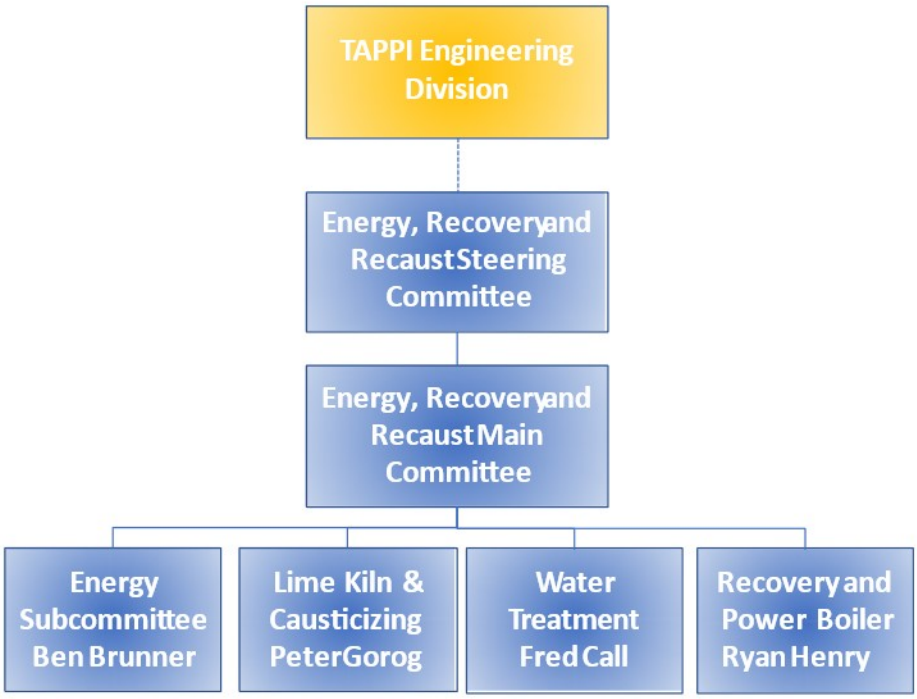
In 2018, the AF&PA Recovery Boiler Program was opened to all Canadian Mills that operate Recovery Boilers. We currently have 22 member companies in the AF&PA Recovery Boiler Program. Our membership currently represents 94% of USA and 30% of Canadian Chemical and Semi-chemical pulp production.

Both the Operation & Maintenance Subcommittee and the Research & Development Subcommittee are working to develop best practices around dissolving tank related issues. The Research & Development Subcommittee is sponsoring some very exciting research projects at the University of Toronto. The 4 projects focus on Dissolving Tank key operating conditions and advanced monitoring techniques to further improve safety and reduce operational risks. The program is building on past studies sponsored by the AF&PA Recovery Boiler Program and related research underway at the University, which is currently funded by a consortium of 26 companies. We are very pleased to have Dr. Markus Bussmann of the University of Toronto leading these studies.

Available documents on the AF&PA Recovery Boiler Website include Publications, Studies, Training Aids, Standards, and General Program Information.

AF&PA Recovery Boiler Program Website:
http://www.afandpa.org/our-industry/recovery-boiler-program

9.0 TAPPI ENERGY, RECOVERY, RECAUST (ERR) Committee REPORT - ERR Committee Chair Thanh Trung



Energy, Recovery and Recaust Steering & Main Committee

Chair: Thanh Trung, FITNIR Analyzers Inc.
Vice Chair: Wei Ren, FPInnovations
TPC: Ben O'Fiel, International Paper
TIP Coordinator: Open Position
Membership Chair: Lisa Stephens, TAPPI

This committee provides a forum to collect information and disseminate the information as a guideline for energy management, sharing ideas on conserving energy, and/or increasing efficiency. We publish TIPs (Technical Information Paper). We focus on Pulp and Paper mills and power plants in areas of energy management and energy consumption, including electrical, steam, condensate and efficient heat exchange.

Energy Subcommittee

Chair: Ben D. Bunner, P.E., Andritz

The objective of the subcommittee is to develop and disseminate information relating to design, application, and operations in the following areas:

- **Power generationdrive equipment and auxiliary drives, the economic and technical aspects of energy procurement and sales, including fuels, electric power and heat.**
- **Energy policies affecting price and availability.**
- **Power plant conceptual thermal cycle design and integration.**
- **Economical and effective energy management technology for pulp and paper mill systems, which use heat and power, including steam and condensate systems and energy consumption management.**

Recovery and Power Boiler Subcommittee

Chair: Ryan Henry, Green Bay Packaging

To develop and disseminate information and provide best practice guidelines related to the design and operation of recovery boilers, liquor evaporators, non-condensable gas systems, and related equipment. To develop and disseminate information relating to steam generation from fossil or refuse fuels, either purchased or from on-site sources

Lime Kiln & Causticizing Subcommittee

Chair: Peter Gorog, Houghton Cascade

The committee will focus on the design and operation of kilns and recausticizing equipment in the pulp and paper industry. The goal will be to identify critical needs and develop pathways to increase understanding in key areas to help the industry to meet its goals in manufacturing efficiency and productivity. The committee will promote ongoing collaboration and alignment of industry owners and operators, equipment suppliers, and research organizations.

Water Treatment Subcommittee

Chair: Fred Call, Buckman

To develop and disseminate information relating to the management of water quality throughout the power plant cycle. This includes the management of water supplies, boiler feedwater,condensate, cooling water,and industrial cleaning.

ERRC Meetings– Twice Annually

- **Spring Meeting co-located with BLRBAC spring meeting**
- **Immediately follows BLRBAC meeting: Wednesday afternoon**
- **Today, starting at 11:45AM**
- **12:45 PM Main Committee Meeting – Open to everyone**
  - **Technical Presentation: Dr. Danny Tandra**
  - **The Impact of Utilizing the Leading Edge Sootblower Nozzle on Recovery Boiler Superheater Platens**
  - **13:15 – 13:45**

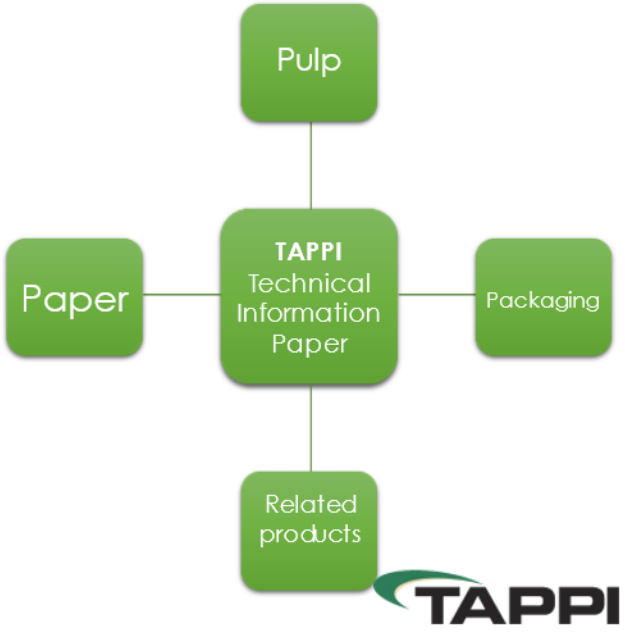
ERRC Meetings – Twice Annually

- **Fall Meeting co-located with TAPPI PEERS Conference**
- **This year, PEERS2022 is in-person conference**
- **Location: Providence, RI**
- **We anticipate a good program with many papers that were not presented in 2021 plus latest content**

TIPs - Technical Information Papers

TIPs contain specialized information (e.g., data, software, calculations) used in the manufacture, evaluation and description of pulp, paper, and related products.

TIPs may contain testing procedures or methods used to evaluate equipment but do not contain pulp and paper testing procedures or methods.



ERRC TIPS Review

TIP Number	*Title*	*Working Group Chair*	*Next Action*
TIP 0416-04	Design engineer decisions tree: paper mill boiler feedwater	Fred Call **Working Group** Robert Bartholomew Susan Childress Frank Destefano Norris Johnston Jim Robinson James Graham	Awaiting final approval from WGC

TIP Number	*Title*	*Working Group Chair*	*Next Action*
TIP 0416-07	Evaluating reverse osmosis for treating makeup to the boiler feedwater in a pulp and paper mill	WGC Needed	Awaiting Draft from WGC
	Summary		

Brittaney Lovett, Standards Manager: tip@tappi.org; standards@tappi.org blovett@tappi.org

ERRC TIPS Review

TIP Number	*Title*	*Working Group Chair*	*Next Action*
TIP 0416-08	**Guidelines for replacement of generating bank tubes with expanded joints in two-drum boilers**	Michael Lykin **Working Group** Fred Marcinek Dennis Beggs Bentley Sherlock	**Awaiting update/Final Draft from WGC**

TIP Number	*Title*	*Working Group Chair*	*Next Action*
TIP 0416-15	**Chloride and potassium measurement and control in the pulping and chemical recovery cycle**	Andrew Jones	**Awaiting Update/Final Draft from WGC**

ERRC TIPS Review

TIP Number	*Title*	*Working Group Chair*	*Next Action*
TIP 0416-20	**Recovery boiler sootblowers: practical guidelines**	Danny S. Tandra **Working Group** Alarick Tavares Andrew Jones Honghi Tran	**QSMC Hit List** **Awaiting Final Draft from WGC**

Reviews scheduled for 2022		
TIP number	*Title*	*Next Action*
TIP 0416-06	**Keys to successful chemical cleaning of boilers**	Automatic review - 8/2022

Kraft Recovery OperationsShort Course

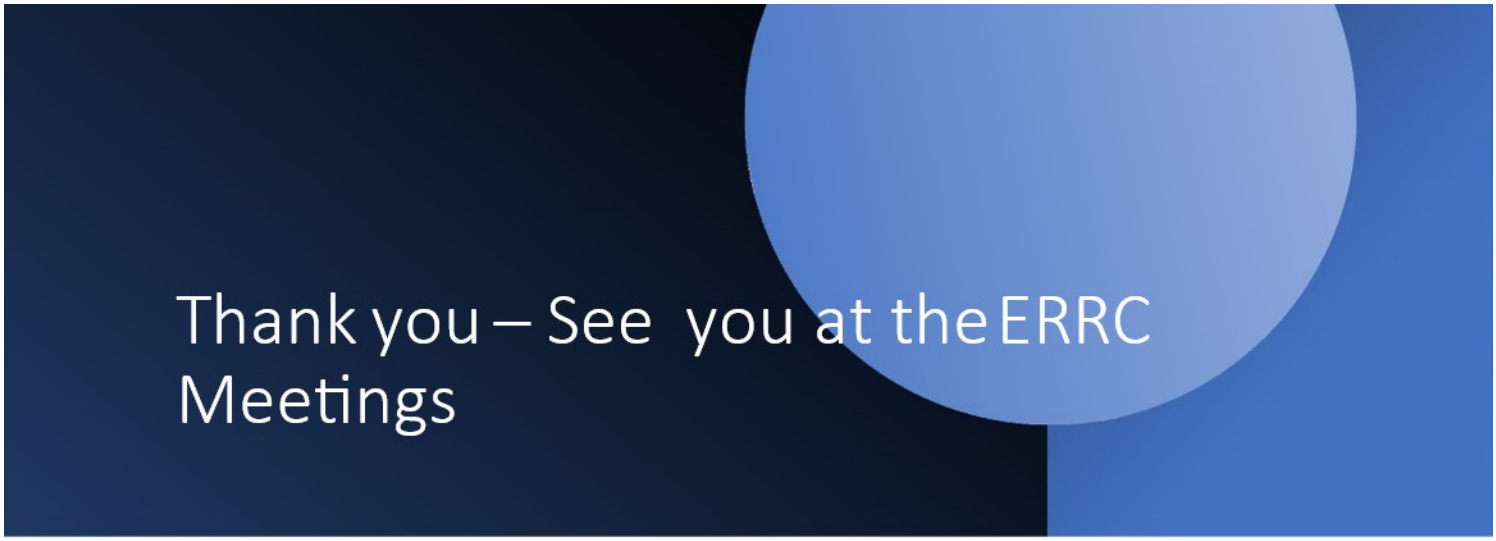
- St. Petersburg, Florida
- Monday, January 09, 2023 to Thursday, January 12, 2023
- One of TAPPI's highest rated, longest running events! You'll learn ways to improve pulp production efficiency, minimize operating costs and reduce environmental impact. This course is designed for pulp mill operations personnel, including operators, process engineers, etc..
- comprehensive review of the important recovery operations in kraft pulp mills with the objective of helping improve pulp production efficiency, minimize operating costs and reduce environmental impact.

TAPPI

Future Event - TAPPI PEERS 2023

- November 5-8, 2023, Hyatt Regency Atlanta, GA

TAPPI



10.0 WESTERN CANADA BLRBAC REPORT

No report was given at this meeting.

11.0 ACTIVITIES OUTSIDE NORTH AMERICA REPORTS

No report was given at this meeting.

12.0 OPERATING PROBLEMS SESSION REPORT – Frank Navojowsky

Session started at 1:00 PM on Tuesday April 5th. We reviewed approximately 25 questions submitted by the membership in writing, with approximately 10 additional questions asked during the session. Covered topics ranged from Spout torches, Interlocks, Refractometers, ESP testing, Water treatment to Liquor divert systems, among others. We also received questions regarding operational procedures and questions about various maintenance practices and training. The Session closed on Tuesday April 5th at 2:40 PM
- This concludes the Operating Problem Solving Session Report.

CLOSING COMMENTS:

CHAIRMAN: David von Oepen:

This actually concludes the main committee meeting this morning. So thank you all for coming and for all your time away from home and work. Our next meeting, as it has been mentioned is on October 3rd, 4th, 5th, 2022. It will be in this hotel of this will be our 60th anniversary, so I really encourage you to go back and

drum up some support to get some additional interest in that meeting as we celebrate 60 years of trying to safely operate our recovery boilers. We are planning something special in recognition of that. So, with that I entertain a motion to close the main committee meeting motion made and seconded. The spring 2022 Meeting is now closed. Thank you very much for coming. We do have some technical presentations that will follow every 15 minutes from now.

