BLACK LIQUOR RECOVERY BOILER
ADVISORY COMMITTEE

MINUTES OF MEETING
October 5, 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
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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

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FUTURE BLRBAC MEETINGS

Spring 2023	**April**	**3, 4, 5**	**2023**
Fall 2023	**October**	**2, 3, 4**	**2023**

"Bring Operator(s). Give them a chance to hear firsthand!"
Past Chairman Lon Schroeder
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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**

Please note that **Proposed Changes to Subcommittee Guidelines** are available for review on the website, under "Documents for Review and Comment". Please advise the Subcommittee chairman prior to the next meeting if you have any comments.

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, Oct 3, 2022
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William	Smith	AIG
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Ben	Bunner	Andritz
Paul	Ceravolo	Andritz
Brandon	Hamilton	Andritz
Greg	Imig	Andritz
David	Johnson	Andritz
Mark	LeBel	Andritz
Pasi	Miikkulainen	Andritz
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Zachary	Payne	Andritz
John	Phillips	Andritz
Robert	Torres	Andritz
Ron	Verreault	Andritz
Bill	Castle	Applied Technical Services
Dan	Kostelecky	AV Terrace Bay
Michael	Schapiro	AV Terrace Bay
Michael	Hayes	AXA XL
Michael	Sides	AXA XL
John	DeFusco	Babcock & Wilcox
Greg	Leibel	Babcock & Wilcox
Derrick	Keller	Babcock Power
Scott	Pimental	Babcock Power
Kris	Larouche	Bluewater Energy Solutions
Dean	Clay	BSI
Fred	Call	Buckman
Todd	Cobb	Buckman
Mike	Bekech	CCA Combustion Systems
Juan Pablo	Palma Pizarro	CMPC PULP SPA
James	Biggs	Crenshaw Machine Systems
Daniel	Norwood	Crenshaw Machine Systems
Juan	Reyes	Crenshaw Machine Systems
Simon	Youssef	Diamond Power
Johan	Engvall	Diamond Power Sweden AB
David	Avery	Domtar
David	Baker	Domtar
Gregory	Burns	Domtar
Zachary	Harding	Domtar
Wid	Winner	Domtar
Jesse	Worsham	Domtar
Mike	Brown	E and E Tech
Jaye	Locke	E and E Tech
Louis	Freitag	Electron Machine Corporation
Brad	Osborne	Electron Machine Corporation
C.A.	Vossberg	Electron Machine Corporation

Josh	Crawford	Emerson Actuation Technologies
Justin	Patrick	Environmental Energy Services, Inc.
Dwayne	Jackson	Envirovac
Tom	Bullard	FM Global
Chris	Carlock	FM Global
Jeff	Chambers	FM Global
Neil	Chaudhuri	FM Global
Scott	Crysel	FM Global
Peter	Goddyn	FM Global
Keith	Holzer	FM Global
Everett	Hume	FM Global
Larry	Jackson	FM Global
Mark	Jackson	FM Global
Antoine	Jacquinot	FM Global
Guy	Labonte	FM Global
David	Lye	FM Global
Jimmy	Onstead	FM Global
Francois	Sauve	FM Global
Maxime	Simard	FM Global
Frank	Theurer	FM Global
Joachim	Baro	FM Insurance Europe SA
Andy	Clement	Fossil Power Systems
Peter	Donahue	Fossil Power Systems
Richard	Dooks	Fossil Power Systems
John	Harmon	GE Steam Power
Brad	Kinney	GE Steam Power
Yoram	Schaker	GE Steam Power
John	Weimar	GE Steam Power
Harrison	Sherlock	Gecko Robotics
Daryl	Philo	General Electric
Michael	Rushing	General Electric
Ivan	Semyanko	General Electric
John	Browning	Georgia Pacific
Chris	Finnemore	Georgia Pacific
Wes	Hill	Georgia Pacific
Steve	Morrison	Georgia Pacific
Chad	Harrod	Georgia-Pacific
Olli	Kujanpaa	Georgia-Pacific
Greg	Zavadoski	Georgia-Pacific
Johnnie	Pearson	GP
Matti	Backman	GRC
Justin	Helton	Green Bay Packaging
Josh	Hendricks	Greif, Inc.
Clark	Conley	Hydro-Thermal Corporation
Kevin	Phillips	Integrated Global Services
Vernon	Blackard	International Paper
Joel	Byrd	International Paper
David	Frazier	International Paper
Bruce	Knowlen	International Paper
Gerald	Nail	International Paper
Frank	Navojosky	International Paper
Matthew	Glenn	Irving Pulp & Paper

Dan	Mott	Irving Pulp & Paper
Steve	Campbell	Jansen Combustion and Boiler Technologies, Inc.
Mark	McCabe	Jansen Combustion and Boiler Technologies, Inc.
Francis	Lagace	Kruger Wayagamack
Leonard	Olavessen	Lenro. Inc.
Gordie	Vandenburg	Liquid Solids Control
Mark	Tanaka	Marsh
Mike	Mesamore	National Boiler Service, Inc
Kyle	Boucher	ND Paper
Jacob	Dowland	ND Paper
David	Frost	ND Paper
Joseph	King	ND Paper
Jason	Lewis	ND Paper
Nick	Woods	ND Paper
Wayne	Bucher	Noram
Shawn	Fenner	Paper Excellence
Christopher	Jackson	Paragon Risk Engineering
Benjamin	Roberge	Paragon Risk Engineering
Jeffrey	Forry	Pixelle Specialty Solutions
Roger	Free	Pixelle Specialty Solutions
Aaron	Holden	Pixelle Specialty Solutions
Keith	Wilson	Pixelle Specialty Solutions
Thomas	Przybylski	Power Specialists Assoc.
Derek	McCallum	ProcessBarron
Russell	Powell	ProcessBarron
Tripp	Whatley	ProcessBarron
Chuck	Dixon	Project Services LLC.net
Don	Downey	Purolite, An Ecolab Company
Bill	Jandrlich	Purolite, An Ecolab Company
Mike	Bayse	RMR Mechanical Inc
Brook	Holland	RMR Mechanical Inc
Bob	Roy	RMR Mechanical Inc
Matthew	Chewning	RYAM
Robbie	Thompson	RYAM
John	Fredrickson	Sappi NA
Eugene	Sullivan	SHB Power Plant Engineering
Craig	Walker	Skookumchuck Pulp Inc.
Daniel Enrique	Franco	Smurfit Kappa Colombia
Carlos Eduardo	Rojas	Smurfit Kappa Colombia
Samantha	Belluz	Solenis
Benjamin	Crowe	Solenis
Scott	Holloway	Solenis
James	Meredeth	Solenis
Bernard	Abramczyk	Southern Environmental, Inc.
Francois	Lacoste	SUEZ Water Technologies & Solutions
Brant	Oberg	Sylvamo
Jyri	Lindström	TÜV SÜD Global Risk Consultants
David	DiCorpo	Vaisala
Keijo	Pyorala	Vaisala
Ricky	Henderson	Vaisala Inc
Rick	Baxter	Valmet
Sarah	Henke	Valmet

Jeremiah	Yoder	Valmet
Ronald	Reed	Valmet Inc.
Ramanamurthy	Relangi	Valmet Inc.
Winston	Lecroy	West Rock
Stuart	Bliss	WestRock
Alessandro	Castanhede	WestRock
Hunter	Frith	WestRock
Nori	George	WestRock
Fabian	Henriques	WestRock
Daniel	Krekeler	WestRock
Racheal	McLean	WestRock
John	Melancon	WestRock
Scott	Moyer	WestRock
Douglas	Murch	WestRock
Robert	Murphy	WestRock
Joseph A	Schill	WestRock
Alarick	Tavares	WestRock
David	von Oepen	WestRock

MAIN COMMITTEE MEETING

1.0 Introduction – (David von Oepen – Chairman)

Good morning! Welcome to the Fall 2022 BLRBAC Main Committee Meeting! Thank you all for being here and participating this week. We had a good week with a lot of excellent participation. Good to be back to doing in person meetings. BLRBAC has thrived over the years from its face-to-face interactions at these meetings. A lot of discussions and exchange of information, as well as friendships have been made at these in person meetings. So glad to be back. And thanks to those who participated in last night's 60th Anniversary celebration. We had some great speakers.

With that we will carry on with our business.

The Main Committee Meeting is now officially open. This meeting is being held in strict compliance with BLRBAC's Anti-Trust Policy.

PLEASE REMEMBER THAT ALL BLRBAC MAIN AND SUBCOMMITTEE MEETINGS INCLUDING THIS SESSION ARE TO BE HELD IN STRICT COMPLAINCE WITH THE BLRBAC ANTITRUST POLICY. DISCUSSIONS INVOLVING PRICE, PRICING POLICY AND ANY RESTRAINT ON COMPETION ARE NOT ALLOWED.

Looking at the number of member companies present I am declaring that we have a quorum for today's meeting.

We will begin with some introductions of the executive committee this morning. We will introduce ourselves one-by-one

I am David von Oepen. I work for WestRock. I am the Chairman on 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, John Phillips, Andritz, Manufacturer's Rep, Len Olavessen, executive committee treasurer, with Lenro Inc., Brad Osborne, Electron Machine, future replacement for Treasurer, Jimmy Onstead insurance representative with FM Global, Greg Burns, Domtar, Operator Rep. We will move into old business.

2.0 Old Business, (David von Oepen – Chairman)

With that we will move into OLD BUSINESS and the ACCEPTANCE OF THE Spring 2022 MEETING MINUTES –The Meeting Minutes for the SPRING 2022 BLRBAC session have been posted on the BLRBAC web site. The new website is blrbac.net. Does anyone else have comments regarding the 2022 SPRING minutes as posted?

Can I get a motion to accept the Minutes? We have a motion. Second? Anybody opposed? All in favor?

Thank You! The SPRING 2022 Meeting Minutes have been accepted. Is there any other old business that we need to bring to light?

If not, then we will move on to **NEW BUSINESS**.

Everett, can you give us a report on new members/representative changes:

3.0 New Members Report (Everett Hume)

The executive committee met virtually had to discuss that three applications for membership in the organization. We had one for corresponding membership. By the way, all three were approved. So, the corresponding membership from Elko TMI from Québec and associate members for our Emerson Automated Solutions and for Control Southern and all members provided primary representatives, as well as an alternate representative who were approved.

4.0 Treasurer's Report (Len Olavessen)

We are going to move to the Treasurers report – Len

As of yesterday the balance in our checking account was $9359.85. Our estimated net meeting revenue for this meeting is $86,200. Our estimated expenses to the end of the year are $74,400 which is going to leave us with a projected end of year balance of $21,160 round numbers. We began the year with $38,945 so we ate into our balance quite a bit of the spring meeting because we had some charges it really bounced very high compared to pre-pandemic and we had to make up for that and that's the reason why for this meeting registration was $500 advanced and $525 at-door instead of the usual amount which was significantly less. We had to make up because we couldn't risk any more money. We had 143 advance registrations and we had 28 at door registrations that is a little lower than we normally see in the Fall. In the Fall meetings we normally have somewhere between 200 to 220 total and this was 171 for this meeting so that hurts a little bit as far as us maintaining a little bit of a cushion. We had some discussions in the executive committee as to what we can do as far as helping improve the attendance rating. I think that chairman is going to get into that a little bit more. We had 31 offshore attendees. That's much higher than normal, with 21 people from Canada, really great to see, one person from Chile and 2 people from Colombia. Three people from Finland, one person from France, two people from Germany and one person from Sweden. We had a good cross-section of the world. And that's it. Glad to announce that I'm leaving, while we're in the black. Any questions? okay

Balance as of 4/4/2022	$ 9,359.85	
Estimated Net Meeting Revenue	$ 86,200.00	
Estimated Expenses to end of year	$ 74,400.00	
Fall Meeting Sonesta and AV		$ 55,000.00
Metroconnections		$ 16,000.00
ESP		$ 3,000.00
Office		$ 400.00
Total		$ 74,400.00
Estimated EOY Balance	$ 21,159.85	
2021 EOY Actual Balance	$ 38,945.46	

Advanced Registrations	143
At Door Registrations	28

Non-USA Attendees: 31

Canada	21
Chile	1
Columbia	2
Finland	3
France	1
Germany	2
Sweden	1

2023 BUDGET

REVENUE at $ 500 Advanced and $ 525 At Door

	Spring	Fall
Advanced 145	$ 72,500	$ 72,500
At Door 40	$ 21,000	$ 21,000
Total	$ 93,500	$ 93,500

EXPENSES		
SONESTA	$ 55,000	$ 55,000
METROCONNECTIONS	$ 16,000	$ 16,000
ESP SECRETARY	$ 3,000	$ 3,000
SECRETARIAL SERVICES	$ 1,500	$ 1,500
TRAVEL EXPENSES	$ 500	$ 500
ACCOUNTING	$ 1,500	$ 1,500
OFFICE EXPENSES	$ 500	$ 500
SPORT'S NIGHT	$ 1,800	$ 1,800
LEGAL RESERVE	$ 1,000	$ 1,000
TOTAL	$ 80,800	$ 80,800
NET	$ 12,700	$ 12,700

5.0 Executive Committee Report (David von Oepen)

The executive committee met yesterday in a closed session. We discussed the budget as Len just did. As we just heard BLRBAC is experiencing the same inflationary pressures that everyone else is. BLRBAC is a non-profit organization, so we raise our registration fees just enough to cover our meeting expenses. The executive committee will be reviewing our costs and anticipated expenses going forward and set the registration fees to essentially break even. We will be investigating how we can reduce our expenses and how we can increase revenues.