APPENDIX I
INCIDENT LIST

ECONOMIZER

ECONOMIZER

SPRING 2022-01	
Classification:	Noncritical
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#3,1986, Ahlstrom, 39445 , Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	2.1 MMlb DS/day, 360,000 lb/hr steam, 1250 PSIG, 860^{o}F, 1475 PSIG Design
Incident Date/Time:	December 15, 2020, Earliest Indication: 12/15/2020 at 8:00 AM
Downtime hrs, leak/total:	31 hrs
ESP?	**NO**
Leak/Incident Loc:	Economizer, Tube leak on the edge of an old pad weld
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Weld Failure, Porosity at edge of old pad weld
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-18
Sequence of events:	Leak was found during walkdown by operator 12/15/20, N economizer ash conveyor. No indication via Parcview trends. Pulled liquor @ 11am same day to determine location of leak. Repairs made 12/16/20 and liquor in boiler 1:45 am 12/17/20
Repair procedure:	Ground out hole and re-welded. Leak was in the bend just after the feedwater header. This area

	had experienced some erosion due to condensate in the IK steam but the tube was not overly thin. The leak was more like a pit than wear. The "pit" was ground out and re-welded.
Future prevention:	Inspect during outage.

ECONOMIZER

SPRING 2022-02	
Classification:	Noncritical
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#3,1986, Ahlstrom, 39445 , Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	2.1 MMlb DS/day, 360,000 lb/hr steam, 1250 PSIG, 860°F, 1475 PSIG Design
Incident Date/Time:	April 8, 2021, Earliest Indication: 4/8/2021 at 12:00 AM
Downtime hrs, leak/total:	27.5 hrs
ESP?	**NO**
Leak/Incident Loc:	Economizer, Tube leak on the edge of an old pad weld
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Weld Failure, Porosity at edge of old pad weld
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-18
Sequence of events:	Leak was found at north economizer conveyor during walkdown by operator 4/8/21 at midnight. No indication via Parcview trends. Pulled liquor and opened doors @6am same day to determine location of leak. Leak was small and not jeopardizing any nearby tubes, so plan was made to take boiler down that night to repair next day. Liquor off 11:15pm 4/8/21, repairs made 4/9/21 and liquor in boiler 2:45 am 4/10/21.
Repair procedure:	Ground out hole and re-welded.
Future prevention:	Inspect during outage.

ECONOMIZER

SPRING 2022-03	
Classification:	Noncritical
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#3,1986, Ahlstrom, 39445, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	2.1 MMlb DS/day, 360,000 lb/hr steam, 1250 PSIG, 860°F, 1475 PSIG Design
Incident Date/Time:	July 19, 2021, Earliest Indication: 7/14/2021 at 11:00 PM
Downtime hrs, leak/total:	32 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer, Leak is at the top of the tube to header weld on tube side. Location of leak suggests stress, however upon inspection excessive stress does not seem to be a factor. Final hypothesis is that leak is related to something from the original fabrication/installation.
How discovered:	Walkdown
Wash adjacent tube:	NO
Root cause:	Fatigue
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Mar-20
Sequence of events:	Leak was discovered in north economizer during a walkdown at 11 pm 7/14. Inspection of feedwater flow trends indicated that leak must have occurred sometime around 10:30 pm 7/14. Liquor was pulled at 11:30pm to inspect the leak. The water was leaking directly onto the walls of the boiler, not compromising any surrounding tubes. For this reason, we chose to keep the boiler running through the weekend to build inventory; the leak was monitored very closely to ensure it was not getting bigger or jeopardizing the boiler. Liquor was pulled at 11:00 pm 7/18. Repair was made and boiler passed hydro at 10:30 pm 7/19, fire in at 1:35 am on 7/20. Liquor was put back in the boiler 7/20 6:50 am and back up to full production at 7:20 am.
Repair procedure:	The leak was plugged
Future prevention:	

ECONOMIZER

SPRING 2022-04	
Classification:	Noncritical
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#3,1986, Ahlstrom, 39445, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	2.1 MMlb DS/day, 360,000 lb/hr steam, 1250 PSIG, 860°F, 1475 PSIG Design
Incident Date/Time:	October 30, 2021, Earliest Indication: 10/29/2021 at 5:30 PM
Downtime hrs, leak/total:	31 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer,
How discovered:	Walkdown
Wash adjacent tube:	NO
Root cause:	Fatigue, Unsure of exact cause, seems to be normal stress/wear. No upset conditions in boiler at the time.
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Mar-20
Sequence of events:	Leak was discovered in north economizer during a walkdown at 5:30 pm 10/29. Inspection of feedwater flow trends indicated that leak must have occurred sometime around 3:30 pm 10/29. Liquor was pulled at 12 am 10/30. Repair was made and boiler passed hydro at 8:50 pm 10/30, fire in at 1:30 am on 10/31. Liquor was put back in the boiler 10/31 6:45 am and back up to full production at 7:15 am
Repair procedure:	Leak was ground out and re-welded.
Future prevention:	

ECONOMIZER

SPRING 2022-05	
Classification:	Noncritical
Co, Mill, Location:	**Mercer Celgar, 1921 Arrow Lakes Dr, Castlegar, BC V1N 3H9**
Unit Data:	RB#2 1992, Gotaverken, 61270, Drums - 1, DCE - -NO, Floor - Sloped to rear.
Unit Size:	5.75 MMlb DS/day, 510 lb/hr steam, 900 PSIG, 849°F, 1204 PSIG Design
Incident Date/Time:	September 24, 2021, Earliest Indication: 9/24/2021
Downtime hrs, leak/total:	48 hours
ESP?	**NO**
Leak/Incident Loc:	Economizer, Fin Termination.
How discovered:	Walkdown, During Hydrostatic test
Wash adjacent tube:	NO
Root cause:	Thermal Fatigue, Fin to tube fillet weld failure.
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Mar-21
Sequence of events:	During a walkdown, it was identified there was a leak in the Economizer section of the Recovery Boiler during the hydrostatic test. Entered in the bottom of Economizer to identify location of leak. Leak was identified at the top of the Economizer on the fin-to-tube filet weld. Access was gained by the removal of a section of the cladding. Full penetrant leak repair approved by Technical Safety BC. Performed full NDT after repair with a successful pass. Completed hydrostatic test at 7,500 kpa
Repair procedure:	Full penetrant leak repair. (Butt weld)
Future prevention:	Minimize start/stop of boiler.

ECONOMIZER

SPRING 2022-06	
Classification:	Noncritical
Co, Mill, Location:	**WestRock, Mahrt, AL**
Unit Data:	RB#2,1989, Tampella, 337, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	3.75 MMlb DS/day, 561,800 lb/hr steam, 890 PSIG, 825°F, 1100 PSIG Design
Incident Date/Time:	January 25, 2022, Earliest Indication: 1/25/2022 at 5:30am
Downtime hrs, leak/total:	30.7 hours
ESP?	**NO**
Leak/Incident Loc:	Economizer, The leak was discovered on Pendant #57. 9th tube down on the header
How discovered:	Walkdown, Operator discovered wet saltcake under the #2 West ECON (hot) conveyor.
Wash adjacent tube:	NO
Root cause:	Stress Assisted Corrosion (SAC), Pin hole leak caused by small radial crack on the bottom of the tube, in line with the pinhole
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Mar-21
Sequence of events:	At 5:30am on Tuesday, January 25th, an operator found water under the #2 West ECON (hot) conveyor. Due to the location of the leak and all other boiler conveyors being dry, the boiler was brought down in an orderly shutdown. Liquor out at 8:56am on 1/25/22. Fire out at 9:57am, bed was completely burned out. Boiler cooldown curve was followed, and boiler water wash started at 6:00pm on 1/25/22. IKs were used only in the ECON section. Wash completed, boiler LOTO and leak identified, weld repaired, PT'd and boiler hydro tested. Boiler lit off at 11:55am on 1/26/22 and boiler on liquor at 3:40pm Wednesday, January 26th.
Repair procedure:	Grind out crack, PT to ensure no cracks present, pad weld over area, PT to insure good weld
Future prevention:	Additional inspection and Penetrant test in this area during Mar 2022 shutdown.

ECONOMIZER

SPRING 2022-07	
Classification:	Noncritical
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#4,1998, Ahlstrom, 59072, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	2.7 MMlb DS/day, 415,880 lb/hr steam, 1250 PSIG, 860ºF, 1550 PSIG Design
Incident Date/Time:	December 8, 2020, Earliest Indication: 12/6/2020 at 8:00 AM
Downtime hrs, leak/total:	31.5 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer, The leak was at the tip of the bottom of the membrane on the rear side of the #1 economizer. There have been several leaks at this area in other locations on the membrane wall. It is believed to be a high stress/fatigue related failure.
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Fatigue, High stress at the edge of membrane
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Mar-20
Sequence of events:	Leak was found during boiler walk down @ 7pm on 12/6/20.Water was seen in North economizer ash conveyor, no indications through parcview trends. Pulled B/L @ 10pm 12/6/20 to determine severity of leak. Leak was not impinging on any other tubes. Repairs made on 12/8/20 and liquor back in boiler at 12:30pm 12/9/20
Repair procedure:	The triangular piece membrane was removed and the crack was ground out and re-welded. The membrane was not put back.
Future prevention:	

ECONOMIZER

SPRING 2022-08	
Classification:	Noncritical
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#4,1998, Ahlstrom, 59072, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	2.7 MMlb DS/day, 415,880 lb/hr steam, 1250 PSIG, 860ºF, 1550 PSIG Design
Incident Date/Time:	December 25, 2020, Earliest Indication: 12/25/2020 at 7:00 PM
Downtime hrs, leak/total:	22.38 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer, Cracked between the feeder tube to feeder header weld and a pad weld. It was the 41st tube from right to left on the main inlet header to #1 Economizer. This is 10th leak in this location in the past 10 years
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Thermal Fatigue, At the edge of an old pad weld
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-18
Sequence of events:	Leak was found during walkdown by operator 12/25/20 @ 7pm. Water was found while checking N economizer ash conveyor. No indication via Parcview trends. Liquor was pulled at 3pm 12/26/20 to determine location of leak. Repairs were made dayshift on 12/28/20(second leak found during hydro & repaired at same time)Liquor was put back in boiler at 1:17am 12/28/20
Repair procedure:	The leak was ground out and re-welded
Future prevention:	Will replace this feeder tube at the next extended outage.

ECONOMIZER

SPRING 2022-09	
Classification:	Noncritical
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#4,1998, Ahlstrom, 59072, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	2.7 MMlb DS/day, 415,880 lb/hr steam, 1250 PSIG, 860°F, 1550 PSIG Design
Incident Date/Time:	April 28 2021, Earliest Indication: 4/28/2021 at 2:00 AM
Downtime hrs, leak/total:	24.5 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer, NW side economizer 1 at membrane
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Thermal Fatigue, At fin termination
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-18
Sequence of events:	Found water in the north economizer conveyor on walk down, pulled liquor and located the leak on north west side 6th floor economizer 1. Leak was determined to be small and not jeopardizing any other tubes, so liquor was put back in to make a plan for downtime. Leak monitored and saw no changes. Liquor back out 11:50pm 4/29/21, repairs made 4/30/21. Passed hydro at 3:15pm 4/30/21, liquor back in at 12:10 am 5/1/21
Repair procedure:	The leak was ground out and re-welded
Future prevention:	Will replace this feeder tube at the next extended outage.

ECONOMIZER

SPRING 2022-10	
Classification:	Noncritical
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#4,1998, Ahlstrom, 59072, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	2.7 MMlb DS/day, 415,880 lb/hr steam, 1250 PSIG, 860°F, 1550 PSIG Design
Incident Date/Time:	September 6, 2021, Earliest Indication: 9/6/2021 at 8:00 PM
Downtime hrs, leak/total:	25 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer, Leak 9th module from west wall, this is 11th leak in this location in the past 10 years.
How discovered:	Walkdown, A.
Wash adjacent tube:	NO
Root cause:	Thermal Fatigue, At the tube to header weld
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-18
Sequence of events:	Leak in economizer was found during walkdown by operator 9/6/21 at 8pm. Liquor pulled at 9:30pm to look inside, water was found while checking SW corner of hopper. No indication via Parcview trends. Leak determined to be small and not jeopardizing any nearby tubes, so liquor put back on until a plan could be made for repair. Leak monitored with no indication of change. Liquor was pulled at 11:30pm 9/7/21, repairs were made dayshift on 9/8/21. Passed hydro 2:30pm, liquor was put back in boiler at 12:30am 9/9/21.
Repair procedure:	The leak was ground out and re-welded
Future prevention:	Will replace this feeder tube at the next extended outage.

ECONOMIZER

SPRING 2022-11	
Classification:	Noncritical
Co, Mill, Location:	**International Paper, Pensacola Mill, Cantonment, FL**
Unit Data:	RB #1,1975, B&W, PR171A, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	3.06 MMlb DS/day, 455,000 lb/hr steam, 850 PSIG, 850^{o}F, 1000 PSIG Design
Incident Date/Time:	July 7, 2021, 7:00 pm Earliest Indication: 7/3/2021 at 12:00 pm
Downtime hrs, leak/total:	46.0 hours, Pinhole leak on bottom header on inner loop
ESP?	**NO**
Leak/Incident Loc:	Economizer, Economizer tube #63 at bottom header
How discovered:	Walkdown, Field operator found water in RB1 economizer wet hopper during walkdown
Wash adjacent tube:	NO
Root cause:	Stress Assisted Corrosion (SAC), Failure mode was determined to be under deposit cracking from corrosion fatigue. Deposits had been found internal to the tubes on previous events. This is the second failure within the last year and eleven overall since 2011.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Sep-20
Sequence of events:	On Saturday, July 3, 2021, at 12:00 p.m., an operator identified steam puffing from the economizer wet hopper during routine inspection. The upper dry hoppers had no indication of leak, so it was determined the presumed leak was in a non-critical area. Contact and coordination was made for first available repair contractor. Follow up checks were initiated for hourly operator walk down of the hopper. Wednesday, July 7, 2021, at 7:00 p.m., RB1 was taken off line to repair the tube leak that was identified in the lower economizer section of the boiler. The tube had a pinhole leak in the inner bend of the bottom header of Eco 1. The recovery boiler economizer tube was repaired by weld overlay and released for startup on July 9 , 2021, at 4:30 a.m.
Repair procedure:	Boiler contractor performed weld overlay at failed location.
Future prevention:	Replacement of economizer one loops were completed during the 2021 Annual Outage. The last leak occurred July 2020. There have not been any historical failures due to O2 pitting.

ECONOMIZER

SPRING 2022-12	
Classification:	Noncritical
Co, Mill, Location:	**International Paper, Pensacola Mill, Pensacola Florida**
Unit Data:	RB #1,1975, B&W, PR171A, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	3.06 MMlb DS/day, 455,000 lb/hr steam, 850 PSIG, 850^{o}F, 1000 PSIG Design
Incident Date/Time:	August 25, 2021, Earliest Indication: 8/22/2021 at 9:00 AM
Downtime hrs, leak/total:	30.75
ESP?	**NO**
Leak/Incident Loc:	Economizer, Tube 32 on the OD of a 180 deg. Bend that supplies the economizer from the bottle header.
How discovered:	Walkdown, Field operator found water in RB1 east economizer wet hopper during walkdown
Wash adjacent tube:	NO
Root cause:	Stress Assisted Corrosion (SAC)Failure mode was determined to be under deposit cracking from corrosion fatigue. Deposits had been found internal to the tubes on previous events. This is the third failure within the last year and twelve overall since 2011.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Sep-20
Sequence of events:	On August 23, 2021, at 9:30 a.m., operations found water in the west economizer wet hopper. The boiler hoppers were dry on the boiler walk down, so operation's made the determination that the source of water was from the economizer in a non-critical area. Liquor was pulled at 10:27 a.m. and with gas fire only the economizer leak was identified on the west side lower section of ECO I near the middle of the economizer. After consulting with Power Technology, the decision was made to address the leak when boiler contractors could mobilize to make necessary repairs. The tube leak repair outage was executed on August 25, 2021, at 12:50 a.m., when liquor was pulled. The exact leak location was identified at 6:00 p.m. and repaired by weld overlay and ready for hydro at 8:45 p.m.. Good hydro at 10:00 p.m.. RB1 on-line August 26, 2021, at 12:05 p.m., and first liquor gun in at 1:30 p.m.. RB1 total downtime was 30.75 hours.
Repair procedure:	Grind out defect and weld repair

Future prevention:	Replacement of economizer one loops were completed during the 2021 Annual Outage. The last leak occurred July 2021. There have not been any historical failures due to O2 pitting

ECONOMIZER

SPRING 2022-13	
Classification:	Noncritical
Co, Mill, Location:	**International Paper, Pensacola Mill, Pensacola Florida**
Unit Data:	RB #1,1975, B&W, PR171A, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	3.06 MMlb DS/day, 455,000 lb/hr steam, 850 PSIG, 850^{o}F, 1000 PSIG Design
Incident Date/Time:	November 23, 2021, Earliest Indication: 11/23/2021 at 1:00 PM
Downtime hrs, leak/total:	30.00
ESP?	**NO**
Leak/Incident Loc:	Economizer, Tube 39 on the toe of vertical fin tube leading edge of Eco I
How discovered:	Walkdown, water was found in the RB1 east economizer wet hopper
Wash adjacent tube:	NO
Root cause:	Fatigue, Stress riser from stray welding arc
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Oct-21
Sequence of events:	On Tuesday, November 23, 2021 at 1:00 p.m., No. 1 Recovery Boiler was shut down to repair an economizer leak. A boiler operator found water in the east economizer wet hopper. The source of the water was isolated to the economizer on the hot side of No. 1 Economizer. The boiler hoppers were dry on the boiler walk down, so operation's made the determination that the source of water was from the economizer in a non-critical area. The leak was identified at 2:00 p.m., repaired by weld overlay and ready for hydro at 8:00 p.m. Hydro of known leak area was successful at 10:00 p.m. RB1 remained off-line due to separate leak identified in the penthouse as found during hydro. RB1 total downtime was 30.0 hours for this initial event.
Repair procedure:	Grind out defect and weld repair
Future prevention:	Replacement of the economizer loops were completed during the 2021 annual outage. Continue detailed NDE inspections and schedule pressure part replacements based on remaining useful life.

ECONOMIZER HEADER INSPECTION ACCESS

SPRING 2022-14	
Classification:	Noncritical
Co, Mill, Location:	**Green Bay Packaging, Inc.; Arkansas Kraft Division; Morrilton, AR**
Unit Data:	RB#2,1975, CE, 20973, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	2.3 MMlb DS/day, 395,200 lb/hr steam, 615 PSIG, 702°F, 715 PSIG Design
Incident Date/Time:	June 22, 2020, Earliest Indication: 6/22/2020 at 05:00
Downtime hrs, leak/total:	53.93
ESP?	**NO**
Leak/Incident Loc:	Economizer, Rear. Hand-hole cap on upper header, east side
How discovered:	Walkdown, -
Wash adjacent tube:	NO
Root cause:	Weld Failure,
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-19
Sequence of events:	2020.06.22 - 05:00 – steam leak discovered on rear economizer, controlled shutdown of recovery boiler commenced - 05:07 – began pulling liquor. - 06:08 – liquor out - 07:21 – fire out - 11:30 – boilermakers onsite - 15:00 – repair work begins 17:00 – hydrostatic testing begins. Economizer leak passed hydro, discovered stitch weld leak in superheater.
Repair procedure:	Grind out failed weld, dye-penetrant NDE performed.
Future prevention:	

ECONOMIZER HEADER INSPECTION ACCESS

SPRING 2022-15	
Classification:	Noncritical
Co, Mill, Location:	ND Paper, Old Town, Maine
Unit Data:	RB# 4, 1971, B&W, PR-137, Drums 2, DCE - NO, Floor - Tubes
Unit Size:	2.6 MMlb DS/day, 339klb/hr steam, 600 PSIG, 750°F, 900 PSIG Design
Incident Date/Time:	11/29/2021 Earliest Indication: 11/28/2021 at 0900
Downtime hrs, leak/total:	42
ESP?	No
Leak/Incident Loc:	Economizer lower
How discovered:	Water in hoppers
Wash adjacent tube:	No
Root cause:	Hand hole weld failure
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	9/2021
Sequence of events:	Experienced water dripping in wet hoppers. Leak was check 3 times per shift by operations. Reported in shift report as well as to myself. After monitoring for 3 days the leak was found worsening, a controlled shut down was initiated. The bed was burned out completely and a water wash was completed.
Repair procedure:	Per NEMO R1 form weld procedure. Original B&W Economizer header design was mechanical handhole design. The mechanical handholes were swapped over to a welded handhole during the history of this unit. It was observed, the seats were not machined correctly inside the header.
Future prevention:	Install new hand hole caps on all headers in economizer Re-work, re-machine effected econ. Header handhole seats or replace with different nipple/nozzle design with buttweld caps.

SMELT SPOUT

SPRING 2022-16	
Classification:	Noncritical
Co, Mill, Location:	**International Paper, Port Wentworth, GA**
Unit Data:	RB#3,1979, B&W, PR-190, 2017 Andritz rebuild, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	5.1 MMlb DS/day, 742,000 lb/hr steam, 1250 PSIG, 950°F, 1566 PSIG Design
Incident Date/Time:	January 24, 2021, Earliest Indication: 1/24/2021 at 15:24
Downtime hrs, leak/total:	0
ESP?	**NO**
Leak/Incident Loc:	Smelt Spout,
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Thermal Fatigue, Punch-out rods were checked and all were found to be blunt • Spout water temps, chemistry, and flows were checked and no substantial deviations were found and were within specifications. Reviewed and confirmed by Andritz (OEM). • Original Andritz smelt spout material: chromized carbon steel • New Andritz design spout material: carbon steel with a laser clad Inconel 625 weld overlay • Parallel cracking in trough is common in Andritz chromized carbon steel spouts per IP Technology. • Final report of metallurgical analysis pending on spouts that were pulled during 21S AO showed that the spouts that leaked showed signs of thermal fatigue/ cycling.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Aug-22
Sequence of events:	• 1/24/21 – West smelt spout leaked and spout was plugged. Max liquor firing rate was 4.9MMlb DS/day (96% of max) after plugging one spout. • 2/8/21 – East Center smelt spout leaked and spout was plugged. Max liquor firing rate was 3.5MMlb DS/day (69% of max) after plugging second spout. • 2/16/21 – Center smelt spout leaked and spout was plugged. Max liquor firing rate was 2.5MMlb DS/day (49% of max) after plugging third spout. • 2/20/21 – West Center smelt spout started to leak and boiler was shut down for annual outage. Smelt spouts changed during 21S AO to Inconel overlay
Repair procedure:	Spouts were changed out.
Future prevention:	Chromized Carbon Steel Spouts replaced with Laser Clad Inconel 625 Weld Overlay

RISER, TUBE ABOVE ROOF TUBES

SPRING 2022-17	
Classification:	Noncritical
Co, Mill, Location:	**WestRock, West Point, Va**
Unit Data:	RB#4, 1976, Combustion Engineering, 21975, Drums - 2, DCE - Cascade, Floor - Decanting
Unit Size:	2.7 mmlb ds/day, 427 klbs/hr steam, 1225 psig, 900 F, 1360 psig Design
Incident Date/Time:	January 10, 2022, 10:00 am Earliest Indication: 1/10/2022 at 3:15 am
Downtime hrs, leak/total:	49.15 hrs, 49.15 hrs
ESP?	**NO**
Leak/Incident Loc:	Upper Furnace, above air entry, Left side wall, tube #90 (front to rear). Leak was located at the top of the membrane to tube weld on #90 left side wall tube. It appears that during original construction membrane was extended up too far and during original construction an attempt appears to have been made to cut membrane back. When membrane was cut back a piece of membrane remained leaving a sharp edge.
How discovered:	Walkdown, 1st Assistant was making his boiler walkdown and noticed small amount of steam coming out from behind insulation on the left penthouse wall
Wash adjacent tube:	YES
Root cause:	Thermal Fatigue, Tube was not cut out so root cause cannot be verified
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Oct-21
Sequence of events:	Jan 10, 2022: At 3:15 am the First Assistant, while making his rounds, notice what he believed to be a small amount of steam escaping from under the boiler insulation on the left wall right below the left side wall header located in the penthouse. He notified the Recovery Operator who then requested assistance from Power Plant supervision with trying to determine source of steam. At 4:30 am decision was made to burn the bed out and take boiler offline. Boiler was taken offline at 10 am on Jan 10, 2022.
Repair procedure:	Performed (1) weld repair to the #90 left side sidewall tube, tubes are counted from front to rear of the boiler. The repair is located right at top of membrane between #89 & #90 tubes. This area is approximately 2 feet below side wall header located in the penthouse. WPS# GT-PI Rev-1, Preheat 50 deg, Material SA 178A. Repair consisted of removing the crack by grinding. PT was used to verify that crack was completely removed, and ground area was welded out using weld procedure WPS# GT-PI Rev-1, Preheat 50 deg, Material SA 178A, Following tube repair to eliminate the high stress area caused by the sharp edge where the membrane had been cut out during boiler construction the remaining membrane was also ground back.
Future prevention:	During the next annual outage insulation will be removed and x-ray shots will be taken of repaired area as well as adjacent tubes in the area of the top of the membrane.

SUPERHEATER

SPRING 2022-18	
Classification:	Noncritical
Co, Mill, Location:	**Green Bay Packaging, Inc.; Arkansas Kraft Division; Morrilton, AR**
Unit Data:	RB#2,1975, Combustion Engineering, 20973, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	2.3 MMlb DS/day, 395,200 lb/hr steam, 615 PSIG, 702°F, 715 PSIG Design
Incident Date/Time:	June 22, 2020, Earliest Indication: 6/22/2020 at 19:00
Downtime hrs, leak/total:	53.93
ESP?	**NO**
Leak/Incident Loc:	Superheater, Front. 3x Stitch weld leaks
How discovered:	Hydro Test, -
Wash adjacent tube:	NO
Root cause:	Thermal Fatigue, stitch weld failure
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-19
Sequence of events:	2020.06.22 - 05:00 – steam leak discovered on rear economizer, controlled shutdown of recovery boiler commenced - 05:07 – began pulling liquor. - 06:08 – liquor out - 07:21 – fire out - 11:30 – boilermakers onsite - 15:00 – repair work begins - 17:00 – hydrostatic testing #1 begins. Economizer leak passed hydro. - 19:00 – discovered stitch weld leak in superheater. 2020.06.23 - 00:07 – begin water washing boiler - 03:18 – water wash complete. Ops spent additional three (3) hours removing clinkers from northeast corner of superheat. - 06:30 – boiler clean and ready for work to begin. - 16:50 – hydrostatic test #2 begins - 17:45 – hydrostatic test #2 complete, additional weepers found in super heat section. 2020.06.24 - 02:51 – dry hydro. Remove scaffold, unlock and prepare boiler for firing. - 05:00 – fire in boiler - 10:24 – boiler at operating pressure - 11:48 – 1st liquor gun in boiler
Repair procedure:	Weld was burred out and a base metal restoration was performed. Dye penetrant test performed on repair.
Future prevention:	Annual NDE. Boiler is equipped with original superheater. Superheater stich weld leaks are known with this vintage CE boiler design due to thermal cycling.