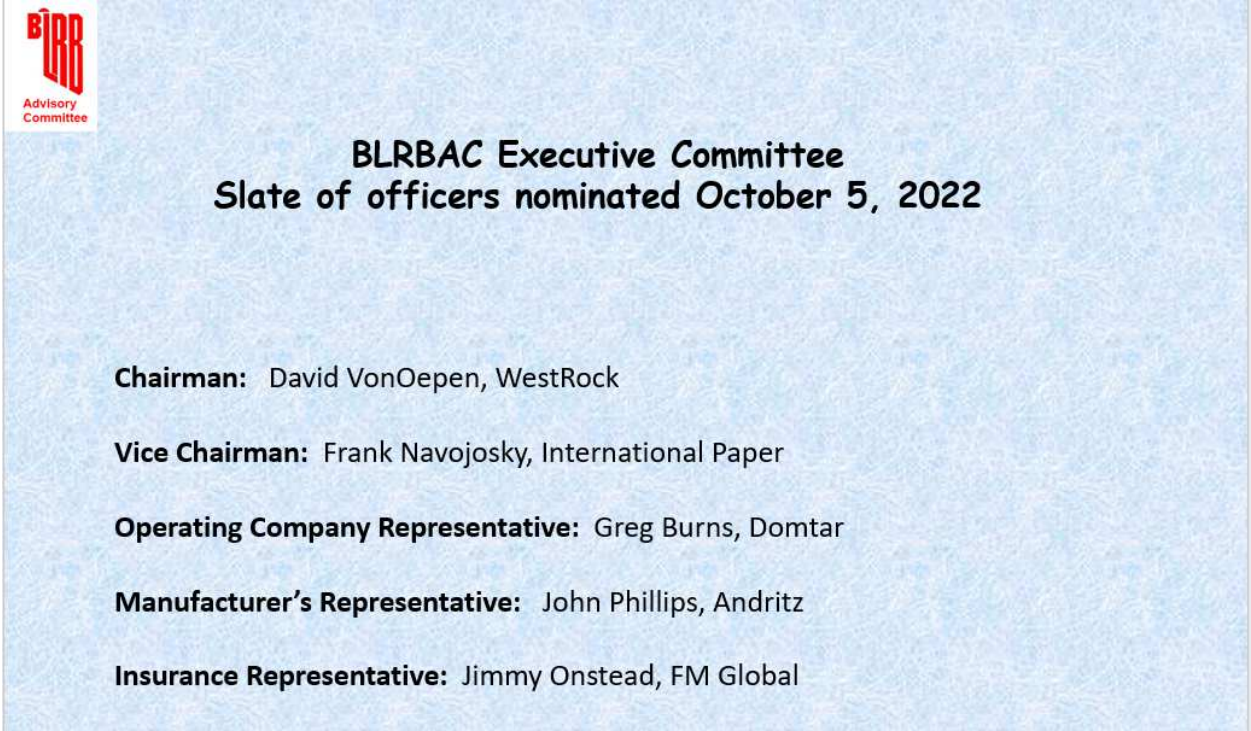
We did a quick survey of those who pre-registered on whether the members wanted to go to 1 virtual meeting and 1 in-person meeting during the year vs the 2 in-person meetings during the year like we have been doing historically. Most registrants wanted to keep the 2 in person meetings per year. So, we are planning to do that.

The other topics discussed are that the executive committee is trying to rebuild our contact list and voting representatives for the member companies. We have had a lot of retirements and a gap of 2 years with Covid, and we need to rebuild the contact list. So, we are asking that the Member Companies go on the BLRBAC website and fill out the Membership form for the member company rep primary and alternate representatives. Please do this even if you think your member company voting rep has not changed. We are also trying to rebuild our meeting notification email list. So, send Everett and me an email if you want to get on that distribution. We always post a meeting registration link on our website, blrbac.net for the Fall and Spring meetings starting in the months of late February and August if you do not get an email notice.

The Executive Committee also discussed how we can increase attendance at our meetings. We focused on how we can make our meetings more attractive to mill personnel specifically the mill supervision and trainers. There will be more on that. A feedback form on how we can do this better will be sent to meeting attendees.

6.0 New Business, Election of Officers

I am Scott Moyer, and per the BLRBAC Bylaws I was nominated by the chairman David von Oepen to develop a nominating committee for the election of executive committee officers. Nominating committee was made up of myself, Dave Gadai, and James Franks. Here is the slate that the nominating committee came up with. I will read them off:



Could I have all of the voting representatives of the member companies stand. All in favor of the slate for executive committee officers please say aye. Those opposed say nay.

The slate of executive committee officers is approved. Thank you.

7.0 Secretary's Report (Everett Hume)

As you saw the primary and alternate voting members stood up when asked to vote. I would ask

the member companies if you could provide me with a list of who is the actual primary and who is the actual alternate from your company. That way they can be identified properly when they register and when they show up so that they do get proper name tag so we can recognize who are the voting members from those companies. Are there any questions on that? Perfect.

David von Oepen: thank you Everett. Okay subcommittee reports will start with the auxiliary fuel, Bruce.

8.0 SUBCOMMITTEE REPORTS

8.1 AUXILIARY FUEL REPORT – Bruce Knowlen

The meeting began at 1:10 PM EDT with the BLRBAC's antitrust statement. The minutes of the last meeting, held on April 4, 2022, were read and accepted. Attendance log sheets were sent around. We had 14 guests joining the 7 members present. Two new members were added in 2022 for a total of 11. Our meetings are often open and have enjoyed the active participation of members and guests alike. We have room for more. We'd like to invite any that have an interest.

We opened the floor to collect any topics for discussion. One interesting question was asked about alternative fuels other than gas and oil for starting burners. Our group started thinking on the possibilities and whether anything had been tried. One idea was offered to use pulverized wood dust, another hydrogen, and another of wood gasification. This question got everyone thinking but we didn't have a known alternative. Please send us your thoughts.

We returned to the agenda and the group received a general update on our subcommittee and our SFAF document. We recognized that our document is needing a refresh. This is being worked on. As part of this, a member volunteered to help compare the SFAF to the SFBL document to ensure our subcommittees provide similar recommendations and logic. SFBL just posted an update to review.

On the agenda was a review of the spout torch discussion from the last session in the spring. We wanted to make sure that the significance of this torch as an ignition source was clear. We reminded all that the purge state of the boiler has to be considered. We directed the group to examine the good guidance present in the SFBL Chapter 10.

The agenda called for us to resume work on the topic of the gas ignitor fuel train. We were specifically discussing the presence of a low-pressure trip shown in the figures in our document. Last spring the absence of a high-pressure trip was raised. 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.) There were several technical talents present to provide ignitor specifications. It was clear that the experience of the group and knowledge on ignitor vendor instructions made the addition of both a low and high trip seem prudent. The result of our discussion was a motion to add a high-pressure trip to the existing low-pressure trip. The motion was passed. From this, we will modify and include this in the update of our SFAF document being planned.

Following the gas train analysis and motion, the time allowed several other random thoughts to be raised for consideration: the use of transmitters as tripping devices (e.g., a single pressure transmitter could serve for both the high and low trip ignitor trip), also the use of wireless means

of valve configuration, and leak testing of fuel valves – leaks both into the furnace and emissions into the atmosphere. This was an opportunity for open exchange that all enjoyed.

In concluding the subcommittee meeting we planned to only have a fall meeting in 2023, none in the spring. Between now and then we are committed to work on document updates and get these placed for consideration and adoption.

The meeting adjourned at 2:55 PM.

8.2 ESP SUBCOMMITTEE REPORT – Frank Navojosky **(**Also, see ***Appendix I*** – **Incident List and *Appendix II* ESP Presentation**)

On Monday, October 3 at 8 AM. The ESP subcommittee met. I just want to thank Dean Clay for filling in until 10 o'clock. First thing reviewed was the antitrust slide. We had 10 of 11 active members present. We reviewed and approved the previous minutes.
Dean has kindly taken a lot of time and pulled together all of the learnings from all of the ESP subcommittee presentations since 2005. It's an excellent document. It is suggested that mills print out and distribute it to your crews. It is all the learnings from BLRBAC from all the incidents since 2005. It's great reading and will generate good conversations with the crews. We have approval from the executive committee to post it on the main BLRBAC website. Dean is doing a final review and then will post it on the BLRBAC website, so please review it.
In the last meeting, we were discussing hydrostatic testing following ESP and that's any ESP, with a leak or without a leak. As we know, any ESP will cause stress to the boiler as it drains and depressurizes suddenly. We discussed that it will potentially aggravate an existing defect to failure, like SAC, Fatigue cracks, etc. So, even if someone accidentally pushed the buttons, you should Hydro. I will send that wording to the executive committee (once we clean it up) and once they accept it, it will get voted on April 2023.
For our West Canada BLRBAC member, the member has had a change in their role. West Canada BLRBAC will discuss attendance in their November meeting and will let us know if and who it will be. We are holding that position open for now.
We had nominations for ESP committee vice chair and selected Chris Jackson. So, congratulations to Chris.
We then started discussing replacement of the open ESP subcommittee Operating company representative member. We selected Greg Zavadoski from GP and he has accepted.
We also discussed attendance guidelines and we want each member to identify a knowledgeable alternate to send if you cannot attend.

Attendance guidelines:

Identify a knowledgeable alternate and send a replacement when not in attendance. Do not send anyone inexperienced. The ESP committee member sending the Alternate will educate the alternate on what is expected of them when they attend. The ESP committee will also coach the Alternate during the meetings

Dean is pulling together a presentation on how new attendees can get the most out of attending BLRBAC. We want to give that person some guidance. It is a draft right now and we will take another look at it for review. It can be part of a recruiting process to get more manufacturing personnel back to BLRBAC attendance.

We had 23 incidents that we reviewed and I'll cover those later.
New business: We want to get the smelt rushes and near misses reported for dissolving tank so we can be preventative. As we know in the AFPA study, most dissolving tank violence occurred

after smell rushes. A smelt rush without DT violence if reported, is like reporting a near miss. So how do we get these reported? We had a discussion regarding degree of damage requiring reporting. We will talk about that definition in our next meeting. We would like to get large smelt rushes reported regardless of degree of damage. Presently, when you look at the incident form, there is an imbedded document for reporting on a DT explosion. We would like that section filled out regardless of damage or not.

The ESP subcommittee met in closed session on October 3, 2022 Monday, and we had 10 of the active members present represented. We had around 130 people in the open Tuesday morning session.
We had 23 North American incidents.
Zero smell water explosions.
Classification: We had 10 that were classified as critical and 11 were noncritical and one was a smell spout cooling water leak.
We had five ESP'd one was an ESP with no leak.
As I mentioned, 10 were critical, eight were critical in operation with a bed and four of those were ESP'd, so 50% of the critical that should've been ESP'd were ESP'd. The last two meetings were at 100% ESP's that should have ESP'd. We are seeing that some of the critical areas with leaks that are not ESP'd are in the economizer section exposed to the back of the generating section. People may not understand the criticality of this area and may take extra time to investigate what's happening when they have enough information to ESP already. So, we want to improve that number all the time if we have a critical leak.
For location: We had 1 dissolving tank incident and 11 economizer, two in the superheater and three in the boiler bank. One in the screen, two in the upper furnace, one a lower furnace and one in the penthouse, plus one ESP with no leak. We do these trends to try to see if we have made any progress in making our different sections of the boiler bulletproof. Have we designed them so they won't have failures, are we seeing a trend downward in any section? We are not really seeing these trends. We haven't totally resolved issues in any section. There is maybe a little bit of a trend on lower furnace recently.
In the 18-year total trends: economizer total incidents, there was 447 tube leaks and the average was 24.8/year. These are mostly noncritical leaks. Upper furnace 18-year total was 134, average was 7.4/yr., superheater 144, average was 8/yr., lower furnace was 100, average was 5.6/yr., boiler bank 106, average 5.9/yr. Screen total was 41, average 2.3/yr. and smell spout 31 total, average 1.7/yr.
Incidents by boiler type: one drum 12, two drum 11. You know we started tracking this to try to see if a one-drum unit was going to be safer with the change in design of the generating section, yet there is really no trend to say a one-drum design made a big difference.
Leak cause: Four weld failures, 1 was unknown, 4 were thinning, 6 fatigue, 5 were SAC/SCC, one was operator error and one was mechanical damage. The average age of our boilers is 44 years, so the older a boiler gets, the more thermal cycles it goes through, the more you're going to see SAC so keep an eye on that. The other thing you're going to see more of with an older unit is corrosion between refractory and the tube. We called it CSC (Cold Side Corrosion) on the loose tube boilers, but anywhere you that refractory on the tube you will tend to hold moisture, especially if you had not been drying it out for years. You may likely have corrosion happening between the tube and refractory. These are two mechanisms that you really want to keep an eye on with your older boilers.
How discovered: again, the same large trend for discovery during walk downs showing the value of an operator making rounds. Two were discovered from the control room, two on a Hydro and two on unit trip. Leak detection systems; none of them identified the leak 13, 65% had leak detection systems and one of them confirmed the leak. Time from an initial indication

to ESP ran anywhere from one minute to 113 minutes; the average was 39 minutes; that's something we really need to focus on getting our operators to really understand the indications of the operating trends. With high furnace pressure and low drum; if your large leak logic doesn't activate, yet you have that trend indicating a large leak, you probably have a large leak, and the drum level may have taken longer to drop and "beat the timer". So training is critical here.
Critical incidents today, we haven't really seen a trend in the reduction in critical incidents but we have seen a reduction in explosions from those critical incidents. It shows all of the policies, practices and procedures that we all have put in place has really helped us handle those critical incidents better. There is a lot of history behind that, but we still haven't totally eliminated leaks, so we have to continue to focus on training and response.
Dissolving tank explosions: again, no real trend there. We focused a lot on understanding the cause in AFPA and we are encouraging incidents to be shared here when any type of dissolving tank violence or runoffs occur.
Five-year average for explosion history; explosions per hundred operating years for boilers in service. The average age is actually 43 years, there's 131 units in the US. The maximum age is 70 years and you can see the numbers from Canada there and the oldest is at Kruger, Three Rivers. If you have corrections to numbers of units, i.e., you're shutting a boiler down or putting a new boiler in, just let Dean know so we can correct this database.

The learnings: We need to be aware that salt sheds from the superheater or the screen can add enough material to the floor even after smelt out, that it can flow to the dissolving tank and cause violence. This causes typically sulfate rich viscous smelt, which tends to dam and jellyroll, and it must be watched for accumulation and be controlled and considered bed material even after you smelted out originally. You believe you had no smelt in the furnace but you have added material to it. The senior most knowledgeable management personnel must be involved when you're having spout issues, spout pluggage. Somebody needs to be that "guard goose" looking in that lower furnace.
Ensure your leak detection systems and alarms are being checked on a regular basis. Some leak detection systems were reported to be in alarm for an extended period, some not reacted to, and some did not have active alarms.
If multiple past leaks have occurred on the unit in a certain section, don't become complacent and assume with an indication of a leak that it is in the same chronic area. The leak might have occurred in a different area that may be critical, such as the upper section of economizer exposed to the rear section of the boiler bank, when in the past you have been having them down in the lower section. Same with chronic leaks on a single drum generating bank in the lower section of the module. Do not assume you are having another leak in this area when it may be in the top section of a single drum boiler generating section that can get over the nose.
Don't leave hoses around the recovery boiler unattended where they might spray in a recovery boiler or confuse operations as to the source of the water.
Don't run with an economizer leak unless you know for certain and can see the leak is in a noncritical area, as it may be in a critical area, it may be in the economizer area exposed to the furnace, with no baffles.
Consider testing the sensitivity or your leak detection system, crack a drain simulating a leak; don't desensitize the system due to nuisance alarms such that an actual leak wouldn't be detected. Utilize an MOC process to make any adjustments to your critical alarms.
Don't assume a sound in a boiler superheater section is a noncritical superheater leak. Even if it is, it can be impinging on a critical wall, roof or screen tube. If you can't see it, ESP it. When in doubt, punch it out. There are a whole bunch of sayings people use. Assume the worst is happening and then convince yourself it's not, versus assuming you're dealing with a noncritical situation, only to find out it's critical.

Consider replacement of pad-welded tubes in future outages, especially if the tube had indication of possible SAC (stress-assisted corrosion). We have discussed not welding over a defect, as you know welding over that is only going come back and bite you. SAC is almost always waterside initiated, so you're not going to see it from the outside of the tube and it may have produced other cracks nearby that haven't reached the surface yet.
Large leak logic states that if the furnace trips on high furnace pressure and the drum level gets to the low trip point within 45 seconds, the BLRBAC large leak logic will activate. This will shut the feed water valve, put it in manual and trigger the possible large leak alarm. That logic is under revision. As Vernon Blackard (The Chair of the BLSF subcommittee) said, 45 seconds has been found to be too short for feed water systems that might be able to out-supply a leak and still maintain drum level above the low trip longer than the timers set 45 second trigger.
The longer boiler goes without acid cleaning the more tenacious and hard to remove the deposits will become. Ensure the low drum level trip point does not allow exposure of upper-level generating section tubes and result in phase separation in the tubes.
Number of smelt spouts required to be open for liquor firing must be established and adhered to.
An ESP Rapid drain may cause a defect to propagate to failure if the defect is there prior to ESP. The root cause of the defect should be determined.
Smelt bed temperatures must be determined through probing the bed through the surface crust with a rod and thermocouples; surface temperature measurements are not sufficient.
There are probably other learnings that we may have touched upon during the discussions or talked about; those are the key ones I have captured.

So as far as reporting your recovery incidents and dissolving tank incidents to BLRBAC, make sure you use the latest form. It's on the website. Our first, primary, function is analysis, classification and reporting of incidents. Have your incident report completed for each recovery boiler explosion, pressure part failure, and make sure we report leaks found on a Hydro. A lot of times people will Hydro on the way down and find a leak, so that leak may have been there when you were running. Plus, it indicates there may be a chronic issue in that section of the boiler that needs to be investigated and learned from, even if you find it on hydro. Reporting incidents of smelt rushes, and minor Dissolving tank damage will be beneficial to the prevention of dissolving tank explosions.
Dean did this chart here that shows the number of submitted ESP incidents by meeting. The more we can get reported, the more we can do something about, so make sure make sure you're getting incidents reported. As I mentioned, get the latest form, submit them to Dean, and look for confirmation receipt from Dean. So, I just want to say thank you for all of the people who spoke up during the whole ESP open session. When we are discussing the incidents, it's invaluable to hear from the mill people, as this adds information that we didn't have, and it's invaluable to hear the logic of what is going through their mind and what they're thinking is happening to them along with their reaction to it and the timing of their reaction.
So, we talked about maybe doing a presentation during our operating problem section on our explosion history, and were still working on that. We will have to get permission use damage pictures.
That’s concludes this report out. Any comments or questions?

Comment: Dean Clay - BSI. We have always wanted a hydrostatic test to follow an ESP, but we don't want to over emphasize the possibility of the ESP causing damage. Again, we tracked this for years in the past and there is no proven connection of damage related to the ESP. The only incident we had that called out damage from the ESP, when we reviewed the report, was they had leaks more or less every time they shut down on the economizer, so an ESP to them was just another shut down. So again, we don't want to leave the impression that you should be reluctant

to ESP because you might damage your boiler, as that is not BLRBAC history. You're always better off if you follow the guidelines with known or suspected leaks and ESP. The boiler will be safer.
Frank: Exactly. Thank you, Dean, for emphasizing that. And as I said in here and in the learnings, if you've aggravated a leak to failure, that mechanism was already there, and it may be elsewhere in the boiler, so you really want to investigate that root cause of the failure. There was one other incident where there was damage after an ESP; that's where the primary air stayed on and the bed fell over against the wall and as you know the water boiled out and it melted down the tubes, but that was a rare incident.
After being notified of an ESP, there are three things I ask:
1. Is everyone accounted for?
2. Did the ESP functions function properly?
3. **Did the primary air shut off?** Because that's where, even though you successfully ESP, you might damage the unit even after successful ESP. If you still have air going in there blowing on the bed and keeping it active, it is going to boil the water out of the tubes and then overheat them or melt them down. You're blowing on that bed with air, and it's going to be intense heat.
As Dean said, an ESP may aggravate previously existing defects but through our history, an ESP has not been known to cause a leak. Thank you.
Comment: Chris Jackson - Paragon, the question about how you get the most out of BLRBAC, I think we cannot leave that subject without making the statement that if you want something out of BLRBAC, you have to put something into BLRBAC. If I was going to go back to a mill and encourage someone to go, I would say if you're going to BLRBAC, to go read the documents or at least read one document that interests you. Read the summaries and come up with a list of questions before you go, bring something with you that you can work with, and ask questions. Don't expect to come here and have it spoon-fed to you.

8.3 FIRE PROTECTION IN DIRECT CONTACT EVAPORATORS REPORT

No Meeting, No report.

8.4 INSTRUMENTATION REPORT – David Avery

The Instrumentation subcommittee met in open session Monday morning with 7 members and 15 guests. Our session began with reading the antitrust statement, then continuing with introductions of members and guest. We reviewed the existing subcommittee membership and adjusted for people who have retired and left committee.

Our fall efforts began with reviewing the Spring 2022 meeting minutes; they were accepted and approved as submitted. We started with an update about Rotork's IQ3 actuator – Rotork's current solution from our position still has issues not adequately addressing Recovery Boiler safety applications. We plan to draft a letter to the appropriate Rotork Personnel stating our concerns and what needs to be done to properly provide protection for our Recovery Boilers. We would like to get voting members to sign the letter with us, expressing the level of concern to Rotork. The letter will be submitted to executive committee for their review prior to signing the letter and sending it to Rotork. This is a working item for the spring.

We received an inquiry about piping configurations for liquor divert refractometers when they are installed in systems using direct steam heaters. The person wanted to know about minimum distances for the measuring heads to be clear of any influences from the heating medium.

Currently this is not covered in our documents, we are sending this to Safe Firing of Black Liquor to develop recommendations that address this concern.

Bed Bug cameras were brought up and how they are classified in the Instrumentation checklist. The checklist has them as recommended. The cameras have become a valuable tool to monitor liquor firing and bed health in our boilers. The group's consensus is in favor of upgrading the classification to required. This is another item we are referring to Safe Firing of Black Liquor to provide guidance for our classification.

Our work continued with the fundamentals of drum level measurement accuracy. After reining in our current body of work, we were able to better define the scope of the new Chapter Five Dum Level. John Browning will work with Andy Clement to provide a basic document for review at the next meeting.

The definition for a "Qualified E&I" for our definition's pages were finally cleared up after we dropped to unnecessary redundant statements. The following is being submitted for Executive Committee review before it is posted for membership review.

Qualified electrical and instrumentation technicians should be readily available to always cover issues with the recovery boiler. Qualified shall be defined as a technician that:

- Understands the recommended good practices of BLRBAC
- Understands the basics of recovery boiler process, operation, control, and safety interlocking
- Understands the individual unique and specialized control equipment and systems associated with the recovery boiler such as the solids control, burner management, drum level control, etc.
- Has a working knowledge of all instruments associated with recovery boilers.
- Can quickly identify where all instrument/devices and supporting documents are.

The following may be considered when determining the above qualifications

- Understands proper calibration and testing procedures for these instruments
- Has a working knowledge of electrical circuits and relay systems
- Has a working knowledge of microelectronic control systems (DCS, PLCs, etc.).
- Has received basic E&I system "trade school' type training.
- Has received training on specialized systems as developed by the vendor.
- Receives continuous and ongoing refresher training on existing systems as needed
- Receives immediate update training on any new devices or systems.

The afternoon session had 5 members and 6 guests. We discussed Advance Process Controls (APC's), the internet of things, wireless devices, IT assistance in the Process Control environment, system security (outside access to our control systems) and the management of all this. The subcommittee has started the conversation at where we can establish guidelines to protect our boilers, controls, and software from a BLRBAC perspective. We will keep everyone advised on this developing project.

The last business of the day; After 19 years, I am stepping down as Subcommittee chair to serve as vice- chair for the next year or so. John Browning will become the new Subcommittee chair

effective as the end of this session. I know we will support John and continue the journey and contributions to BLRBAC making the industry safer. Thank you for past support and guidance.

Final thoughts for today … Our industry not Just Paper is seeing changes that can hamper our future success. Operators, mechanics, and technical types (E&I's, Process Control) and others are not as abundantly available as in the past. We need to help encourage and foster our young people to get interested and have a career in our industries. Let's help where you can, whither it is mentoring or taking time to answer a young person's questions, let get involved in their future and ours.

Thank you.

8.5 MATERIAL & WELDING REPORT – Jesse Worsham

The Materials and Welding (M&W) Subcommittee met in Open Session on Monday morning October 3, 2022.

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

Attendance
Eight (8) members attended. There were 18 guests.
Members
8/16 members in attendance

Discussions

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

- General discussion of Operating Problem Session posed.

- Reviewed and made changes to our document to incorporate Personnel Safety information referencing Materials and Welding. Changes were accepted and the document will be submitted to the Executive committee for review.

- Opened floor for any discussion and recommendations for future consideration
  New technology in NDE
  Discussion of root causes
  SAC programs (methods, observations)

Discussion of Repairs (temporary versus permanent) and Alterations

8.6 PERSONNEL SAFETY REPORT – John Fredrickson

The Personnel Safety Sub-committee met in an "open" session on Monday, October 3, 2022. There were 5 (out of 11) committee members plus approximately 17 guests in attendance during the meeting.

Meeting started 0800.

Representation at our meeting by regular members and guests included one original equipment

manufacturer (Andritz), three Service Providers (3S Team, RMR/Bodman, and Buckman), and an AF&PA representative. Operating company representation included Georgia-Pacific, International Paper, Domtar, SAPPI NA, ND Paper, RYAM, Kruger, and WestRock.

The BLRBAC anti-trust statement was read. A sign-in sheet was passed around for a record of attendance and contact information.

Contact information for all committee members in attendance were confirmed or updated as needed. Four members were present for the meeting: Greg Zavadoski, Zachary Payne, John Fredrickson, and Brook Holland.

No new committee members joined since the Spring 2022 meeting. John encouraged attendees to consider joining the committee. (One guest joined the committee at the conclusion of the meeting: Jake Dowland, Utilities Superintendent at ND Paper).

The minutes of the last meeting (April 2022) were read, discussed for clarity, and approved by the Committee.

SIF Working Session

A working session with committee members and guests was held to review progress on SIF tasks since last meeting and review the latest high risk potential list ("Top 14"). The attendees and committee members confirmed value in continuing along this path. The following tasks were raised for further consideration:

- Cleaning Direct Contact Evaporators (cascades / cyclones)
- Placing auxiliary burners in service. Attendees had experience with plugged guns/ports propagating flames back into operating areas. (This risk needs to be considered on the analysis spreadsheet).
- Collecting black liquor samples, especially if lines are plugged. (Note some locations consider plugged sample lines a line-break situation requiring enhanced protocols).
- Excessive smelt flow / runoff should be considered separately from unplugging spouts
- Consider lock box risks (wrong lock out) and LOTO coordination between maintenance & operations

The committee will continue down the path of refining SIF potential tasks incorporating new items suggested by attendees. Six attendees agreed to review the risk rating document and provide feedback before the Spring meeting.

Open Forum Topic – Safety Incident Review

Purpose is to increase awareness of how people have been injured around the recovery area so we can prevent it from happening to others. If this is successful it may become a standing agenda item each meeting and used to focus future committee efforts. Sharing incidents could be used in annual refresher training.

As a preamble, the committee reviewed one company's Recovery area injury summary since 2019, most agreed it was very similar to the injuries in their companies.

- Chemical burns and hand injuries show up pretty strongly in the data.

    - Discussed mill glove policies and challenge in gate-to-gate policies.
    - One attendee noted significant steam/hot water/condensate injury trend in their company.
- Discussed diphoterine as an important treatment to reduce severity of chemical burns – common in South Africa and Canada as well as many other countries, but in USA it is prescription only.

- **Incident 1: Chemical Burn to Eyelid from Green Liquor**
    - Discussed incident where operator was injured rodding spouts after complete power outage
    - Discussion importance of considering emergency lighting requirements for spout decks and liquor gun elevation
    - Discussed methods for handling power outages including buddy systems, headlamps, alternate communication.
    - Discussed importance of reviewing emergency SOP's and considering whether procedures would change for loss of power
    - Discussed benefits of moving to spout rodding robots in industry. (Consideration needed for emergency power within broader MOC).
- **Incident 2: White Liquor chemical burns**
    - Must use the MOC procedure to assure changes don't produce unintended safety consequences.
    - Trainer injured – trainee was wearing correct PPE but not trainer because he underestimated the Line of Fire zone for the worst-case scenario.
    - Washing in cold water a significant issue – can cause hypothermia
    - Curtains need to be considered to remove the barrier of "I'm not taking my clothes off here"
    - Eyewash temperatures need to be addressed – some require heating and cooling
- **Incident 3 – Leaving off U-drain covers – Chemical & Thermal Burns**
    - Diphoterine was critical to reducing severity of the injury
    - Barricade area before covers are pulled
    - Put sign in trench
    - Asked for barricading procedures for sharing in Spring

The committee will continue to solicit lessons learned from recovery personnel injuries (in the past or recent) to be reviewed, discussed and shared during the Spring meeting.