SUPERHEATER

SPRING 2022-19	
Classification:	Noncritical
Co, Mill, Location:	**Green Bay Packaging, Arkansas Kraft Division / Morrilton, AR**
Unit Data:	RB2,1975, Combustion Engineering, 20973, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	2.3 MMlb DS/day, 395,200 lb/hr steam, 615 PSIG, 702ºF, 715 PSIG Design
Incident Date/Time:	July 25, 2020, Earliest Indication: 7/25/2020 at 08:50
Downtime hrs, leak/total:	Found on 2020 Annual Outage during hydro.
ESP?	**NO**
Leak/Incident Loc:	Superheater, Front. Platen #10, stitch weld between tube 20 & tube 21; platen 12, stitch weld between tube 20 & 21
How discovered:	Hydro Test, 400# hydro. discovered on internal inspection
Wash adjacent tube:	NO
Root cause:	Fatigue, stitch weld failure
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-20
Sequence of events:	Outage hydro
Repair procedure:	Weld was burred out and a base metal restoration was performed. Dye penetrant test performed on repair.
Future prevention:	Annual NDE

SUPERHEATER

SPRING 2022-20	
Classification:	Noncritical
Co, Mill, Location:	**Green Bay Packaging, Arkansas Kraft Division / Morrilton, AR**
Unit Data:	RB2,1975, Combustion Engineering, 20973, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	2.3 MMlb DS/day, 395,200 lb/hr steam, 615 PSIG, 702ºF, 715 PSIG Design
Incident Date/Time:	September 24, 2021, Earliest Indication: 9/24/2021 at 20:00
Downtime hrs, leak/total:	Found on 2021 Annual Outage during hydro.
ESP?	**NO**
Leak/Incident Loc:	Superheater, Primary.
How discovered:	Hydro Test, 400# hydro. discovered on internal inspection
Wash adjacent tube:	NO
Root cause:	Fatigue, stitch weld failure
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-21
Sequence of events:	Leak discovered on 400 psig hydrostatic test.
Repair procedure:	
Future prevention:	Annual NDE

SUPERHEATER

SPRING 2022-21	
Classification:	Noncritical
Co, Mill, Location:	**Canfor Pulp Limited, Northwood RB5, Prince George, BC**
Unit Data:	RB#5,Started 1982, CE, 79120, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	3.45 MMlb DS/day, 558,800 lb/hr steam, 652 PSIG, 752^{o}F, 800 PSIG Design
Incident Date/Time:	November 7, 2021 Earliest Indication: 9/9/2021
Downtime hrs, leak/total:	200 hours (8 days 8hrs)
ESP?	**NO**
Leak/Incident Loc:	Superheater, severed superheater hanger tube at roof line on furnace side of crown seal, orderly shutdown initiated, no ESP completed.
How discovered:	Leak Detection System,
Wash adjacent tube:	NO
Root cause:	Fatigue, Mechanical. Similar failure occurred in December 2019. Suspected mechanical fatigue on swinging superheater platens.
Leak detection:	YES
Bed cooling enhanced	NO
Last full inspection:	Jan-21
Sequence of events:	#5 Recovery Boiler was operating at 3.2mmlb/day when the leak detection warning alarm activated in the control room at 1:30am on Nov 7th. The operating crew proceeded to shut down the sootblowers and do an acoustic walk down of the furnace. An audible steam leak was noted around the upper area of the furnace. The shift engineer, in consultation with the steam Chief, pulled liquor at 3:10am in a controlled manner to investigate further. The leak location was narrowed down to an area of the rear superheater section while on gas but was not able to be visually confirmed initially. Gas burners were then shut off at 6:48am to cool the boiler and prep for a leak check of the superheaters by flooding the superheater section with treated water. The leak location was confirmed at hanger tube 5 on platen 14 when water started pouring out from the failed superheater tube. During the subsequent hydro test another cracked superheater hanger tube on rear superheater platen 28 was discovered along with a weeper at a stitch weld on mid superheater platen 15. These were repaired, followed by a second hydro test. During hydro test #2, another leak was found on another stitch weld on the rear superheater platen #21. Repairs were made and hydro test #3 was successful.
Repair procedure:	**CIMS RP-11 & CIMS RP-13**
Future prevention:	

SUPERHEATER

SPRING 2022-22	
Classification:	Noncritical
Co, Mill, Location:	**ND Paper, Rumford Mill, Rumford, Maine**
Unit Data:	RB#PR-197,1981, B&W, BW-24523, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	4.0 MMlb DS/day, 600 lb/hr steam, 1300 PSIG, 849°F, 1450 PSIG Design
Incident Date/Time:	December 2, 2021, 8:10 AM Earliest Indication: 12/2/2021 at 7:35 AM
Downtime hrs, leak/total:	260 hrs
ESP?	**YES**
Leak/Incident Loc:	Superheater, Secondary Superheater Pendant tube rupture, 34 platens wide, rupture in platen 24, blistered tube in platen 30.
How discovered:	Leak Detection System, Large Feedwater/Steam Split seen by Operator in Control Room
Wash adjacent tube:	NO
Root cause:	Overheat. The tubes failed due to hot tensile rupture and were also damaged due to long-term overheating resulting in graphitization. Failed sections were made of ASTM A210, Grade A-1 carbon steel instead of ASTM A213, Grade T22 low alloy steel as specified. Grade A-1 is significantly less resistant to higher temperatures than Grade T22, making the tubes more susceptible to graphitization and failure. Also thermal fatigue, source, condensate impingement from Sootblower, steam from drum.
Leak detection:	YES
Bed cooling enhanc	YES
Last full inspection:	May-21
Sequence of events:	On 12/2/21 Control Room Operator identified a Steam/feedwater split at 7:42 AM. Operations does have complete authority to initiate an ESP if Operator suspects water may be entering the furnace. The Operator called the Recovery Superintendent as he suspected a superheater tube leak. After a quick investigation, ESP was initiated at 8:10AM after hearing steam leak in Superheater section. Leak identified after mandatory 8 hr wait period by a small team of investigators. A 3-6' bed remained in the lower furnace. Southland Fire & Safety not available for 4 days so mill used steam smothering with lances to cool bed below 600 degrees. Water washed the boiler furnace with sootblowers and a Contractor washed the smelt bed thru smelt openings after bed cooled. 6 dutchman performed in the Secondary Superheater section – 2 tubes with leaks and 4 others with severe "elephant hide".
Repair procedure:	Dutchman performed
Future prevention:	Possible re-design to include using superheated steam supply for sootblowers steam supply. [After failure analysis report received, RB was shutdown and wrong material dutchmen sections in SSH were replaced with T22]

BOILER BANK

BOILER BANK

SPRING 2022-23	
Classification:	**Critical #939**
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#3,1986, Ahlstrom, 39445 , Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	2.1 MMlb DS/day, 360,000 lb/hr steam, 1250 PSIG, 860°F, 1475 PSIG Design
Incident Date/Time:	February 9, 2021, Earliest Indication: 2/9/2021 at 11:40 AM
Downtime hrs, leak/total:	37.5 hrs
ESP?	**YES**
Leak/Incident Loc:	Boiler Bank, Tube leak RW leak at manway
How discovered:	Other, Weren't seeing ash fallout from IK's inspection/target blowing so opened doors to inspect inside, found leak in the generating bank
Wash adjacent tube:	NO
Root cause:	Weld Failure, Porosity at edge of old pad weld
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-18
Sequence of events:	Due to pluggage issues with paper machine outage, chose to inspect and target blow IKs. We weren't seeing ash fall out like we thought we should so opted to open a few other doors to take a look inside. A tube leak was found in the generating bank. ESP'd the boiler at that point. ESP occurred at 11:40am 2/9/21. Repairs made to the boiler tubes throughout the night of 2/9/21 into the next morning 2/10/21. Passed hydro at 12 pm 2/10/21, but had issues with start up burners.

	Liquor back in at 1:35 am 2/11/21.
Repair procedure:	Ground out hole and re-welded.
Future prevention:	Inspect during outage.

BOILER BANK

SPRING 2022-24	
Classification:	Noncritical
Co, Mill, Location:	**Westrock, West Point, West Point Va.**
Unit Data:	RB#5, B&W, 1992, PR-219, Drums - 1, DCE - NO, Floor - Sloped to rear
Unit Size:	3.0 MMlb DS/day, 497,000 lb/hr steam, 1200 PSIG, 900°F, 1225 PSIG Design
Incident Date/Time:	October 15, 2021, Earliest Indication: 10/15/2021 at 9:30 am
Downtime hrs, leak/total:	0/335
ESP?	**NO**
Leak/Incident Loc:	Boiler Bank, Leak was discovered during routine operator walkdown. While walking boiler down the 2nd assistant notice steam escaping from the front wall of the generating bank.
How discovered:	Walkdown, 2nd assistant noticed steam coming from under the insulation on the front wall of the generating bank and water in the generating bank ash hopper
Wash adjacent tube:	NO
Root cause:	SAC
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Aug-20
Sequence of events:	At approximately 9:30 am, on October 15th, the Recovery Operator was notified by the 2nd Assistant that he had noticed steam coming from under the insulation on the front wall of the generating bank, directly below the dead air space, and that there was moisture in the generating bank ash hopper directly below this location. The area assistant superintendent was notified and met with the 2nd assistant and confirmed that there appeared to be a leak on the front wall of the generating bank right above the generating bank inlet header. Liquor firing had been discontinued at approximately 6:30 the previous evening and the smelt bed was burned completely out in preparation for the upcoming annual outage. Due to the smelt bed having been completely burned out and the location of the leak decision was made to continue to operate the boiler on auxiliary fuel (natural gas) until 7 pm that evening to allow for the mill to be shut down in an orderly fashion. As an added safety precaution the area around the suspected leak was barricaded off to prevent anyone from entering the area. Unit was taken off line 7:30 pm on October 15th.
Repair procedure:	Tube section replaced
Future prevention:	During the annual outage the following was completed.1. All the generating bank front wall tube to header welds were inspected (no additional indications found). 2. Handhold caps on the ends of each header were removed and the first tube on the left and right side of the generating bank front header were boroscoped and x-rayed (no signs of stress assisted corrosion (SAC) were discovered).3. All found membrane cracks were removed and repaired. During the next annual outage, the rest of the generating bank tubes entering the header will be ultrasonic tested. This form of cracking can be detected using shear wave or angle beam ultrasonic testing.

ROOF

SPRING 2022-25	
Classification:	**Critical #940**
Co, Mill, Location:	**International Paper, New Bern Mill, Vanceboro, NC**
Unit Data:	RB#1,1969, CE, Contract #11667, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	4.5 MMlb DS/day, 630,000 lb/hr steam, 835 PSIG, 825°F, 1000 PSIG Design
Incident Date/Time:	August 11, 2021, Earliest Indication: 8/11/2021 found on Hydro coming up from annual outage
Downtime hrs, leak/total:	24 hours delay to startup
ESP?	**NO**
Leak/Incident Loc:	Roof, Roof tube at the secondary superheater tube outlet penetration between platens 12 and 13 from left sidewall on the penthouse side at an attachment and roof tube at 6th screen penetration also from left side wall where roof tubes have been welded together.
How discovered:	Hydro Test,
Wash adjacent tube:	NO
Root cause:	Thermal Fatigue, Leak areas were ground out and repair welded as restricted access and availability of bent tube sections made installation prohibitive. Leak was fan pattern in both locations less than 1" in length on outer surface. As the cracks were ground out they culminated in a very small penetration (<1/8" long) on the tube ID. There was no metallurgical analysis done
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Aug-20
Sequence of events:	During Hydro on annual maintenance outage, saw water coming from the roof.
Repair procedure:	Ground out crack indications and restored tube metal
Future prevention:	Inspect roof tubes on next outage. Install Dutchmen in the repaired sections. Screen area roof tube is accessible and all stitch welds between tubes at that sootblower lane were visually and PT inspected during the repair. Several cracks were found and were ground out. No cracks were into tubes and no repair welds were necessary. The superheater area roof tube leak had to be accessed from the penthouse. The support scallop plate weld to the cold side of the tubes was not visible until the roof casing was cut out. As the casing was close to the tubes only the immediate area of the leak was exposed. The additional tubes adjacent to the leak were inspected and no additional cracks were discovered. In addition to the Dutchmen on the failed tubes the mill is evaluating what additional changes are required to the design to ensure long term reliability. Inspection of the welds on regular basis with no changes to the design is not practical. The solid plate scallop support on roof tubes has been flagged as SAC potential area in presentations previously. See photo 1

ROOF

SPRING 2022-26	
Classification:	**Critical #941**
Co, Mill, Location:	**International Paper, Pensacola Mill, Pensacola Florida**
Unit Data:	RB #1,1975, Babcock and Wilcox, PR171A, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	3.06 MMlb DS/day, 455,000 lb/hr steam, 850 PSIG, 850°F, 1000 PSIG Design
Incident Date/Time:	November 23, 2021, Earliest Indication: 11/23/2021 at 8:00 PM
Downtime hrs, leak/total:	186
ESP?	**NO**
Leak/Incident Loc:	Roof, Tubes 13 & 33 at the steam drum.
How discovered:	Hydro Test, water was found on the nose arch section and generating bank tubes
Wash adjacent tube:	NO
Root cause:	Thinning External, salt cake in penthouse with missing refractory sections
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Oct-21
Sequence of events:	On Wednesday, November 24, 2021, at 8:00 p.m., a hydro was performed to check the repair to economizer tube. However, during the boiler walk down, water was seen on the rear wall and on the nose arch. Steam drum internals had to be removed to facilitate two roof tube repairs. Tube 13 was a pinhole sized leak in the tube and tube 33 was drum seal weeper. However, the thickness readings on tube 33 several inches from the drum were at mill flag and were pad welded. The dutchman style repair on tube #13 failed X-ray multiple times from weld

	contamination. New bent tube materials were ordered and the cut line moved several feet away from problem area. The total outage duration with both combined events was 216 hours.
Repair procedure:	Dutchman repair to tube 13 and weld overlay on tube 33.
Future prevention:	Continue NDE inspections. Future plans to replace pressure parts identified by near drum examination.