The following detail the ad-hoc topics that were discussed during the meeting:

- Lock box physical layout & location are important mitigation steps to avoid confusion.
- Changes in contractors present increased risks, especially with extended outage durations – need to be evaluated & managed along with total costs
- Changes in vendor/contractor personnel is as significant an issue as turnover in mill personnel.
- Loss of coal plants has reduced amount of skilled boilermakers available in some regions
- Longer durations between outages reduces skill in operating staff – creates more need for training.
- Consider benchmarking against oil & gas and/or steel to learn how those industries remove employees from risk

- Enhanced collaboration with contractors prior to outage – need to remove discussion from schedule and cost
- Furnace pre-entry inspection needs to be taken more seriously across industry. (Consider joint sign-off – enhanced inspections with drones). Need to have problem areas identified for opening and inspection – picture of doors in sign-off procedure is best practice.
- Discussed the value in dedicated training on language choices and feedback methods to create a "caring culture."
- One location had success with an on-site sports trainer reducing soft tissue injuries.
- Situational awareness – always be aware of escape routes and nearest emergency door number.
- Nearest eye wash and is it functioning – flow sensors can indicate whether in use and checked on expected frequency
- There was general group discussion on difficulty of getting meaningful data on near-misses and strategies to increase. John noted there can be a complacency gap when lagging indicators are good but still high percentage of findings of inadequate PPE. This might indicate a loss of accountability.
- Smart phones (social media) are a distraction that needs to be recognized and acknowledged

- With the time remaining, a number of ad hoc topics were discussed and experience and lessons learned were shared. Topics included (not all):
    - Near miss. 2 employees, supervisor + operator, plugged GB hopper. Donned PPE (not taped) – washing and thought he had everything cleared. Supervisor went to check, saltcake fell into conveyor, splashed water into hopper and flashed off and burned supervisor.
        - Last revision has good info on hopper has good info. Request for attendee to review and suggest what may have been missed.
    - Demographic change and the impact on safety an asset health
        - Incidents dipped at beginning of covid, maybe more awareness?
        - Incidents seem to be rebounding
        - Some negative impacts from covid keeping teams apart and missing control room conversations
        - Retention is problem especially in competitive job markets. Tenure is reduced and not likely to look like the past – staffing and methodology needs to change.
        - Ability to retain people likely gone – need to change how experience is accrued. Digitalization – building out tools so people can "see" multiple sites & accelerate learning. Understand how people learn and accelerate that.
        - Continuity in knowledge key to keeping people from getting hurt and protecting assets.
        - Rate at which we listen, change, and try new things is key. Is it reasonable to expect same demands on family prior generations accepted?
        - Leaders need to be open to new ways for the next generation of leaders to safely manage RB risk.
        - Direct oversight of the process from home, can create an environment where the monitoring makes people feel watched and over managed – downside of technology

- The meeting ended at 11:55 am.

- Next BLRBAC: April 3-5, 2023

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.

8.7 PUBLICITY & NEWS REPORT – Matt Paine
No report

8.8 SAFE FIRING OF BLACK LIQUOR REPORT – Vernon Blackard

Monday October 3 - 8:30 am – 11:30 am
8:30 am --Noon Safe Firing of Black Liquor Subcommittee – (CLOSED)
1 pm to 4 pm Safe Firing of Black Liquor Subcommittee - (OPEN)
Proposed Agenda:

1. Open the meetings. Both Closed and Open.

2. Reviewed BLRBAC Anti-Trust statement. Both closed and open meeting.

3. Introduce members and guests. 11 committee members present in the closed Meeting. 38 total in the open, 27 guests in the open meeting and 11 committee members.

4. Review and approve the Spring 2022 minutes. Approved.

5. Review any open items brought up to the subcommittee before the Fall 2022 Meeting.

    - Our document was posted for a main committee vote this fall 2022 meeting. The changes for chapter 10.2 item 8 were rejected by the EC and will need to be revisited.
    - Revisit and discuss changed to 10.2 item 8. Main issue was not considering DT scrubber bypass damper a DT explosion vent.

Items brought up Fall 2022 meeting.

- Continue discussions from Spring 2022 meeting (Refer to minutes). OK submitted without 10.2 item 8

6. Open item discussion from members.
    - Any new items will be discussed.
    - IP Pine Hill smelt rush incident review and discussion (Incident attached).

Discussed incident about having person assigned to watch bed and low DT level check. Open meeting brought out need to burn out old char bed with viscous smelt after chill and blow before next liquor firing.

- Do we need smelt bed cameras and spout deck cameras in our document as

recommended… Both closed and open meetings it was a strong recommendation to have smelt bed and spout cameras for normal operation with priority repairs if out of service. Check EC.

- More discussions and shared AFPA and other documents about DT explosion venting. Voted to resubmit 10.2 item 8 more general recommendations in them.
- Clarification on stable liquor firing definition. 15.6.
- Sarah of Valmet showed DT venting guidelines on PowerPoint slide show.

7. Open discussion from guests
    - Email request around checking roof tubes with brick sealing (email attached) in agenda. Reviewed Stasuk WIP scans for RB loose roof tubes.

8. Explosion videos…Showed some salt explosions from U tube.
9. **Frank Navojosky of the EC has some mark ups to be reviewed before we can submit our document. Will work on those before the Spring 2023 meeting. I will attach that mark up in the minutes.**
10. Close meetings as needed (close and open).

8.9 WASTE STREAMS REPORT
No Meeting, No report.

8.10 WATER TREATMENT REPORT – Tom Przybylski

- The water treatment subcommittee met in open session for morning and afternoon sessions. There were 8 of 14 subcommittee members in attendance along with 21 guests

- Membership information was updated

- 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 an update on the status of the chemical cleaning section. A presentation of the section for general membership was shown to subcommittee members.

- The remainder of the morning was spent on production of the testing and sampling section. Basic system components were thoroughly revised for clarity and readability. This includes why we are testing for specific contaminants, and where they come from. Starch, silica, hardness, sodium and iron testing were among the topics that were edited for clarity.

- The afternoon session continued with refinement of the testing and sampling document, with an extensive revision of three components that should all be achieved simultaneously: laminar flow, timely sample transport, and sample temperature.

- Proper steam sampling techniques were revised and appropriate references to ASME and ASTM were added.

- The various types of iron testing were discussed with an outline of some test methods added; this will be refined at the next meeting.

- Functional testing definitions, constraints, and best practices were discussed, with input from mill operators. Recommendations were amended following that input.

- The meeting was adjourned at 2:55PM

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

10.0 TAPPI ENERGY, RECOVERY, RECAUST (ERR) Committee REPORT

No Report

11.0 WESTERN CANADA BLRBAC REPORT

No Report

12.0 ACTIVITIES OUTSIDE NORTH AMERICA REPORTS

No Report

13.0 OPERATING PROBLEMS SESSION REPORT – Frank Navojosky

Session started at 1:00 PM on October 4th. We reviewed approximately 15 questions submitted by the membership in writing, with approximately 3 additional questions asked during the session. Covered topics ranged from residual alkali limits, Acid cleaning guidelines, NG valve trains, Loss of 1 ID fan, Tmin, Bevels when welding, Bed and spout cameras, and spout torches among others. We also received questions regarding operational procedures and questions about various maintenance practices and training. The Session closed on Tuesday October 4th at 2:30 PM

- This concludes the Operating Problem-Solving Session Report.

CLOSING COMMENTS: CHAIRMAN: David von Oepen:

That concludes our Main Committee Meeting this morning. Thank you all for your attendance and your time away from home and work. Our next meeting will be April 3rd, 4th, 5th 2023 and it will be here at the Sonesta Hotel. And the Fall mtg Oct 2nd,3rd,4th. Please spread the word to increase participation in these meetings. We really need more participation from the mills. With that I'll now entertain a motion to close the Main Committee meeting. Second? All in favor? The Main Committee Meeting is now closed. We will have our Technical Presentations starting in about 15 minutes.

Thank you all and have a Safe trip back!

APPENDIX I ESP Subcommittee
INCIDENT SUMMARIES

NO LEAK

FALL 2022-01	
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^{o}F, 1100 PSIG Design
Incident Date/Time:	March 14, 2022, Earliest Indication: 3/14/2022 at 7:10 AM
Downtime hrs, leak/total:	38.6 hours
ESP?	**YES**
Leak/Incident Loc:	Boiler Bank, NO LEAK, Generating Bank conveyor
How discovered:	Walkdown, Operator discovered water and steam in generating bank conveyor on a boiler walkdown
Wash adjacent tube:	NO
Root cause:	No Leak,
Leak detection:	YES
Bed cooling enhanc	YES
Last full inspection:	Mar-22
Sequence of events:	At 7:15am on Monday, March 14th, an operator found water, vapors, and a loud blowing noise under the Generating bank (hot) conveyor on his routine round. Upon investigation, the decision was made to evacuate the boiler housing immediately and rapid drain the boiler due to the location, intensity of the water/vapors, and the audible blowing. The ESP was initiated by the crew leader from control room at 7:16am. All ESP interlocks functioned correctly. The mill's ESP procedure was followed and all personal evacuated the building for 8 hours. After the allotted evacuation period, mill personal entered the boiler housing and determined that the area was clear. To help cool off the residual smelt bed, an enhanced cooling medium was inserted into the bed for six hours. After the bed floor was sufficiently cooled, the boiler was filled back with water to hydro. Once full, the boiler was pressurized and held between 850 – 875 psig for 30 minutes. No leaks were found. Upon further investigation, an IK was found to be stuck/held in the boiler around the time the ESP was initiated. This IK was located just above the area/conveyor where a potential leak had been suspected. It was concluded that this was the source of the water, vapors, and noise discovered by mill personnel. After concluding that IK had been hung inside the boiler for an extended period of time, the surrounding area was inspected for potential damage. The IK was stuck approximately 3 ft inside the boiler; therefore, the tubes were able to be inspected from a nearby manway. After confirming that a leak was not present and tubes were not damaged, actions were then taken to proceed to starting up the boiler. The boiler lit off at 4:26pm on 3/15/22 and boiler was on liquor at 9:57pm Wednesday, March 15th.
Repair procedure:	
Future prevention:	

FALL 2022-02	
Classification:	**Noncritical**
Co, Mill, Location:	**Georgia-Pacific, Naheola Mill, 7530 Highway 114, Pennington, Al 36916**
Unit Data:	RB#4,1993, Babcock & Wilcox, PR-220, Drums - 1, DCE - NO, Floor - Sloped to rear
Unit Size:	5.4 MMlb DS/day, 883,000 lb/hr steam, 1300 PSIG, 905°F, 1625 PSIG Design
Incident Date/Time:	April 1, 2021, Earliest Indication: 4/1/2021 at 8:05 PM
Downtime hrs, leak/total:	5 Hrs.49 Min.
ESP?	**NO**
Leak/Incident Loc:	Smelt Spout, No. 4 Spout
How discovered:	Walkdown, Popping sound and visual reaction
Wash adjacent tube:	NO
Root cause:	Weld Failure, the surviving evidence suggests that when the weld overlay originally was applied to the trough surface, problems with the overlay occurred that required a local repair (repair was done in the shop) of both the overlay and the trough surface. This repair apparently was not properly executed, and small cracks remained in the overlay and in the repair that, once the spout was placed in service, began to propagate into the trough under the influence of the thermal stresses that are an inherent component of the operation of the spouts.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Sep-20
Sequence of events:	At 8:05pm on April 1st the recovery operators discovered a leak on #4 Smelt Spout on CRU4. They observed a lot of popping in the lower half just above the discharge and reduced liquor flow soon after by approximately 200 GPM. At 9:30pm operations terminated all liquor flow to the boiler and attempted to install a Valmet refractory spout plug. At 11:30pm CRU4 went back on liquor, however the operators soon discovered that smelt was leaking past the refractory plug. At 1:52am on 4/2/21 operators terminated all liquor flow to the boiler again. Once the spouts stopped smelting, the operators inspected the spout and noticed that the refractory plug was not fully inserted since the spout throat was not cleaned prior to installing it. Operators then cleaned the spout throat and re-installed the refractory plug. At 6:30am CRU4 is back on liquor and by 11am CRU4 is back running at 370 GPM liquor flow which is approximately 80-85% of full load. Operators reported that everything is stable and all 4 remaining spouts in service are operating normally. Refractory plug has been working as designed since it was reinstalled.,
Repair procedure:	Plugged Spout, 4/1/2021, Spout Changed 11/2021
Future prevention:	RCA Action Items: Capture cooling water data and send to Valmet for analysis. Follow up on re-write of the SOP, ensure it contains language for cleaning the throat area for installing plugs. Send Valmet the report from the last CMO for the spout inspections (the actual spouts were disposed of and not analyzed). Follow-up on ordering plug kits and on the PO for replacement spouts Once removed, send #4 spout to Valmet for analysis and perform visual and/or PT on the remaining spouts when replaced. Follow up with Valmet on list of spouts on hand at GP mills in case the need arises, viable option to keeping in storeroom. Develop plan to change current spout

FALL 2022-03	
Classification:	**Noncritical**
Co, Mill, Location:	**International Paper, Pine Hill Alabama**
Unit Data:	RB#2,1982, B&W, PR-201, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	4.0 MMlb DS/day, 590,700 lb/hr steam, 1500 PSIG, 900F, 1700 PSIG Design
Incident Date/Time:	July 21, 2022, Earliest Indication: 7/21/2022 at Incident happened at 5:40 pm
Downtime hrs, leak/total:	1.75 hrs
ESP?	**NO**
Leak/Incident Loc:	Dissolving Tank, smelt rush due to spouts plugged and internal dam of saltcake forming a pool of smelt
How discovered:	Walkdown, saw that spouts had plugged from camera view in control room and operator in field confirmed
Wash adjacent tube:	NO
Root cause:	Ash Fall, following a chill and blow on field day
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	May-22
Sequence of events:	On 7/20/2022, a scheduled field day was executed for the Recovery Boiler as part of the PM1 field day. This field day was scheduled as an extended field day due to economic downtime, with the intentions of PM1 starting up the morning of 7/21/2022. Operations got a fire in the recovery boiler on 7/20/2022 at 3:58 pm, with the intentions to have the boiler warmed up and on standby waiting to be put in the header based on steam demand. At approximately 1:10 PM on 7/21/2022, fuel oil was put in boiler and boiler put in header once steam drum pressure was above 750 psi. At approximately 3:40 PM after putting liquor gun in, it was discovered that smelt spouts #1, #2, and #3 were plugged with #4 spout being the only one with flow. Liquor was pulled out around 4:30P when the #4 spout quit smelting. The new smelt spout burners were brought to spout deck and used in effort to unplug spouts. The #4 spout was back flowing around 5:25 PM and then the spout burner was moved to start unplugging #2 spout. One liquor burner was put back in boiler at 5:35P. At 5:40 PM a significant smelt flow was established on #4 spout and the dissolving tank began to experience violent smelt reaction. At 5:42 PM the dissolving tank level dropped from 6.0 ft to around 1.7 - 2.0 ft and at 5:45 PM operations master fuel tripped the boiler due to indications of low level in dissolving tank. An issue was found with the dissolving tank level indication where the standpipe drain valve at bottom had been damaged during the violence allowing the water to leak out of standpipe causing level to read artificially low. The level reading was restored at 6:40 PM and a fire back in boiler at 6:58 PM. A fire was kept in Recovery Boiler for 24 hrs after a scheduled field day on hot standby without firing any liquor. When liquor was put in boiler, the hot salt cake shifted down to the smelt spouts and caused them to plug
Repair procedure:	No repairs needed. Minor bowing of smelt chamber. Will address on next inspection outage.
Future prevention:	During extended downtime field days: Do not run the sootblowers; Keep the fire out of the boiler until steam demand calls for it so that liquor firing can be initiated as soon as possible once the boiler is back in the header. Review SOPs for additional guidance for starting up the boiler with large slag fall on the floor.

FALL 2022-04	
Classification:	**Noncritical**
Co, Mill, Location:	**Sylvamo, Eastover Mill, Eastover, South Carolina**
Unit Data:	RB#2,1991, Tampella, 343, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	4.65 MMlb DS/day, 800,000 lb/hr steam, 1500 PSIG, 900°F, 1860 PSIG MAWP
Incident Date/Time:	March 15, 2022, Earliest Indication: 3/15/2022 at 04:00 AM
Downtime hrs, leak/total:	55 hours
ESP?	**NO**
Leak/Incident Loc:	Economizer, #2 economizer – leak on tube closest to gen bank on the 5th bottle header from the right-hand side wall
How discovered:	Walkdown. Operator noticed water in the economizer 2 hopper. Assembled additional resources to conduct a walk down and found water on a door on the 7th floor on the right-hand side wall.
Wash adjacent tube:	NO
Root cause:	Most likely root cause is fatigue from the design of the square fin terminations that form the baffle wall. The OEM shared other failures/leaks at the bottom of the fin terminations on other "hockey stick" style economizers. A handful of other boilers experienced similar leaks, primarily in economizer 2 (hot economizer). The leak could have also been due to an arc mark during installation or a combination of the two.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Oct-21
Sequence of events:	On dayshift Monday 3/14/22, the #2 economizer conveyor shut down when to the hub came off rotary feeder. As a result, the #2 economizer chute plugged, but operations were able to clean the chute out with water. The chute experienced a few more small plugs on dayshift (did not need water to clean), but operations suspected the cause was the water used to initially clean out the chute. Night shift also had a plug, they decided to walk down the system and see if there could be other issues. An operator noticed some water was still in the hopper, but realized it should have been dry by then. At this point operations suspected there could be a leak, but they were not getting any leak logic indications. Operations confirmed there was no water entering the furnace so a thorough economizer walkdown was conducted**. A small amount of water was seen on a right-hand side wall access door on the 7th floor (bottom of the economizer above the hopper). The decision was made there must be a leak and to transition off liquor to get a better look in the economizer. Once off liquor, water could be seen dripping through the #2 economizer IK lane access door on the right-hand side wall. Again, operations confirmed no water was accessing the furnace (or could access the furnace) and liquor was put back in to burn the bed out. The boiler was taken down in an orderly fashion for cool down and inspections and repairs. Boiler was offline 3/15/22 at 18:30 and back online 3/18/22 at 01:30. ** Since the water was seen in Econo 2, water could not enter furnace because a baffle wall separates the Econo 2 from the Gen Bank and the furnace.
Repair procedure:	Safe entry was made into the #2 economizer IK lane to identify the leak location. Water was left in the economizer tubes and at head pressure, water could be seen coming from the farthest back tube (closest to gen bank) several bottle headers in from the right-hand side wall. It was determined the leak could not be easily accessed from the economizer IK lane so the decision was made to clean and scaffold the gen bank gas pass. The skirt casing was removed in the area of the leak to perform inspections and repairs. The leak was found just below the toe of the fin attachment weld on the 5th bottle header. The membrane was split and bent back to reveal the leak area. The indication was ground out and dye penetrant testing confirmed there were no additional cracks prior to making the repair. Ultrasonic thickness testing and dye penetrant testing confirmed no other tubes in the area were damaged. The leak area was cleaned and weld overlay repairs were performed (1" x 1").

ECONOMIZER

FALL 2022-05	
Classification:	**Noncritical**
Co, Mill, Location:	**WestRock, Mahrt, Phenix City AL.**
Unit Data:	RB#1,1966, Babcock & Wilcox, BW-PR97, Drums - 2, DCE - NO, Floor - Sloped to Front
Unit Size:	2.9 MMlb DS/day, 440,000 lb/hr steam, 890 PSIG, 825°F, 1000 PSIG Design
Incident Date/Time:	March 24, 2022, Earliest Indication: 3/24/2022 at 8:15pm
Downtime hrs, leak/total:	37 hrs
ESP?	**NO**
Leak/Incident Loc:	Economizer, the leak was on West (#1) Economizer platen #51 (numbered 1 – 91 going from left wall to right wall). The leak was coming from the end cap of the bottom header at the edge of a previous pad weld repair.
How discovered:	Walkdown, Operator reported of water in west economizer conveyor
Wash adjacent tube:	NO
Root cause:	Weld Failure
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Oct-22
Sequence of events:	At 8:15pm on Thursday, March 24th, an operator found water in the west economizer 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 2:52am on 3/25/22. Fire out at 3:40am, bed was completely burned out. Boiler cooldown curve was followed, and boiler water wash started at 11:30pm on 3/25/22. IKs were used only in the economizer section. Wash completed, boiler LOTO and leak identified, weld repaired, PT'd and boiler hydro tested. Gas fire in at 7:10am on 3/26/22 and boiler on liquor at 4:33pm Saturday, March 26th.
Repair procedure:	Grind out hole, PT to ensure no cracks present, pad welded over and "sealed" the ends of the pad weld, PT to insure good weld.
Future prevention:	Plan to X-ray test end caps on the lower headers of the west economizer to identify problems in the welds before they cause leaks. Also plan to PT any previous weld repairs made to these areas.

ECONOMIZER

FALL 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:	May 29, 2022, Earliest Indication: 5/29/2022 at 8:00pm
Downtime hrs, leak/total:	39.3 hours
ESP?	**NO**
Leak/Incident Loc:	Economizer, the leak was discovered on Platen 93 (numbered 1 – 93 from the south wall to the north wall, tube 1 on the header (numbered 1-16 from front to rear of the boiler).
How discovered:	Walkdown, Operator discovered wet saltcake under the #2 West ECON (cold) conveyor.
Wash adjacent tube:	NO
Root cause:	Other, A crack had propagated from a previous fin attachment point and a pinhole leak formed in the crack.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Mar-21
Sequence of events:	At 20:10pm on Sunday, May 29th, 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 10:49pm on 1/25/22. Fire out at 11:47am, bed was completely burned out. Boiler cooldown curve was followed, and boiler water wash started at 8:00am on 5/30/22. 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 7:53am on 5/31/22 and boiler on liquor at 2:07pm Tuesday, May 31st.
Repair procedure:	The crack on the tube was ground out and then inspected with PT to confirm no additional cracking was present. Then the leak was weld repaired. The repair weld was inspected with PT to confirm there were no voids. The tube with the leak and the tube adjacent that was getting

	sprayed were tested with UT to confirm thicknesses were in normal range. No abnormalities on the adjacent tube were seen.
Future prevention:	We currently do full PTs on all tubes in the tube 1 position on Major outages (every 2 years), however we do not do full PT on Mini outages since there are hopper support brackets around the tubes that need to be removed and it is a time-consuming process. We are evaluating possible options of either doing spot checks on tubes underneath these support brackets on Mini outages or plan to remove the brackets and do full inspection if outage manning is increased and outage time is not impacted. We are also following up with the OEM to determine if these hopper brackets can be safely removed based on previous correspondence with them. If they can be removed in the future, this will allow for easier access on annual outages and full PT and even RT of these tubes.

ECONOMIZER

FALL 2022-07	
Classification:	**Critical 944**
Co, Mill, Location:	**Verso Corporation, Quinnesec Mill, Quinnesec, MI**
Unit Data:	RB#,1989, B&W, PR-203, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	4.4 MMlb DS/day, 585,000 lb/hr steam, 600 PSIG, 750°F, 600 (drum 720, design drum 800) PSIG Design
Incident Date/Time:	December 17, 2021, Earliest Indication: 11/22/2021 at 20:44
Downtime hrs, leak/total:	35 hr 45 min
ESP?	**NO**
Leak/Incident Loc:	Economizer, 1st gas pass economizer, hot side of rear header, tube 76, 1.5 inches below header weld
How discovered:	Walkdown, Acoustic leak detection in alarm since 11/22, operator found by opening door and looking and listening
Wash adjacent tube:	NO
Root cause:	Corrosion Fatigue
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	May-21
Sequence of events:	Beginning on November 22, and continuing until the leak was discovered, acoustic leak sensor 20 was intermittently in alarm. Initially it cleared when the sootblowers were held, but later that was not the case. Operators performed walkdowns and opened doors several times to look for a leak with nothing found. On Dec 17, an operator opened a mandoor near the top of the economizer and heard a sound. Further investigation resulted in finding saltcake deposits on a tube. Probing the area with a rod resulted in the rod being wet when removed from the furnace. Decision was made to conduct an orderly shutdown to repair the leak. Liquor firing was stopped at 23:45 on 12/18, and the boiler was tripped at 04:05 on 12/19.
Repair procedure:	Tube removed from service; plugs installed at both headers
Future prevention:	First four to six tubes in both directions from the risers and supply tubes at all headers should have radiographic examination done to inspect for possible internal issues.

ECONOMIZER

FALL 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, 860°F, 1250 PSIG Design
Incident Date/Time:	July 21, 2022, Earliest Indication: 7/17/2022 at 2:00 AM
Downtime hrs, leak/total:	31 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer, Tube to lower bottle header weld
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Fatigue, Damage from not having clamps
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Mar-22
Sequence of events:	Leak in economizer was found during walkdown by operator 7/17/22 at 2am. Liquor pulled at 11am to look inside, leak could be seen looking in the southeast corner of the hopper. No indication via Parcview trends. Leak determined to be small but impinging upon tube next to it. Liquor put back on until a plan could be made for repair. Leak monitored with no indication of change. Liquor was pulled at 10:00pm 7/20/22, repairs were made dayshift on 7/21/22. Passed hydro 12:30pm, liquor was put back in boiler at 2:30am 7/22/22.
Repair procedure:	The leak was ground out and re-welded, and a patch was welded on the tube the leak was impinging upon
Future prevention:	Will replace tubes at the next extended outage.

ECONOMIZER

FALL 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, 1250 PSIG Design
Incident Date/Time:	August 20, 2022, Earliest Indication: 8/19/2022 at 3:00 PM
Downtime hrs, leak/total:	34 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer, tube to upper bottle header weld
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Fatigue,
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Mar-22
Sequence of events:	Leak in economizer was found during walkdown by operator 8/19/22 at 3pm. Liquor pulled at 4pm to look inside, leak could be seen looking in the southeast corner of the hopper. No indication via Parcview trends. Leak determined to be small and not jeopardizing any nearby tubes, so liquor was put back in until we could perform a controlled shutdown of the boiler beginning that evening. Liquor was pulled at 10:00pm 8/19/22, repairs were made dayshift on 8/20/22. We failed the first hydro and had to lock back out and determine if top or bottom plug was leaking. Leak identified at bottom plug, removed 6-inch section of tube above bottom plug and welded the top side of the bottom plug (see section 11). We passed hydro 1:20am, in the header at 5:20am, liquor back in boiler at 8:00am 8/21/22.
Repair procedure:	Plugged tube at the top and bottom
Future prevention:	Will replace tubes at the next extended outage.

ECONOMIZER

FALL 2022-10	
Classification:	**Noncritical**
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#3,1987, Ahlstrom, 39445, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	2.1 MMlb DS/day, 360,000 lb/hr steam, 1250 PSIG, 860°F, 1250 PSIG Design
Incident Date/Time:	July 16, 2022, Earliest Indication: 7/15/2021 at 11:00 AM
Downtime hrs, leak/total:	39 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer, Leak is at the toe of the weld between the membrane and tube
How discovered:	Walkdown
Wash adjacent tube:	NO
Root cause:	Internal Thinning
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Mar-22
Sequence of events:	Leak was discovered in north economizer during a walkdown at 11 am 7/15. Inspection of feedwater flow trends do not indicate a leak. Liquor was pulled at 12:30pm to inspect the leak. The leak could not be seen well from opening doors on the 4th floor, but we could tell it was higher up in the economizer than we are used to seeing, and that it was running down the wall, not appearing to be compromising any surrounding tubes. A plan was built to do a controlled shut beginning the evening of 7/15 and begin repairs the next morning at 7 am; the leak was monitored very closely throughout the afternoon/night via conveyor inspections to ensure it was not getting bigger or jeopardizing the boiler. Liquor was pulled at 9:00 pm 7/15. Once entry was made, the leak appeared to be at #26 IK, located on the east wall on the 5th floor. Engineering removed the IK and gained access by removing siding at this location. Filled boiler north economizer until leak appeared and it was then pinpointed to be 42-48 inches above IK opening. More cladding was removed, allowing access to leaking tube. Repair was made and boiler passed hydro at 7:00 pm 7/16, fire in at 4:00 am on 7/17. Liquor was put back in the boiler 7/17 12:00 pm and back up to full production at 2:15 pm.
Repair procedure:	Leak was ground out and rewelded
Future prevention:	

ECONOMIZER

FALL 2022-11	
Classification:	**Noncritical**
Co, Mill, Location:	**Domtar, Hawesville, Ky**
Unit Data:	RB#3,1987, Ahlstrom, 39445, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	2.1 MMlb DS/day, 360,000 lb/hr steam, 1250 PSIG, 860°F, 1250 PSIG Design
Incident Date/Time:	August 29, 2022, Earliest Indication: 8/26/2022 at 9:00 PM
Downtime hrs, leak/total:	34 Hours Liquor Out to Liquor In
ESP?	**NO**
Leak/Incident Loc:	Economizer, Leak is at the weld between the tube and the feeder header
How discovered:	Walkdown
Wash adjacent tube:	NO
Root cause:	Fatigue
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Mar-22
Sequence of events:	Leak was discovered in #2 economizer during a walkdown at 9pm 8/26. Inspection of feedwater flow trends do not indicate a leak. Liquor was pulled at 10pm to inspect the leak. The leak could not be seen well from opening doors on the 4th floor, but we could tell it was along the west wall above the mezzanine on the 4th floor, and it did not seem to be compromising any other tubes. A plan was built to do a controlled shut beginning the evening of 8/28 and begin repairs the next morning at 7 am; the leak was monitored very closely throughout the weekend via the leak index and conveyor inspections to ensure it was not getting bigger or jeopardizing the boiler. Liquor was pulled at 9:00 pm 8/28. Once entry was made, the leak appeared to be at the bottom feed tube header on #2 economizer. Engineering made the repair, and boiler passed hydro at 5:30 pm 8/29, fire in at 9:00 pm. Liquor was put back in the boiler 8/30 8:00 am and back up to full

	production at 11:00 am.
Repair procedure:	Leak was ground out and rewelded
Future prevention:	