UPPER FURNACE, ABOVE HIGHEST AIR ENTRY

UPPER FURNACE, ABOVE HIGHEST AIR ENTRY

SPRING 2022-27	
Classification:	**Critical #942**
Co, Mill, Location:	**International Paper, Flint River Mill, Ogelthorpe, Georgia**
Unit Data:	RB#1, 1980, Babcock and Wilcox Company, PR198, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	5.4 MMlb DS/day, 778,000 lb/hr steam, 900 PSIG, 900^{o}F, 1175 PSIG Design
Incident Date/Time:	November 3, 2021/9:25PM, Earliest Indication: 11/3/2021 at 9:25pm
Downtime hrs, leak/total:	24 HOURS
ESP?	**NO**
Leak/Incident Loc:	Upper Furnace, above air entry, Leak was located at 304L Composite weld line above Tertiary
How discovered:	Hydro Test,
Wash adjacent tube:	NO
Root cause:	Fatigue, ID initiated crack, crack was in a 309L weld that was through thickness, 309L weld was added in past due to thinning of the carbon steel tube at the edge of the composite tube to carbon steel tube original weld 309L cap.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Oct-21
Sequence of events:	The Recovery Boiler was down for annual inspection and maintenance (Fire out was 10/24/21 at 5AM Maintenance started on 10/25/21) After all pressure part work was completed the boiler was hydrostatically tested at 910psig and was held for 10 min. The pressure was then dropped to 600 lbs. and the Boiler was walked down, upon inspection of the lower furnace a leak was discovered at an existing clad weld on the RHSW, tube number 85 was leaking. A 304L clad dutchman was installed at this area, 1" below the existing clad weld line. After all pressure part work was completed the boiler was hydro tested to 919psig, and held for 10 minutes with no issues found.
Repair procedure:	Tube was replaced with an 18" Dutchman
Future prevention:	Will plan to PT Test 304L Cutline

LOWER FURNACE, BELOW HIGHEST AIR ENTRY

LOWER FURNACE, BELOW HIGHEST AIR ENTRY

SPRING 2022-28	
Classification:	**Critical #943**
Co, Mill, Location:	**Canfor Pulp Limited, Northwood RB1, Prince George, BC**
Unit Data:	RB#1,Started 1965, CE Canada, CA64127, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	4.00 MMlb DS/day, 627,800 lb/hr steam, 652 PSIG, 752^{o}F, 800 PSIG Design
Incident Date/Time:	November 19, 2021, Earliest Indication: 11/19/2021
Downtime hrs, leak/total:	Ongoing
ESP?	**YES**
Leak/Incident Loc:	Lower Furnace, below highest air entry, rear wall at a primary air port
How discovered:	Walkdown, Click here to enter text.
Wash adjacent tube:	NO
Root cause:	Stress Assisted Corrosion (SAC) Unknown; Leak was in the hot side of the tube, at the beginning of a upper bend of the primary air port tube. Root cause is thermal fatigue cracks on adjacent crotch plate for tucked tube running into tube. Heavy Scale inside tube contributed to the failure by causing elevated tube metal temperatures. The adjacent primary air port was also observed to be blinded over and may have contributed to thermal cycling.
Leak detection:	NO
Bed cooling enhanced:	NO
Last full inspection:	Sept 2020
Sequence of events:	On Nov 19 during the dayshift, the phosphate residual was noted to have been dropping for the

	last 3 days but did come up very slightly from 8.8 to 9.5 on dayshift. Operators double checked phosphate pumps and drawdowns. On Nov 19, 2022 nightshift, the Field Engineer 4th (spoutman) noted a dirty sight glass on one of the primary air ports around 10:15pm. He removed the glass with the intention of cleaning or replacing it. During this process he saw what appeared to be water being blown around at the furnace at the bottom of the most Easterly primary air port on the North side of the boiler. The Assistant Shift Engineer was contacted and checked this; he then contacted the Shift Engineer. The shift engineer then went with the Assistant Shift Engineer and saw the water. Upon viewing the water the shift engineer immediately advised the Assistant Shift Engineer that this was not going to get better and ordered an ESP of the boiler. The operators pulled the liquor guns from the boiler and at 10:30pm the ESP was initiated. Time from initial discovery to ESP was about 5 minutes in total because of the 2 steps of checking and pulling the liquor guns. The shift engineer ordered the ESP within seconds of seeing the water.
Repair procedure:	Tube Pup
Future prevention:	Unknown at this time.

INTERNATIONAL INCIDENTS

ECONOMIZER

Spring 2022x1180	
Classification:	Noncritical
Co, Mill, Location:	**Sylvamo, Svetogorsk Russia**
Unit Data:	RB#3,1981, TAMPELLA , Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	1.6 MMlb DS/day, 264,000 lb/hr steam, 550 PSIG, 824°F, 711 PSIG Design
Incident Date/Time:	February 8, 2022, 1:00 am. Earliest Indication:
Downtime hrs, leak/total:	30
ESP?	**NO**
Leak/Incident Loc:	Economizer, Leak on #1 panel, 1 stage
How discovered:	Walkdown, the RB-3 operator has find a wet area in the hopper
Wash adjacent tube:	NO
Root cause:	Thinning External, cold back end temperatures on this boiler resulting in excess corrosion. Eco 1 exit temperature 152 Degree C. Exploring rebuild options and this condition is being addressed in our discussions with OEM's
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Jun-21
Sequence of events:	FEB 7, 2022 17:00pm the RB-3 operator found a moisture in the ECO#1 hopper. Following the procedure, the boiler was switched to oil to burn the bed. The following actions: - burning the bed - 6 hrs.; - Shutdown and cooling down the boiler - 5 hrs., the temperature was controlled with the portable thermocouples; - Washing the heating surfaces (ECO#1) - 3 hrs. The hydro test revealed a small leak. Two weeks ago we eliminated leaks on poppet valve of one of the SB installed in ECO 1 area.
Repair procedure:	Tube repaired with overlay welding
Future prevention:	Complete a more thorough visual and UT spots of concern. The boiler is currently being modeled for a potential rebuild and OEM's are aware as they study this boiler of the low exhaust temperatures.

APPENDIX II

ESP POWER POINT PRESENTATION

ESP Subcommittee

SUBCOMMITTEE REPORT

WEDNESDAY APR 6 TH , 2022

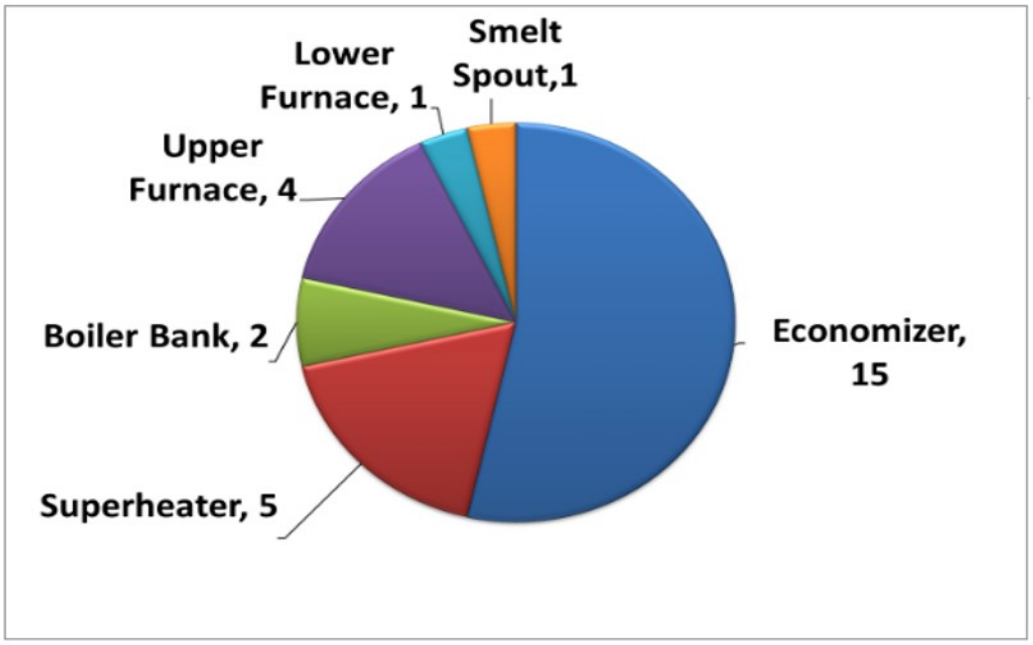
Meeting Attendance

- Closed session Monday Apr 4th
  - 10 members represented
- Open session Tuesday Apr 5th
  - 10 members
  - About 130 guests

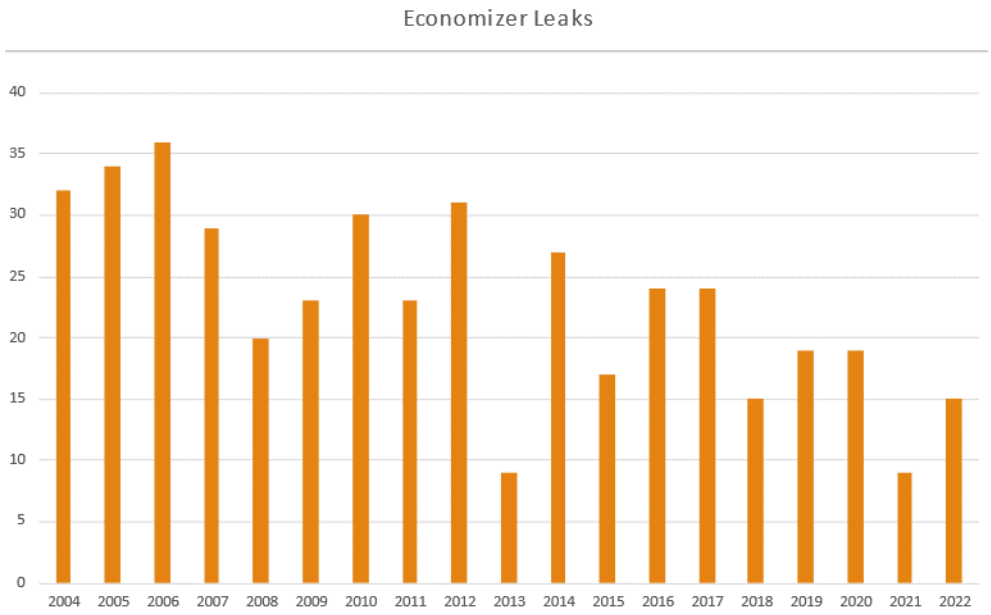
Incident Questionnaire Review

- 28 North American incidents
  - 0 Smelt Water Explosion
  - 5 Critical
  - 23 Non-critical
  - 1 Spout CW Leak (Included as Non - critical)
- 3 ESP'd
  - 5 Critical
  - 100% of Critical that Should ESP
- 1 International Incident Submitted

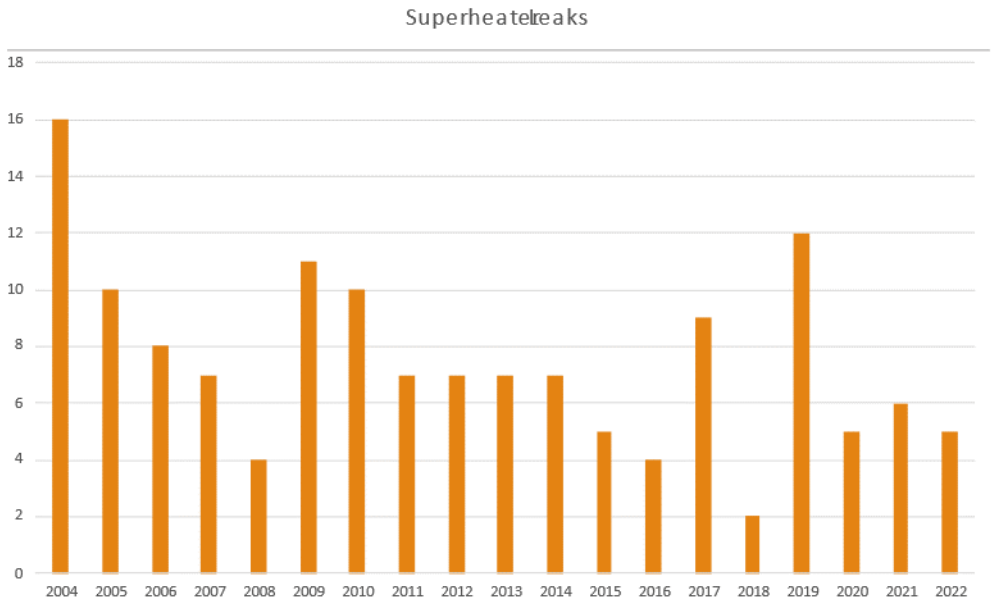
Incident Locations



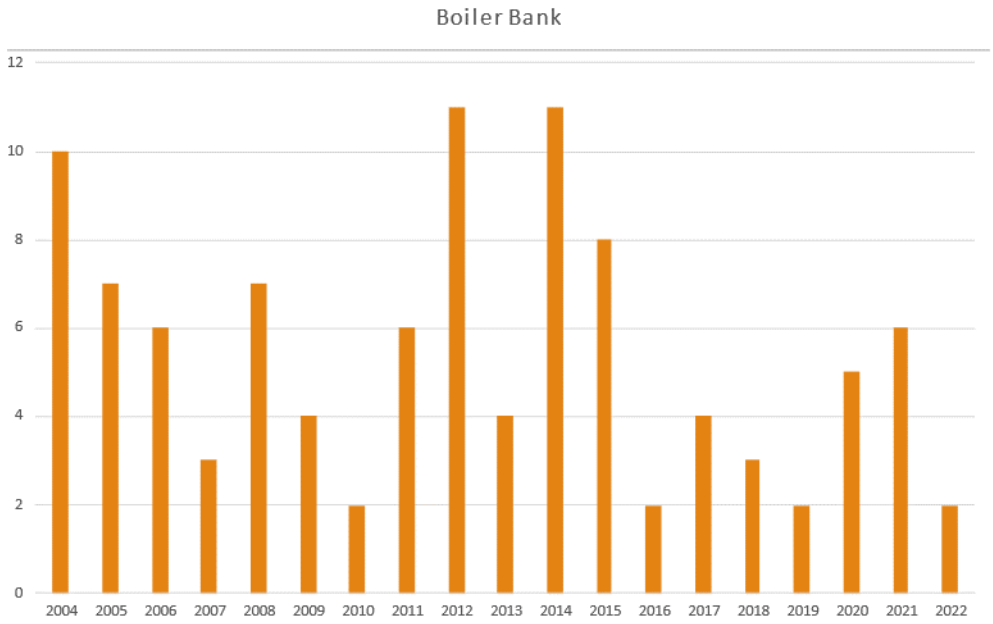
Boiler Component Leak trends



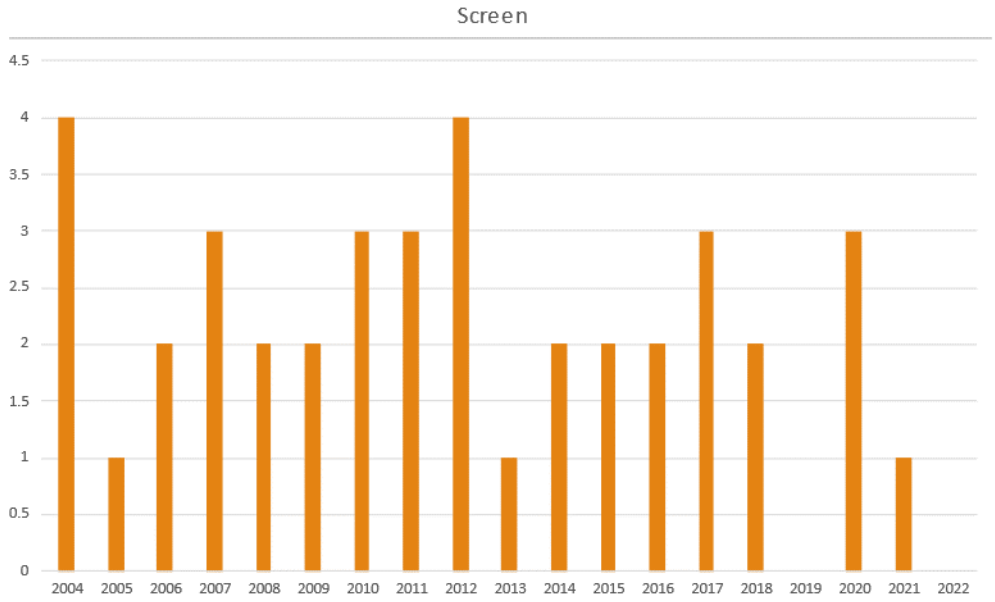
Boiler Component Leak trends



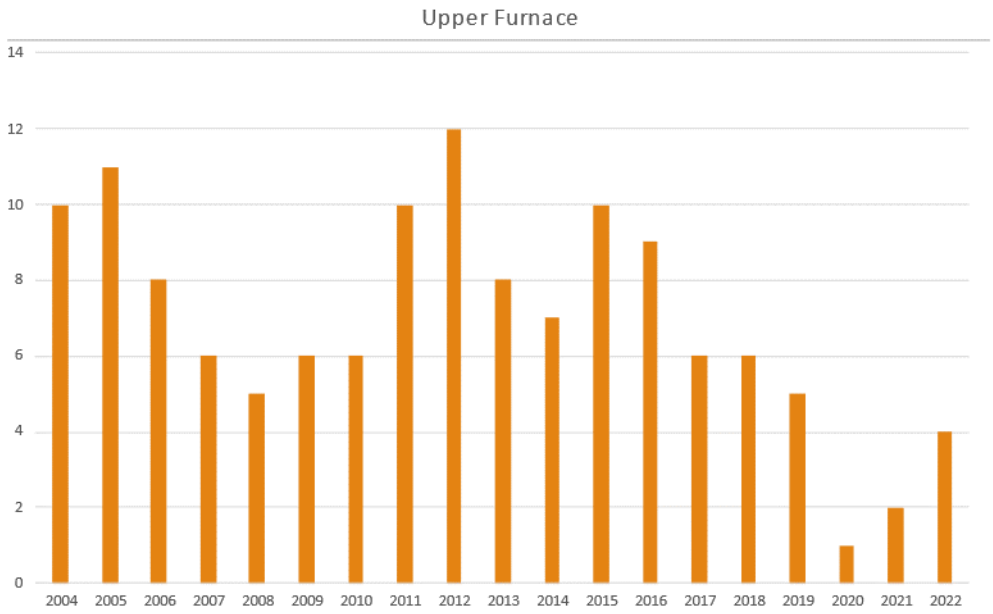
Boiler Component Leak trends



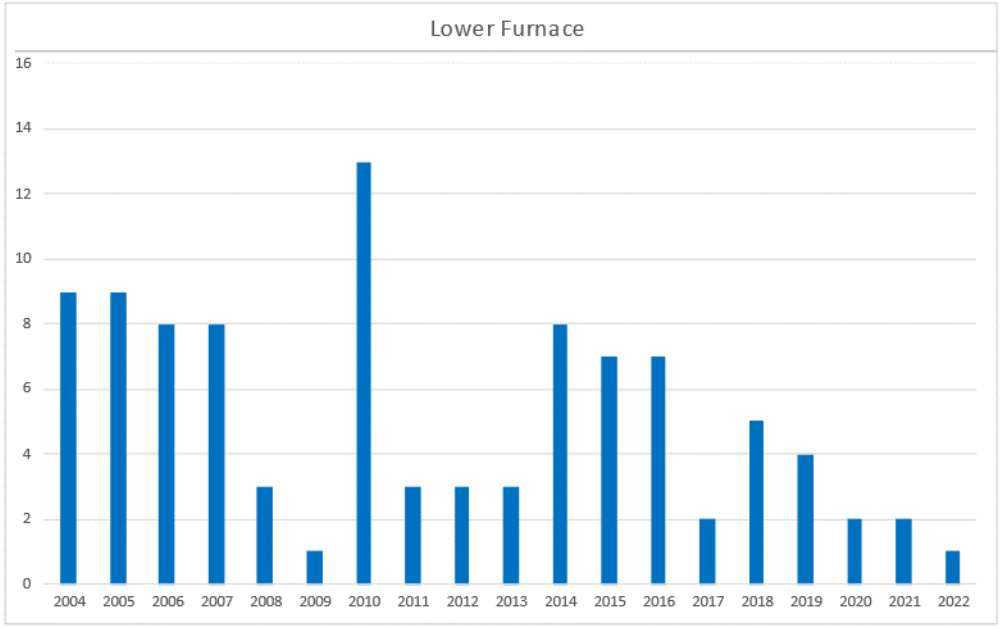
Boiler Component Leak trends



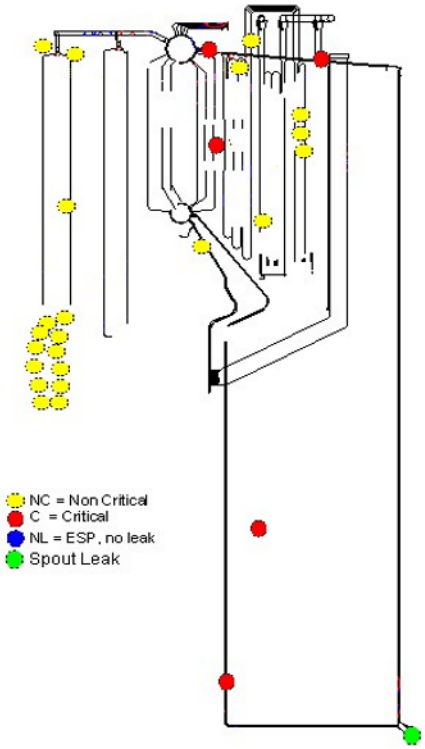
Boiler Component Leak trends



Boiler Component Leak trends



Spring 2022 leak locations



BLRBAC Reported Leaks (US + Canada) 2004 thru Spring 2022

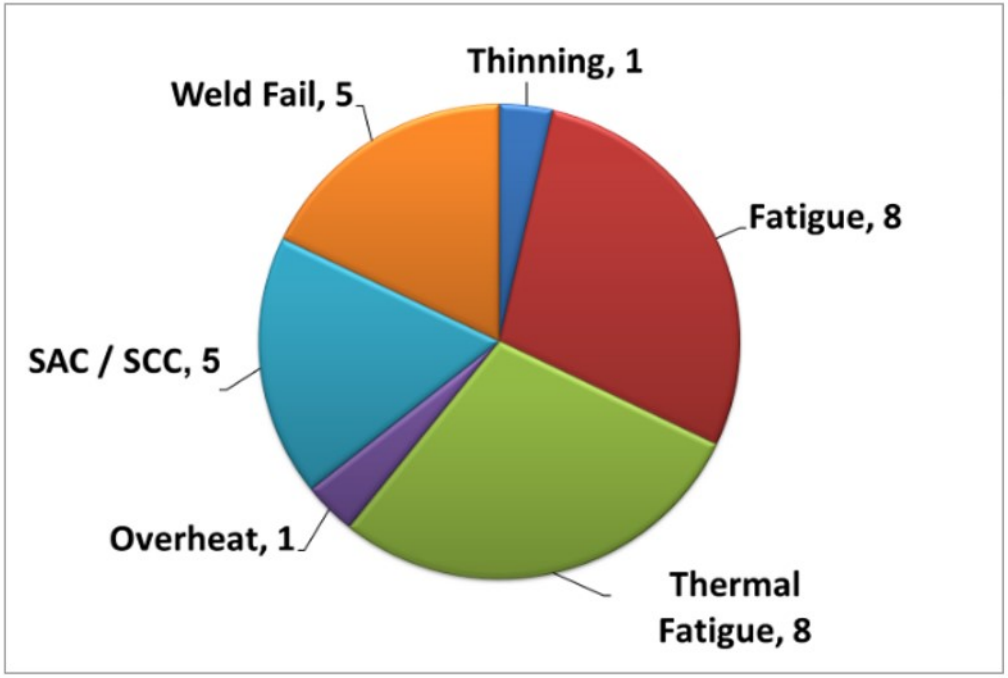
Location	19 Year Total	Average/Year
Economizer	436	25.6
Upper Furnace	132	7.8
Superheater	142	8.3
Lower Furnace*	98	5.8
Boiler Bank*	103	6.1
Screen*	40	2.4
Smelt Spout	30	1.8

*Four Smelt-Water Explosions Recorded 2004 thru 2020,
One from Boiler Bank Leak, Two Screen Tube Leaks, One Floor Leak

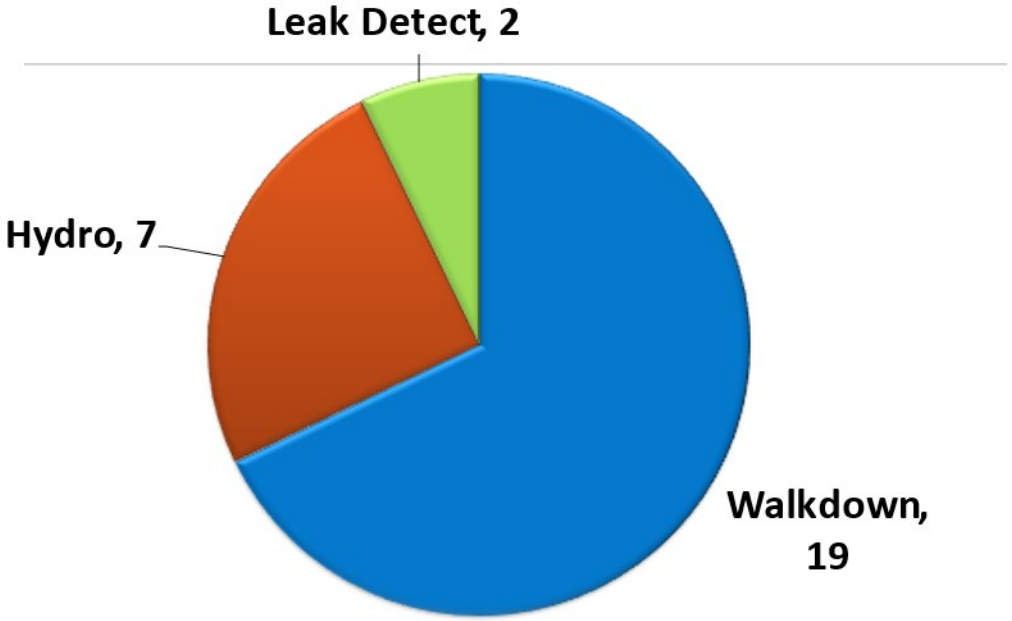
Incidents by Boiler Type

- Drums
  - 1 - 10
  - 2 - 18
  - 3 - 0
- Back End
  - Large Economizer - 27
  - Cascade - 1
  - Cyclone - 0