ECONOMIZER

FALL 2022-12	
Classification:	**Critical 945**
Co, Mill, Location:	**Georgia-Pacific Toledo, Oregon**
Unit Data:	RB#2,1959, CE, 14169, Drums - 2, DCE - Cascade, Floor - Decanting
Unit Size:	1.44 MMlb DS/day, 170,000 lb/hr steam, 600 PSIG, 750^{o}F, 750 PSIG Design
Incident Date/Time:	December 22, 2021, 7:20pm Earliest Indication: 12/22/2021 at 7:20pm
Downtime hrs, leak/total:	5 days
ESP?	**YES**
Leak/Incident Loc:	Economizer, caused by the rapid drain. “Rapid drain was triggered by an un-attended running hose which another operator observed running down the exterior of the boiler from the floor below.”
How discovered:	Operator walk down discovered what was believed to be a leak.
Wash adjacent tube:	NO
Root cause:	SAC
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	March 2021
Sequence of events:	Operator left hose unattended, water was noticed running down side of boiler from floor below by lead operator performing a routine round, call was made from lead operator to recovery operator to clear the building and rapid drain. ESP document was filled out and appropriate notifications were made. Due to the stress put on the boiler during the rapid drain leaks formed at the Economizer. Leaks were repaired, hydro tested @ ~500psi, inspected throughout entire boiler through all available ports and doors. Dry hydro was achieved and boiler was then returned to service. Operator left water hose running on port deck. Hose moved at some point and ran downside of external boiler lagging. As it ran down to the floor below an operator notice the water, thought it was a tube leak from the volume of water and steam as it ran over the water wall header under insulation and rapid drained the boiler. Inspection and Hydro was performed after it was safe to enter the recovery building. Leaks were found at the economizer which is at end of life. Took a multiple day down before recovering from the event and 10 economizer leaks that were repaired by base metal restoration prior to startup. Repairs were in several locations, majority being at fin to tube welds where SAC has been known to be present.
Repair procedure:	Base metal restoration
Future prevention:	Avoid leaving wash down hoses un-attended.

ECONOMIZER

FALL 2022-13	
Classification:	**Critical 946**
Co, Mill, Location:	**Georgia-Pacific Toledo, Oregon**
Unit Data:	RB#2,1959, CE, 14169, Drums - 2, DCE - Cascade, Floor - Decanting
Unit Size:	1.44 MMlb DS/day, 170,000 lb/hr steam, 600 PSIG, 750^{o}F, 750 PSIG Design
Incident Date/Time:	August 21, 2022, 10am Earliest Indication: 8/14/2022 at 10pm
Downtime hrs, leak/total:	3 days
ESP?	**NO**
Leak/Incident Loc:	Water leaking from rear roof area of economizer
How discovered:	Operator walk down.
Wash adjacent tube:	NO
Root cause:	Stress Assisted Corrosion (SAC)
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	March 2022
Sequence of events:	Operator noticed water exiting rear side of economizer casing roof. Leak was monitored then taken down for repair 8 days later. There were approximately 14 leaks repaired at the economizer and cross over tubes. Repairs were done by base metal restoration, after several

	hydro's, fixing leaks we final obtained a dry hydro at approximately 500psig. Typical leaks we have been seeing at the economizer tube to fin attachments and near heat affected zones. Only unusual area were crossover tubes where they go into the steam drum at the dead air space. This was new and were difficult to access in the roof due to the amount of salt cake that had accumulated over time.
Repair procedure:	Base metal restoration
Future prevention:	Economizer replacement to take place in April of 2023

ECONOMIZER HEADER INSPECTION ACCESS

FALL 2022-14	
Classification:	**Noncritical**
Co, Mill, Location:	**HSPP, Port Mellon, BC**
Unit Data:	Recovery ,1990, B&W, 7618, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	5.72 MMlb DS/day, 850,000 lb/hr steam, 9050 Kpa1380 PSIG, 480°F, 1500 PSIG Design
Incident Date/Time:	May 24, 2022, Earliest Indication: 5/24/2022 at 08:00
Downtime hrs, leak/total:	70 hrs
ESP?	**NO**
Leak/Incident Loc:	Economizer Header Inspection Access, Lower Header west
How discovered:	Walkdown
Wash adjacent tube:	NO
Root cause:	Weld Failure, crack at the handhole cap fillet weld
Leak detection:	YES
Bed cooling enhanc	YES
Last full inspection:	May-22
Sequence of events:	During the walk down of Boiler worker noticed evidence of water dripping from hopper conveyor. Further inspection with reduced liquor firing and then ceasing in controlled condition. Sootblowing stopped and inspection from outside the North Hopper access door spotted the leak location on the back side of header appearing to be at handhole cap location. Controlled shutdown of the boiler was initiated to burn down the bed and bring the boiler offline. Shutdown procedure followed. Shutdown, cooldown, isolation and lockouts completed. CSE initiated for access to erect scaffold and provide access to the location. Inspection conducted cleaned area and identified porosity at the outer fillet weld of the handhole cap. Repair plan developed to grind out porosity and determine removal to parent metal, PT, then welded with PT final. Boiler unlocked filled for Hydro. Test completed. Complete unlocking and prepare for startup. Follow start up procedure warm up and bring boiler back online.
Repair procedure:	Grind out crack, inspect, weld and NDT, Hydro
Future prevention:	Include inspections of similar locations in upcoming annual

RISER, TUBE ABOVE ROOF TUBES

FALL 2022-15	
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:	June 5, 2022, Earliest Indication: 6/5/2022 at 19:30
Downtime hrs, leak/total:	0
ESP?	**NO**
Leak/Incident Loc:	Riser, Screen Tube Riser Vent Line Small Crack Leak in Penthouse
How discovered:	Hydro Test, Post Annual Outage Hydro Test
Wash adjacent tube:	NO
Root cause:	Unknown,
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Jun-22
Sequence of events:	5/28/22 – RB taken down for Annual Outage 6/5/22 – 7:00pm - Boiler brought up to 1250psi for hydro check 6/5/22 – 7:30pm – Operations leadership found small crack leak in Screen Tube Riser Vent Line during internal penthouse inspection 6/5/22 – 8:45pm – Hydro of remainder of the boiler complete and pressure dropped for lockout and leak repair 6/6/22 – 1:15am – Leak repair completed and boiler successfully re-hydroed
Repair procedure:	Weld overlay at leak location
Future prevention:	Evaluating modifying NDT scope in this area

SUPERHEATER + FURNACE SCREEN

FALL 2022-16	
Classification:	**Critical 947**
Co, Mill, Location:	**Georgia-Pacific, Foley, Perry Florida**
Unit Data:	RB#4,1974, B&W, PR-167, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	3.2 MMlb DS/day, 450,000 lb/hr steam, 600 PSIG, 750°F, 750 PSIG Design
Incident Date/Time:	June 17, 2022, Earliest Indication: 6/17/2022 at 22:30
Downtime hrs, leak/total:	120 hrs
ESP?	**NO**
Leak/Incident Loc:	Superheater, Superheater tube leak near T&G-link attachment, washed upper screen tube next to it creating leak
How discovered:	Other, 15-minute rolling Steam/FW differential alarm triggered additional walkdowns. Found suspicious area.
Wash adjacent tube:	YES
Root cause:	Thinning External, the metallurgical report indicated the SH failure was due to erosion/erosion-corrosion initiated from the OD of the tube. However, the erosion mechanism is not readily apparent or present on adjacent tubes.
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Sep-21
Sequence of events:	The 15-minute steam vs feedwater differential alarm alarmed, operators followed the checks and walked the boiler down and did not find any obvious causes on walkdown, reached out for more assistance. Additional walkdown was completed with day tech where suspicious noises were heard around 8th floor at superheater. Believed to have a superheater leak, liquor was pulled, bed burned out for 2 hrs and fire pulled. About the time of fire being pulled the FW operator reported the chemical test had dropped some on the feedwater. Inspection showed that there was no bed in the boiler and no longer smelting so decision was made to cool down the unit as planned on normal shut down, another test was run and came back relatively unchanged. Initiating failure is believed to be a superheater leak adjacent to attachment. The metallurgical report indicated the SH failure was due to erosion/erosion-corrosion initiated from the OD of the tube. However, the exact erosion mechanism is not readily apparent or present on adjacent tubes. (Sootblowers are on the opposite side of the thinning). Another possible root cause is the failure initiated at an old arc-strike or nick when attachments were installed. The superheater leak

	washed out the screen tube adjacent to it resulting in three water leaks. Platen 6 row 1 loop 1 of the high temp superheater was original leak. On hydro found a weeper on weld attachment (D-link) on Platen 9 row 5 loop 1 of low temp superheater
Repair procedure:	Replaced sections of SH and screen tubes with dutchmen. Thorough inspection of area and completed a weld repair on another super heater weeper after the hydro
Future prevention:	Monitor chemicals closer to see if losing chemicals, deeper inspection dive on October 21 outage to assess condition of superheater.

BOILER BANK

FALL 2022-17	
Classification:	**Critical 948**
Co, Mill, Location:	**AV Terrace Bay, Terrace Bay Ontario, Canada**
Unit Data:	CE, CE-70121, Unit #2, 1972. Low odour conversion by Babcock & Wilcox. Direct contact Evap > NO
Unit Size:	2.4 MMlb DS/day, 354,000 lb/hr steam, 900 PSIG, 900^{o}F,
Incident Date/Time:	December 26, 2021, Earliest Indication: 12/26/2021 05:27
Downtime hrs, leak/total:	unknown
ESP?	**NO**
Leak/Incident Loc:	Boiler Bank, A pinhole at the swage portion of a gen bank tube washed an adjacent gen back tube which caused a fish mouth type rupture
How discovered:	Boiler Trip, followed by Operator walk-down
Wash adjacent tube:	YES
Root cause:	Thinning External, Near drum cracking
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Oct-18
Sequence of events:	Initially looked as if we lost a feedwater pump-Low feedwater pressure. Upon removing liquor guns from furnace after trip, noticed water running down the side of the southeast corner. Proceeded to 4th-6th floors and noticed water near mud drum on 6th floor. Went back down to operating floor and heard noise coming from furnace. A visual at the liquor gun ports confirmed water entering the furnace on the south side (right side). Feedwater automatic valve, as well as the manual isolating valve were closed. It was discussed between chief and senior operators to not ESP the boiler as 20-30 minutes had passed, and feedwater had been isolated slowing leak significantly. Further a small area on the north west side of the bed had a hot spot, all other areas of the bed showed the bed was cold and crystalized
Repair procedure:	Plugged tubes in boiler bank that tested close to MWT based on Stazuk IRIS NDT
Future prevention:	Boiler bank anti-vibration bars to be installed at next msd

BOILER BANK

FALL 2022-18	
Classification:	**Noncritical**
Co, Mill, Location:	**Domtar, Marlboro, Bennettsville SC**
Unit Data:	RB#1 Recovery Boiler,1990, Ahlstrom, 5904, Drums - 1, DCE - NO, Floor - Decanting
Unit Size:	4.4 MMlb DS/day, 635,000 lb/hr steam, 1080 PSIG, 850°F, 1550 PSIG Design
Incident Date/Time:	June 12, 2022, Earliest Indication: 6/12/2022 at 11:00pm
Downtime hrs, leak/total:	62 hrs 27 min
ESP?	**NO**
Leak/Incident Loc:	Boiler Bank,
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Stress Assisted Corrosion (SAC),
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Sep-21
Sequence of events:	On June 12, 2022, a leak was discovered at the bottom header of the Generating Bank (non-critical location, no ESP). The Recovery Boiler was already off-line due to the Secondary FD Fan drive failing earlier on the day shift. On the night shift, water was discovered in the Boiler Bank conveyor and a leak was found after further investigation. The boiler was partially water washed and the leak(s) were located. Initially, there were two leaks near the bottom header. One leak was at the swage tube area at the lower header. The other leak was up higher on the adjacent header where the membrane interface is. Pad weld repairs were made by NBS. Hydro inspection showed an additional leak on the swage tube adjacent to the initial swage leak on same platen on lower header. Pad weld repairs were made to the second swage leak and hydro was good. The boiler was brought back online.
Repair procedure:	Pad weld repair. Will replace tube(s) on 2023 major outage.
Future prevention:	Pursuing capital project to replace Generating Bank section in 2024.