Leak Cause


Thinning, 1
Weld Fail, 5
Fatigue, 8
SAC / SCC, 5
Overheat, 1
Thermal Fatigue, 8

How Discovered



Leak Detection Systems

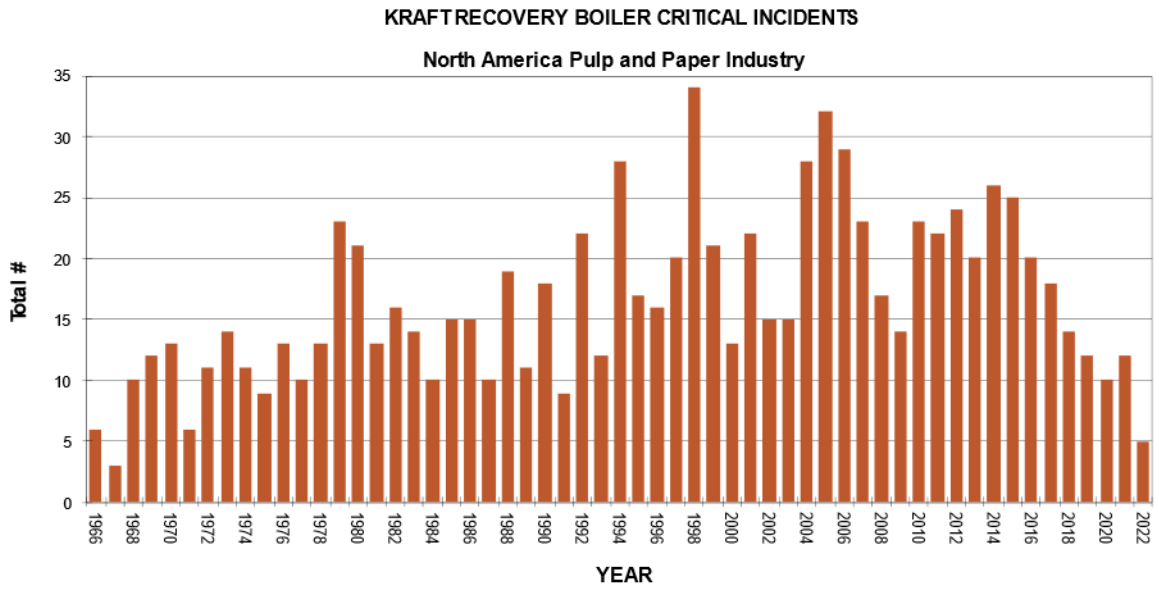
- Leak Detection Systems installed – 9 (32%)
  - Identified leak – 2
  - Confirmed leak - 0

Time to ESP from Initial Indication

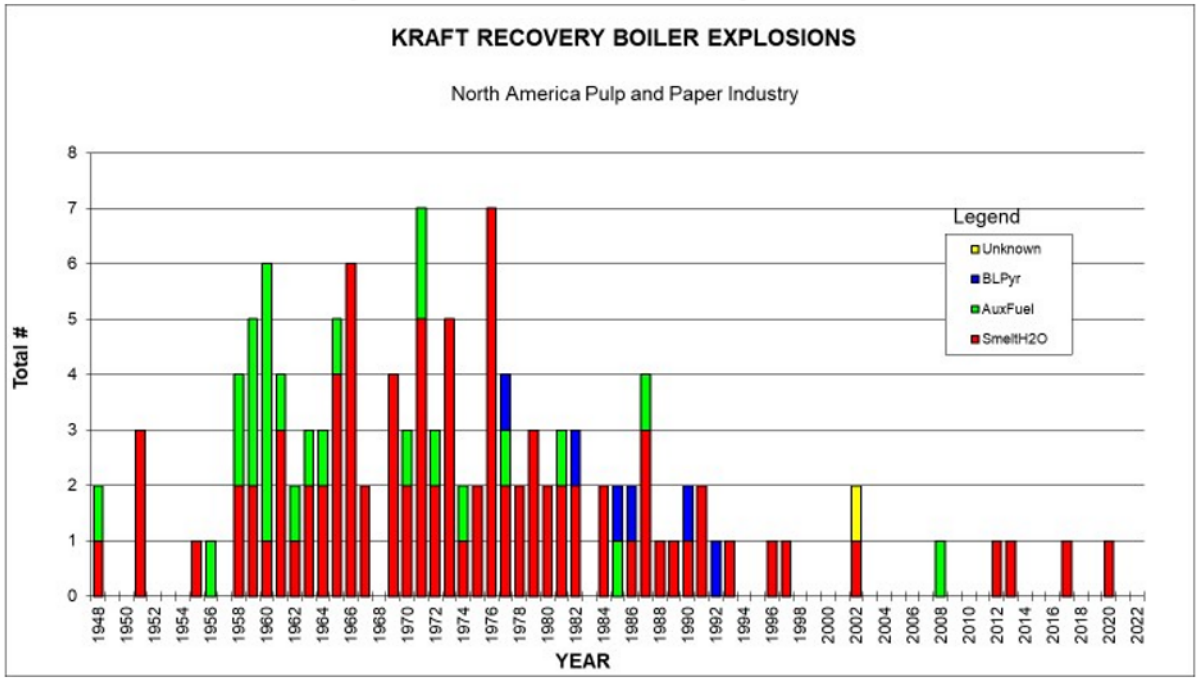
Ranged from 0 minutes to 35 minutes

Median time was 13.3 min

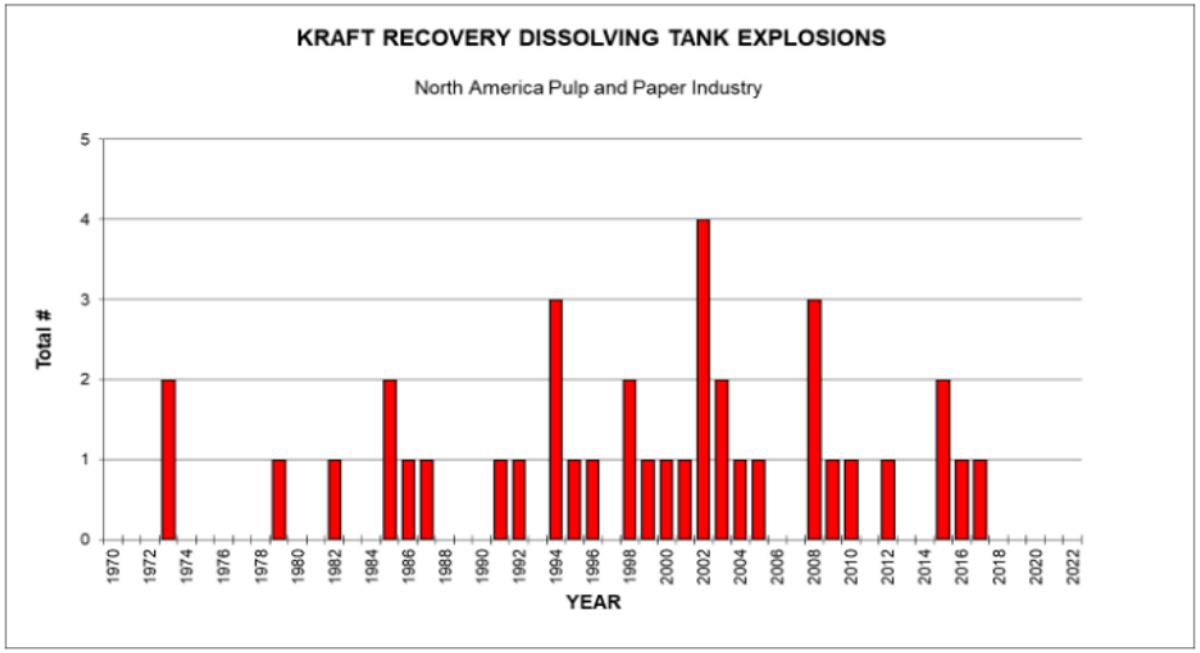
Critical Incidents to Date



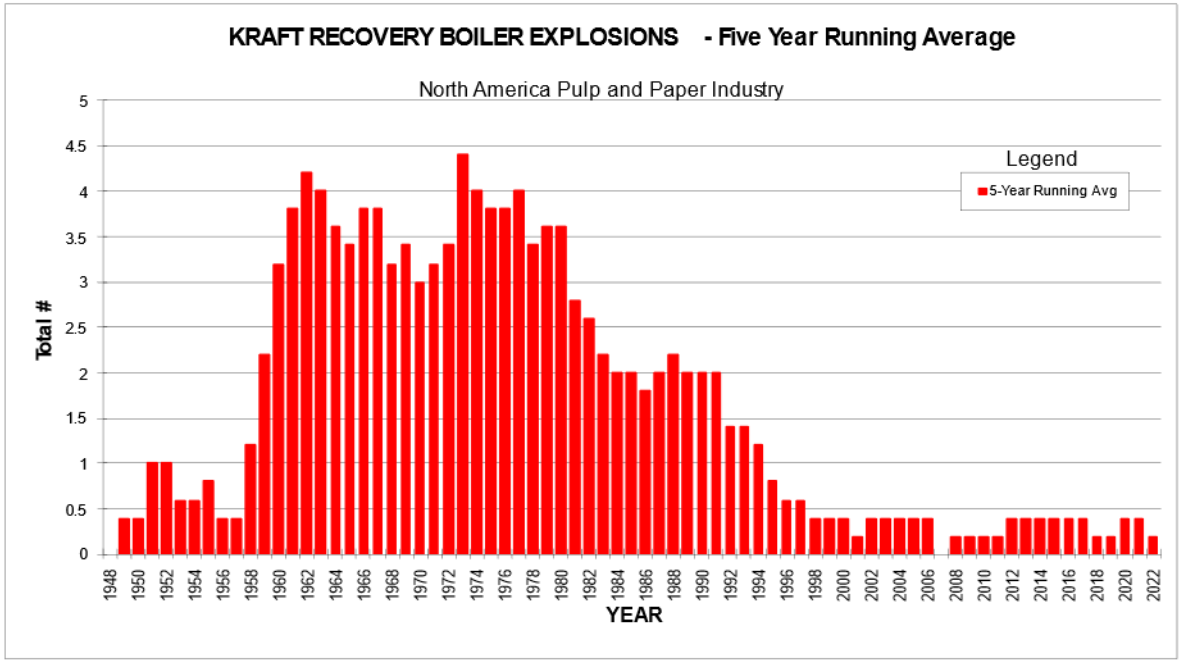
Boiler Explosion History



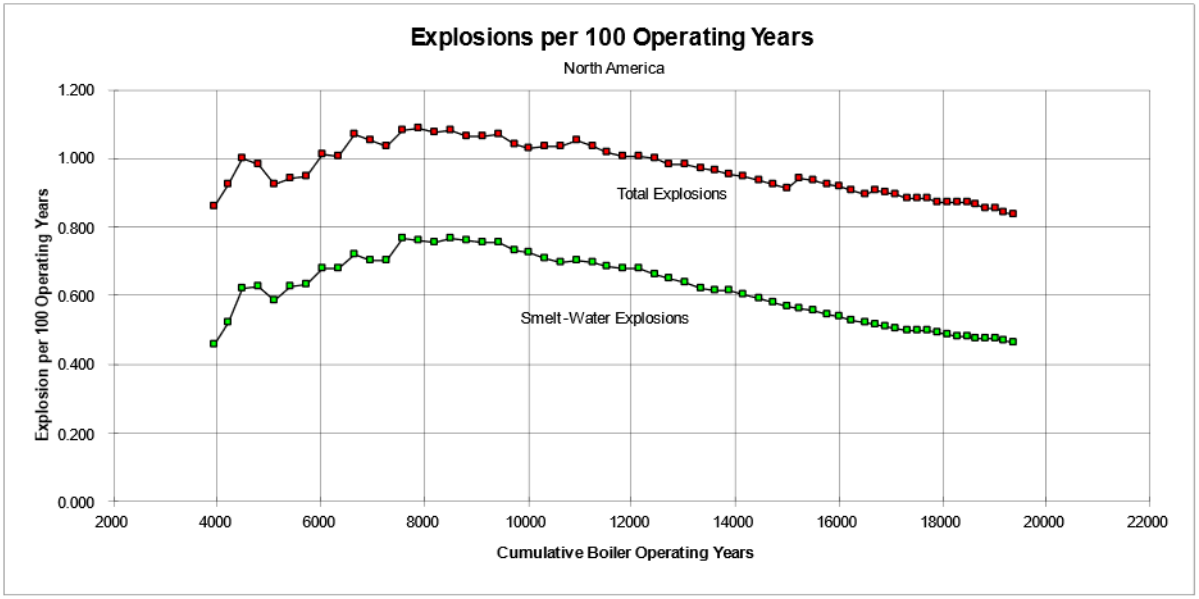
Dissolving Tank Explosions



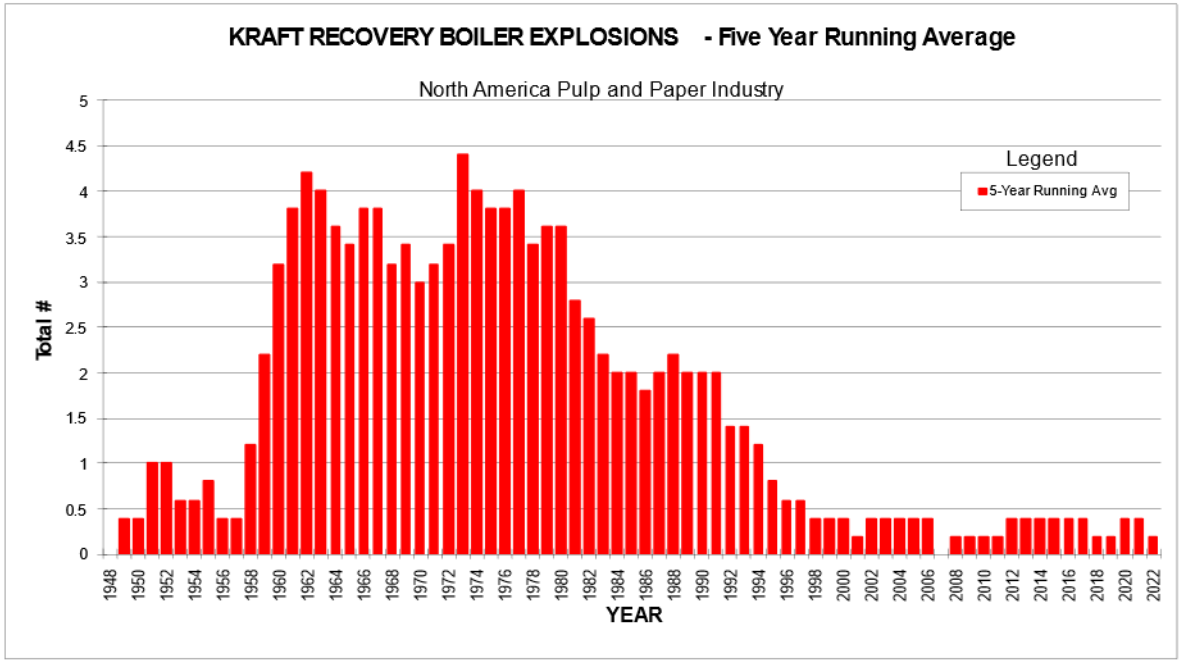
Explosion History - Five Year Avg



Explosion History per 100 Oper Yr



Explosion History - Five Year Avg



Boilers in Service

- North American Total 171
	US	Canada
Number	133	38
Avg Age	43.1	45.6
Max Age	70	75
- Oldest
  - Kruger Three Rivers, PQ
  - 1947 Alstom
- Contact Dean Clay with any Corrections or Updates

Learnings

- Minimize welding on tube bends and have spare tube bends on hand.
- Using tube shields long term can cause corrosion behind the tube shield.
- Where failures occur at attachment welds, SAC is highly suspected as the cause. X-raying for SAC prior to repair is prudent. Welding over SAC or defects will cause cracking to spread and cause future failures. Limit the size of pad welds.
- Evaluate the frequency of acid cleanings. Waterside deposits become more tenacious over time and harder to remove. Deposits raise the tube metal surface temperature thereby accelerating corrosion rate.
- Ensure waterside deposits are tested for composition so that acid cleaning steps are appropriate for removing the type of deposit existing on the tube.