BOILER BANK + SUPERHEATER

FALL 2022-19	
Classification:	**Critical 949**
Co, Mill, Location:	**International Paper, New Bern Mill, Vanceboro, NC**
Unit Data:	RB#1,1969, CE, Contract#1167, 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:	June 26, 2022, Earliest Indication: 6/26/2022
Downtime hrs, leak/total:	Liquor to Liquor: 6 days, 23.5 hrs.
ESP?	**YES**
Leak/Incident Loc:	Boiler Bank, Rear Gen Bank, Row 1 tube 16, on the Cold (Rear) Side of the Generating Bank. Tube failed just before the beginning of the swage approximately 8" from the steam drum and bent backwards towards the Economizer Section. Superheater, the tube leak found on the initial hydro was at platen 19 of SH 1A located at the roof line on the leading edge of the lead outlet tube. There was an apparent failure line indication present.
How discovered:	Boiler Trip, in investigating cause of trip, walked boiler down before start up and found tube spraying
Wash adjacent tube:	YES
Root cause:	Thinning Internal, pitting, Steam Blanketing
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	Jul-21
Sequence of events:	The Recovery Boiler tripped on high furnace pressure at 1:00 AM on 6/26/2022. No leak indications were present prior to the boiler trip. There were no changes to the water or chemical mass balances or ID Fan speed prior to the trip. Steam Drum level was lost and bottomed out at the time of the high furnace pressure trip. Operators performed a walk down of the boiler and noticed water spray from the economizer section of the boiler at the steam drum level. An ESP was initiated at 2:53 AM on 6/26/2022 after finding water spraying in the transition between the back of the generating bank and the economizer. The failed tube was removed and plugs were installed in the Steam and Mud Drums. Additional inspections on the front and rear of the

	generating bank were performed while the boiler was still down for this incident. Five additional tubes on the rear side of the generating bank were found to be below minimum thickness specification and were also plugged. A hydro on the boiler was performed and during this time a tube leak was found at the roof penetration in the primary superheater section. A pad weld repair was made on this tube, a Dutchman will be installed on the 2022 Annual Outage. The next hydro was successful and the boiler was back on liquor at 12:30 AM on 7/3/2022.
Repair procedure:	BB, Plugged failed tube and 5 additional tubes due to thinning SH, A section of the high crown seal was removed and the failure appeared to be a stress crack. Ultrasonic testing around the area was performed and the wall thickness was 0.170 to 0.180 with no thinning present. The tube was excavated and dye penetrate tested before welding. A weld overlay repair was made with an area of 1" by ½".
Future prevention:	More frequent inspections in this area and preventing low steam drum level end to end variations

UPPER FURNACE, ABOVE HIGHEST AIR ENTRY + FURNACE SCREEN

FALL 2022-20	
Classification:	**Critical 950**
Co, Mill, Location:	**WestRock, Covington, VA**
Unit Data:	RB#1, 1973, CE 26370, Drums - 2, DCE - Cascade, Floor - Decanting
Unit Size:	3.968 MMlb DS/day, 680 lb/hr steam, 650 PSIG, 750°F, 790 PSIG Design
Incident Date/Time:	March 14, 2022, Earliest Indication: 3/13/2022 at 1:56am
Downtime hrs, leak/total:	5 days, 17 hours, and 25 mins
ESP?	**YES**
Leak/Incident Loc:	Upper Furnace, above air entry, Pinhole in one wall tube buttweld caused leak in one screen tube
How discovered:	Control Room, Noticed high feedwater/steam differential and low boiler water conductivity
Wash adjacent tube:	YES
Root cause:	Weld Failure,
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Apr-21
Sequence of events:	Around 7:30am on Monday March 14th, the #1 Recovery Unit operator noticed unusual numbers for the feedwater/steam differential and blowdown water conductivity. Feedwater/steam differential stepped from 0 kpph to an average of 50 kpph. Blowdown conductivity dropped from 58 mmhos to 30 mmhos. The 1st assistant noted that they had been adding more chemical makeup than usual since Sunday morning. The automatic blowdown valve was stuck open Saturday night, and it was assumed we needed extra chemical makeup because we lost some through the blowdown. Trending the two values showed a clear step change around 2am on Sunday March 13th. In addition, there was a dark spot on the smelt bed as seen through the bed cameras. No alarms were activated for the feedwater/steam differential and the boiler water conductivity. Management was immediately notified and initiated a walkdown of the boiler with sootblowers off. A loud noise was heard just under the boiler roof and evidence of water was noticed near a furnace door. Supervision told operator to initiate an ESP one 3/14 at 8:35am, and all personnel returned to the control room. The ESP checklist was on hand and used to confirm proper shutdown of equipment. There is a Trasar unit used to help detect possible tube leaks but the alarms having not been working properly. Operators do not get alarms in the DCS, only Nalco representative receives alarms. Nalco only received an alarm when logging in remotely through a laptop, they did not receive it on their phone app. Thus, Nalco did not know of the incident until Monday morning.
Repair procedure:	Replaced three screen tubes and repaired welds on wall tube panel
Future prevention:	Reviewing welding inspection report and compiling list of panels replaced over the last few outages. Leak detection (TRASAR) alarms and feedwater/steam differential alarms added to DCS. Improved communication issues with leak detection system and independent notifications (TRASAR).

UPPER FURNACE, ABOVE HIGHEST AIR ENTRY

FALL 2022-21	
Classification:	**Critical 951**
Co, Mill, Location:	**International Paper, Flint River Mill, Oglethorpe, Georgia**
Unit Data:	RB#1,1980, Babcock and Wilcox Company, PR-198, 232-6104, 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:	June 22, 2022, Earliest Indication: 6/22/2022 at 13:00
Downtime hrs, leak/total:	18 Hours
ESP?	**NO**
Leak/Incident Loc:	Upper Furnace, above air entry, Leak was located at weld wrap at membrane termination
How discovered:	Walkdown, Walking area down during Quarterly Outage
Wash adjacent tube:	NO
Root cause:	Fatigue, Membrane Length above seal weld was too high, which created undue stress at membrane termination points. Membrane ends square cut, no concavity at end to reduce stress at membrane end wrap.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Oct-21
Sequence of events:	The Recovery Boiler was down for quarterly planned maintenance outage. The maintenance outage had activities starting June 21st and ended roughly on June 23rd. Operations had started washing hoppers on night shift of June 21st after liquor had been pulled. During day shift of June 22nd, operators walked hoppers down to inspect washing progress and discovered leak. The boiler was cooled off and scaffolding was installed to get to the leak. We discovered the leak on the 9th floor level, approximately 10 feet from the LHSW above the east generating bank hopper. The tube leaking was on the rear wall (#29). The membrane was trimmed to allow access and expose leak. Defect was ground out to allow weld repair. Area of weld repair was 1”x1”. The area was dye penetrate tested without any issues.
Repair procedure:	Base Metal Restoration
Future prevention:	PT arch tubes at membrane termination, replace failed tube, scallop membrane ends to lessen stress

LOWER FURNACE, BELOW HIGHEST AIR ENTRY

FALL 2022-22	
Classification:	**Critical 952**
Co, Mill, Location:	**Westrock, La Tuque Mill, La Tuque, Québec**
Unit Data:	CE Canada, RB5, 1976 CA-73114, Drums - 1, DCE - NO, Floor
Unit Size:	3.5 MMlb/hr
Incident Date/Time:	February 13, 2022, Earliest Indication: 2/13/2022 at 12h45 am
Downtime hrs, leak/total:	5 Days
ESP?	**YES**
Leak/Incident Loc:	Lower Furnace, below highest air entry, Tube leak near startup burner inspection door
How discovered:	Walkdown, while cleaning startup burner airport operator noticed the leak
Wash adjacent tube:	NO
Root cause:	Stress Assisted Corrosion (SAC), Near crotch plate weld
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	May-21
Sequence of events:	12:45 a.m. the helper cleaned burner box #3 on the 1st floor on the "South, West" side. The burner box was very dirty. When he broke the crust, he heard a fizzing noise. he realized this was not normal, so he notified his operator and the team leader. Nothing abnormal on the "DCS" pages that makes us think that a leak is possible. 12:50 a.m., the team leader went to check around the burner, it has apparent steam and a little hiss, he double check with the evaporator operator who also says it's a possible leak, they looked through the holes in the primary air ducts and opened the small observation door. The latter seems wet and the hiss seems louder. Back in the control room and reuniting the whole team, the boiler ESP was initiated at 12:55 am The General Foreman, the supervisor, the person on duty and the superintendent were immediately notified.
Repair procedure:	Tube section and two adjacent tube sections were replaced
Future prevention:	Crotch plates will be replaced by castings to eliminate welds

LOWER FURNACE, BELOW HIGHEST AIR ENTRY

FALL 2022-23	
Classification:	**Critical 953**
Co, Mill, Location:	**Sylvamo, Ticonderoga Mill**
Unit Data:	RB#1 B&W, 1970, PR-131, Drums - 2, DCE - NO, Floor - Sloped to Front
Unit Size:	2.1 MMlb DS/day, 328,000 lb/hr steam, 850 PSIG, 875^{o}F, 925 PSIG Design
Incident Date/Time:	May 19, 2022, Earliest Indication: 5/19/2022 at 2:30 PM
Downtime hrs, leak/total:	Major Outage
ESP?	**NO**
Leak/Incident Loc:	Lower Furnace, below highest air entry, Furnace Front Wall Tube #18 just above knuckle seal
How discovered:	Hydro Test, Annual Outage
Wash adjacent tube:	NO
Root cause:	Unknown, waiting on removed tube sample analysis
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	May-21
Sequence of events:	RB#1 was shut down on May 2, 2022 for a scheduled cold outage. A hydro was completed on May 4, 2022 at 4:00 PM on the way down with no leaks or water spots observed. We proceeded to lock out the boiler for entry. The boiler contractor was finished with the initial scope of work on the morning of 5/19/2022. The drum doors were installed and the boiler was unlocked for hydro starting at 1:15 PM. We began filling the boiler at 2:10 PM and the leak was noticed at 2:30 PM on the ground floor coming from the lower vestibule. The boiler was drained and relocked at 3:45 PM. The leak location was identified on the furnace front wall tube #18 just above the knuckle seal plates. The boiler contractor began work on the ~51.5” dutchman. Work was completed and RT of the Dutchman was accepted on 5/20/22 at approximately 6:45 AM. The boiler was unlocked at 12:10 PM for hydro, we started squeezing at 2:30 PM, and a dry hydro was declared at 4:40 PM.
Repair procedure:	Installed a ~51.5” dutchman

APPENDIX II
ESP POWER POINT PRESENTATION

ESP Subcommittee

SUBCOMMITTEE REPORT – FRANK NAVOJOSKY

WEDNESDAY OCTOBER 5TH, 2022

Meeting Attendance

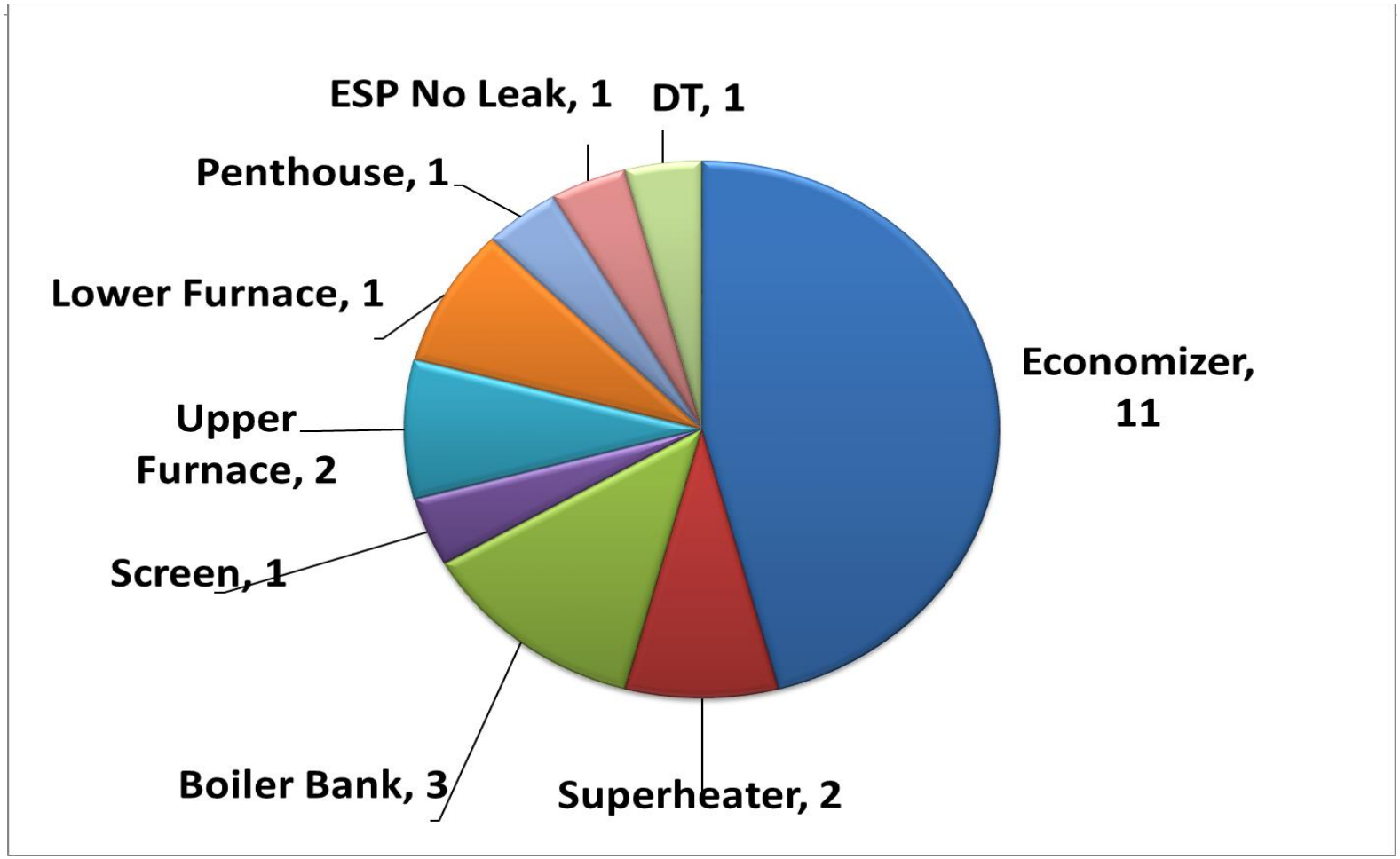
- Closed session Monday Oct 3rd
  - 10/11 Active members represented
- Open session Tuesday Oct 4th
  - 10/11 Active members represented
  - About 130 guests