Learnings

- Ensure economizer fins are angled and not square and that welds wrap around the fin. Consider stress relieving 2' beyond the end of the fin.
- Ensure vibration and anti sway restraints exist where needed in Superheaters , Economizers and Generating sections.
- Consider Nipples and Caps for handhole caps in lieu of traditional plug type caps
- Do not assume the sound of a leak in the SH section is a SH leak. Steam/FW differential can help determine the source as well as boiler chemical possible loss. (Is the differential caused by FW flow rise or Steam flow drop?) "If you can't see it – ESP it!"
- Leading edge Sootblower nozzles will aggravate boiler tube sway and fatigue failures.

Learnings

- When plugging a spout, Consider the dry solids loading on the remaining spouts. (1MM – 1.2MM max. typical)
- Consider increasing Spout cooling water flow to 40 -45 gpm if spouts are suffering with Thermal cycle fatigue.
- Ensure all spouts are level (Laser level) to ensure equal smelt flow and acceptable cooling per spout.
- Ensure SB steam is dry steam not saturated. Check header slopes and insulation.
- SB steam traps are one of the most critical steam traps in the mill to maintain. Consider orifices in parallel with traps and cracking drains open ahead of traps.
- Ensure tube material installed is appropriate for the section of the unit. Have a boiler diagram showing material required and verify tube material certs from suppliers

Reporting RB Incidents to BLRBAC

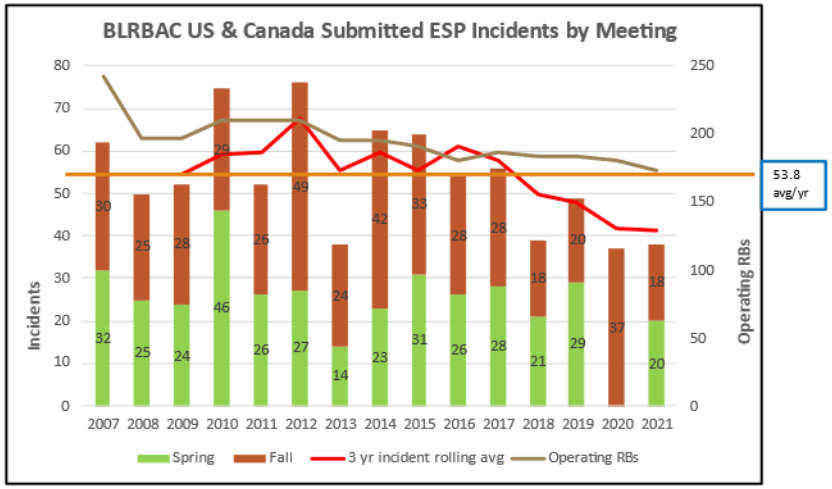
Per BLRBAC "Operating Policies and Procedures" our first primary function is: Analysis, classification and reporting of incidents.

As listed in our incident questionnaire Instructions:

The purpose of the Incident Questionnaire is to provide prompt reliable information to aid in preventing explosions through improved awareness, practices and emergency shutdown procedures.

This Questionnaire should be completed for **each** recovery boiler explosion , pressure parts failure or leak, ESP, potentially explosive incident, water entry into furnace, smelt spout leak , or smelt dissolving tank explosion .

- *We have requested that RB pressure leaks found on a hydro test be reported also.*



28 incidents in Spring 2022 – Chart will be updated in the Fall for a full year total.

Incident Questionnaires

- Obtain Up to Date Questionnaire with Fill In Form from BLRBAC.net
- Submit to Dean Clay at dclayesp@gmail .com
  - Please use Word .docx files, not .pdf
  - Please use .jpg illustrations
- Look for confirmation of receipt from Dean

APPENDIX III
AF&PA Presentation

American Forest & Paper Association

BETTER PRACTICES BETTER PLANET 2030
SUSTAINABLE PRODUCTS FOR A SUSTAINABLE FUTURE

AMERICAN FOREST & PAPER ASSOCIATION RECOVERY BOILER PROGRAM STATUS UPDATE

BY

WAYNE GRILLIOT
April 6, 2022

2022 Spring BLRBAC

AF&PA Recovery Boiler Program

The **AF&PA Recovery Boiler Program**

- Established in **1974**
- Help improve the **safety, integrity, and reliability** of Recovery Boiler operations
- Identify the root cause of Recovery Boiler explosions and critical incidents
- Membership is open to all companies & mills that operate Recovery Boilers
- Activities are funded by membership dues

American Forest & Paper Association

AF&PA Recovery Boiler Program

The **Recovery Boiler Program** is directed by a **Steering Committee**

- **Frank Navojosky** – International Paper
- **Wes Hill** – Georgia-Pacific
- **Jeff Wagoner** – International Paper
- **Greg Burns** – Domtar

Program Projects & Initiatives based on Member & Industry Needs

- Member Company Input
- BLRBAC Incidents

American Forest & Paper Association

AF&PA Recovery Boiler Program

Documents developed by the Program:

- **Reference Manuals**
- **Audit Guidelines**
- **Best Practices**
- **Training Aids**
- **Checklists**
- **Textbooks**
- **Studies**

American Forest & Paper Association

AF&PA Recovery Boiler Program

- The Program sponsors R&D projects for:
  - **Safety Improvements**
  - **Process Improvements**
- Program Projects and Initiatives focus on:
  - **Safety**
  - **Operations**
  - **Maintenance**
  - **Recovery Boiler Integrity**

American Forest & Paper Association

AF&PA Recovery Boiler Program

Two Standing Subcommittees

- **Operation & Maintenance Subcommittee**
  - **Frank Navojosky**– International Paper (Co-Chair)
  - **Wes Hill** – Georgia-Pacific (Co-Chair)
- **Research & Development Subcommittee**
  - **Jeff Wagoner** – International Paper (Co-Chair)
  - **Greg Burns** – Domtar (Co-Chair)
- **Subcommittee Membership**
  - Representatives from the Member Companies

American Forest & Paper Association

Membership

The AF&PA Recovery Boiler Program Membership

- 25 Companies
- 109 Mills
- 95% of the USA Capacity
- 41% of Canadian Capacity
- South American Member

American Forest & Paper Association

Operational Safety Seminars

- The **O&M Subcommittee** sponsors the **Recovery Boiler Operational Safety Seminars**
  - Objective: **Safe Operation of Recovery Boilers**
- Operators, Supervisors, Superintendents, Maintenance Professionals, Engineers, Steam Chiefs, and Managers attend
- **Training continues to increase in importance,** as more senior operators and supervisors retire
- Companies are finding these seminars to be an important part of their **Safety & Training Programs**

Operational Safety Seminars

- The dialogue among the attendees and monitors of the seminars provide attendees with valuable information and insight
- Tabletop exercises help operators and supervisors make the important decision: **When to ESP a Recovery Boiler**
  - The six (6) Case Studies are based on recent **actual BLRBAC Recovery Boiler Incidents**
  - **Six (6) new Case Studies** for each Safety Seminar Series
- Over **4,100** people have attended the seminars since they were started in 1985
- We continue to recommend that all companies and mills seriously consider sending people to these valuable seminar

Operational Safety Seminars

2021: Five (5) Virtual Recovery Boiler Operational Safety Seminars

- March 10, 2021 (7:45 am– 5:00 pm) Eastern Time
- April 7, 2021 (7:45 am– 5:00 pm) Pacific Time
- May 5, 2021 (7:45 am– 5:00 pm) Eastern Time
- September 22, 2021 (7:45 am– 5:00 pm) Eastern Time
- October 27, 2021 (7:45 am– 5:00 pm) Pacific Time
- Attendance has been great – **283** people attended in 2021!

Operational Safety Seminars

2022: Four (4) Virtual Recovery Boiler Operational Safety Seminars

- April 20, 2022 - Eastern Time
- May 18, 2022 - Pacific Time
- September 21, 2022 - Eastern Time
- October 19, 2022 - Pacific Time
- Safety Seminar Monitors
  - **Dean Clay**, BLRBAC ESP Subcommittee Secretary
  - **John Andrews**, Former BLRBAC ESP Subcommittee Chairman
- More people can attend due to the lower registration fee
- + No travel time or cost!

Annual Conference & Meetings

2022 AF&PA Recovery Boiler Conference & Committee Meetings
on February 1-2, 2022, at the Atlanta Airport Marriott

- 1st In-Person Event in 2 Years!!!
- All relevant Covid related protocols were followed due to the new variant
- 49 people attended in-person, 15 additional people attended virtually or provided presentation materials
- 96 people participated in the 2020 AF&PA Recovery Boiler Conference

2023 AF&PA Recovery Boiler Conference & Committee Meetings
are scheduled for **February 7-8, 2023** at the Atlanta Airport Marriott

- The Conference is **open to everyone** interested in Recovery Boilers!!!

American Forest & Paper Association

Smelt Dissolving Tank Studies

- The **O&M and R&D Subcommittees** are both working to develop best practices around Dissolving Tank related issues
- The **R&D Subcommittee** is sponsoring some important research projects at the University of Toronto for improved safety and reduced operating risk of Dissolving Tanks
  - The 4 projects focus on:
    - **Dissolving Tank key operating conditions**
    - **Advanced monitoring techniques**
- The program builds on prior AF&PA studies and related research underway at the University of Toronto, funded by a consortium of 26 companies

Best Practices

- The **O&M Subcommittee** is currently working to formalize recommendations from the "Dissolving Tank Survey and BLRBAC Incidents Study" completed by Dr. Tom Grace
  - Work continued on the project at the O&M Subcommittee Meeting on February 1, 2022 and is nearly complete
    - It will be posted on our website and will be available to everyone
- Next **O&M Subcommittee** Project
  - **Impact of extended run time on Recovery Boilers**
    - Operations, maintenance, risk, areas of concern, and criteria for allowing extensions

Kraft Recovery Boilers "Blue Book"

- **The AF&PA R&D Subcommittee** sponsored the publication of the new **Kraft Recovery Boilers, Third Edition** textbook
- **Dr. Honghi Tran** of the University of Toronto led the effort to author the new book – 1st available for sale in 2020
- Dr. Tran and 7 other world-renowned Recovery Boiler experts completed the 16 chapters of the new book
- Available through **TAPPI Press!!!**
- The book is also used for the **TAPPI Kraft Recovery Operations Course**
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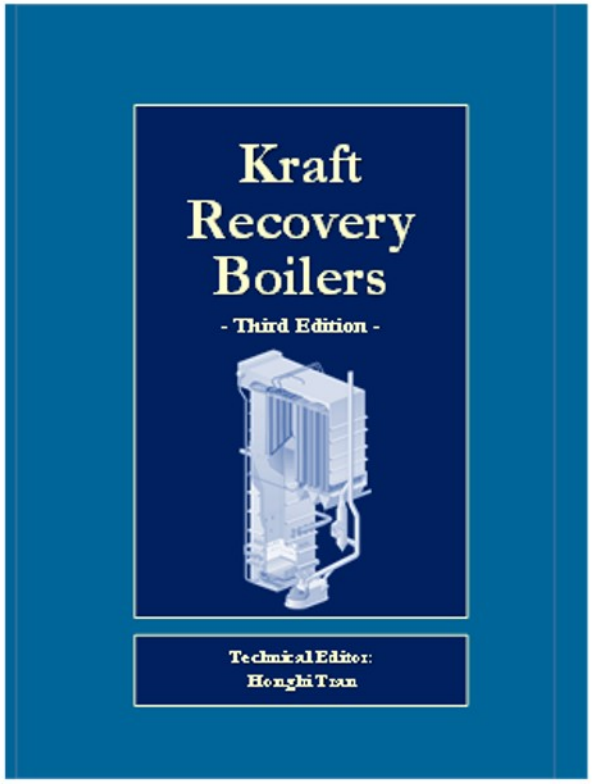

Kraft Recovery Boilers

- Third Edition -

by

Terry N. Adams
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Recovery Boiler Program Information

- AF&PA Recovery Boiler Program Website:
  https://www.afandpa.org/getinvolved/industryprograms#RecoveryBoiler
- Recovery Boiler Program General Information
- Information on Available Documents
  - Publications
  - Studies
  - Training Aids
  - Standards

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Contact Information

- AF&PA Website:
  http://www.afandpa.org

- AF&PA Recovery Boiler Program Website:
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