Incident Questionnaire Review

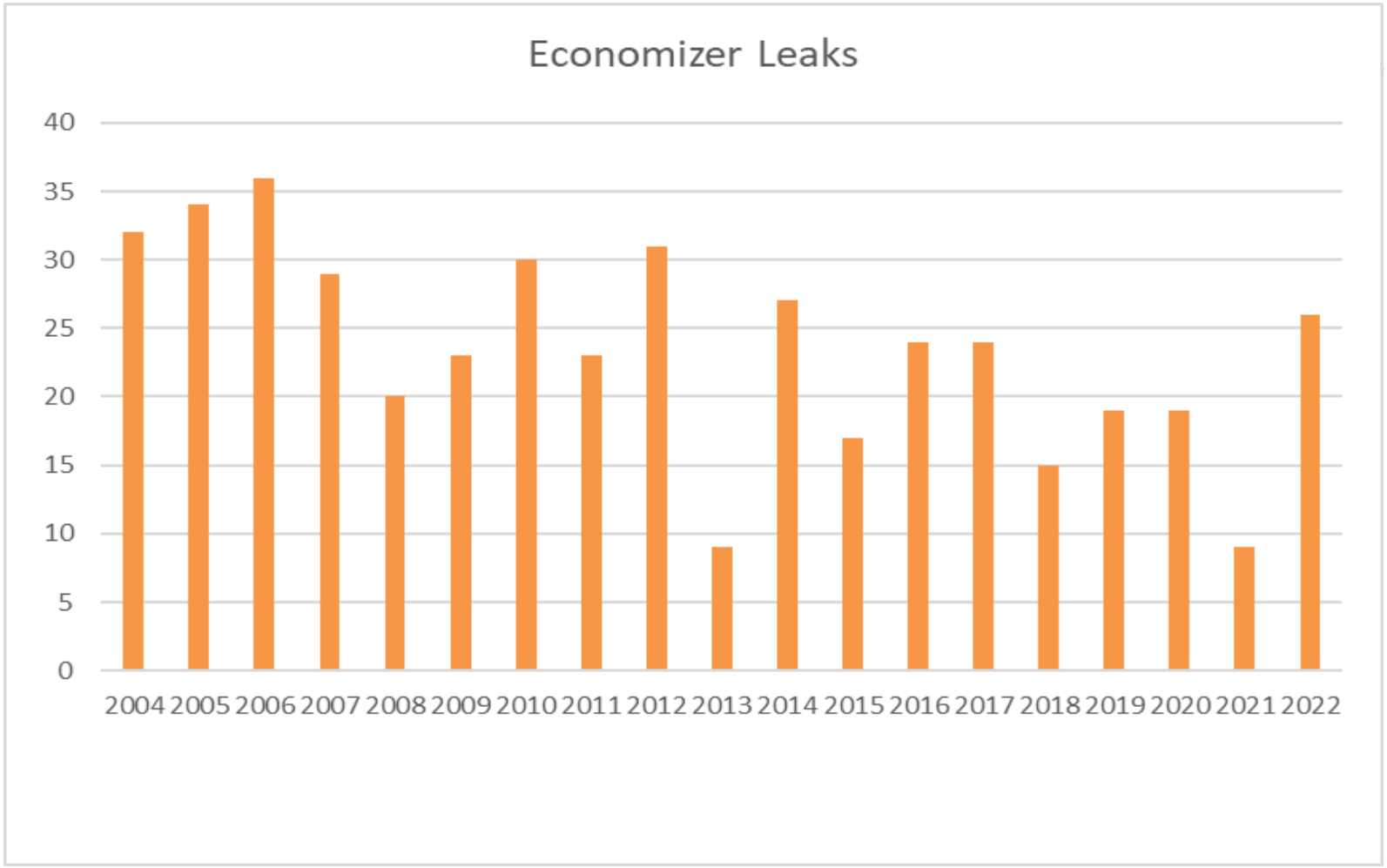
- 23 North American incidents
  - 0 Smelt Water Explosion
  - 10 Critical
  - 11 Non-critical
  - 1 Spout CW Leak (Included as Non- critical)

- 5 ESP'd (1 ESP No leak)
  - 10 Critical
  - 8 Critical in operation with a bed & 4 of these ESP'd
  - 50% of Critical ESP'd that Should ESP

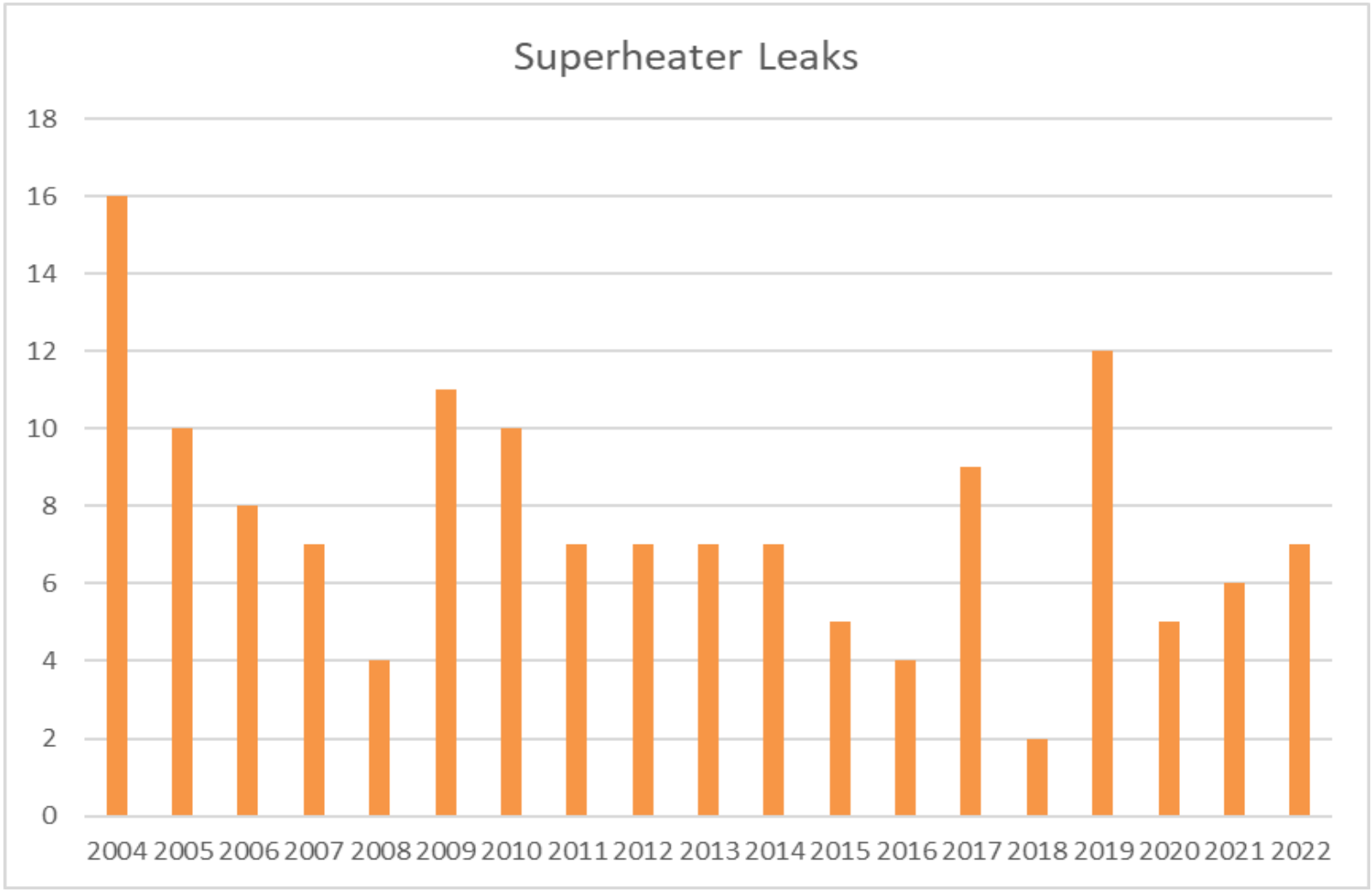
Incident Locations



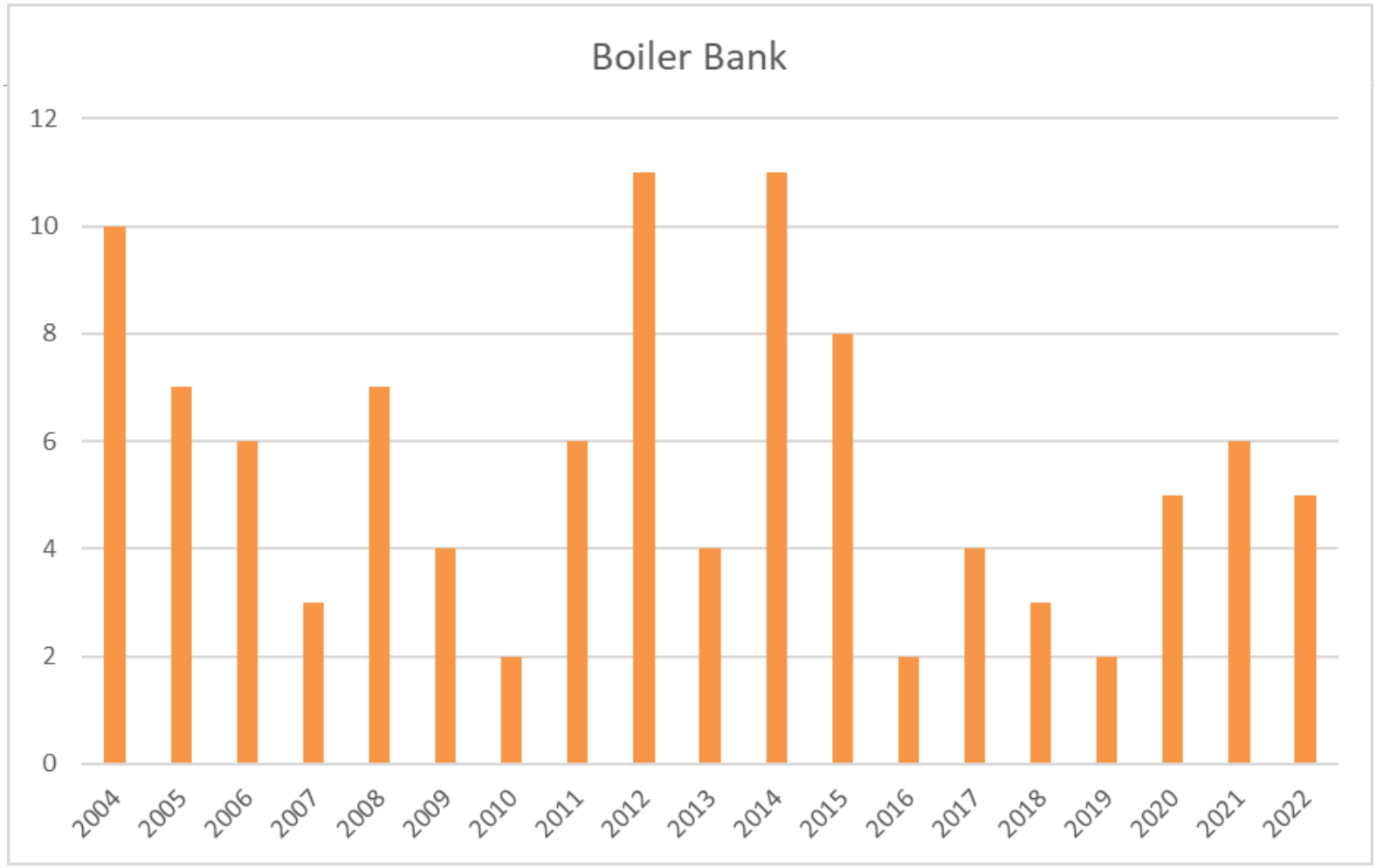
Boiler Component Leak trends



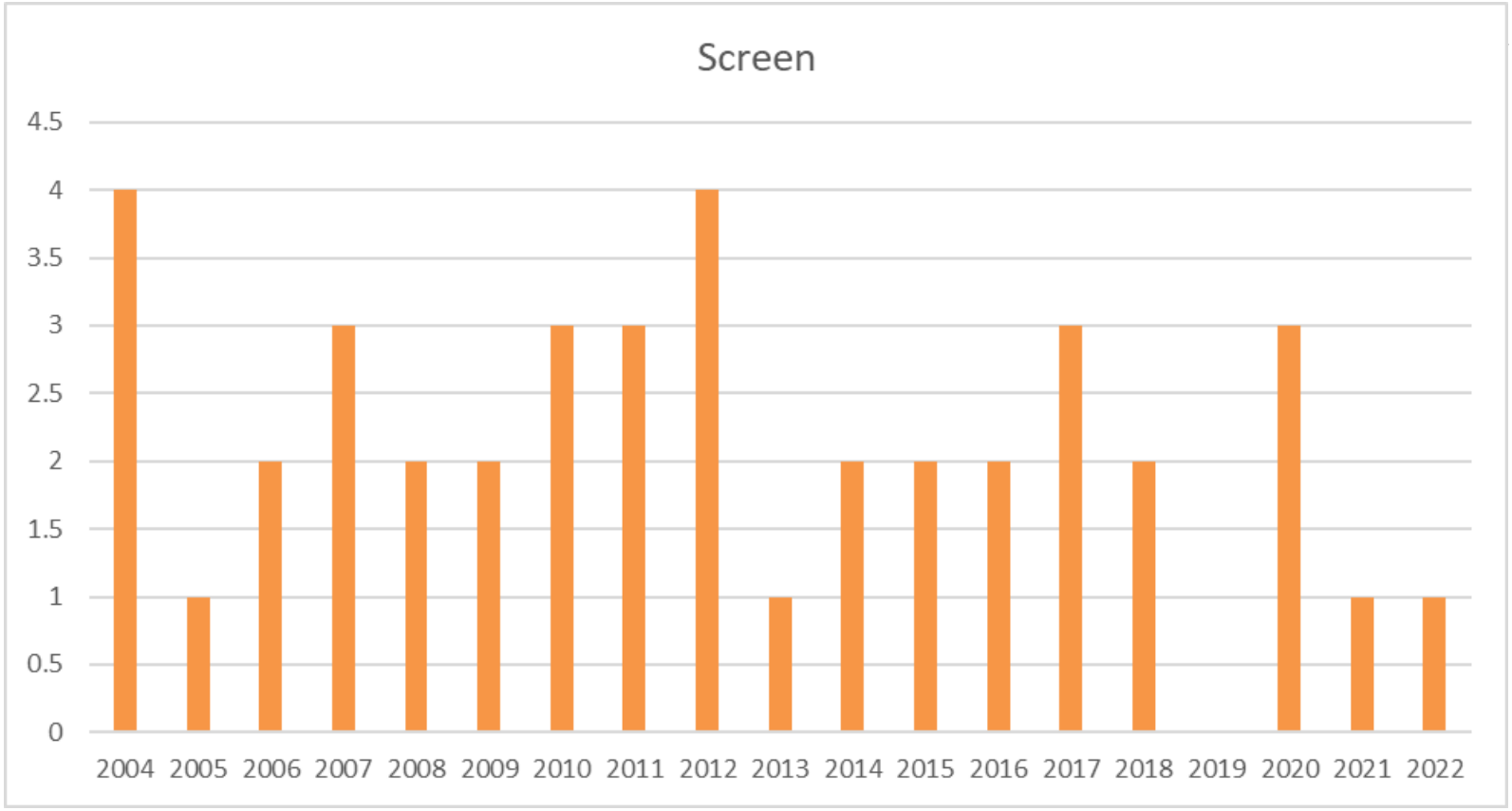
Boiler Component Leak trends



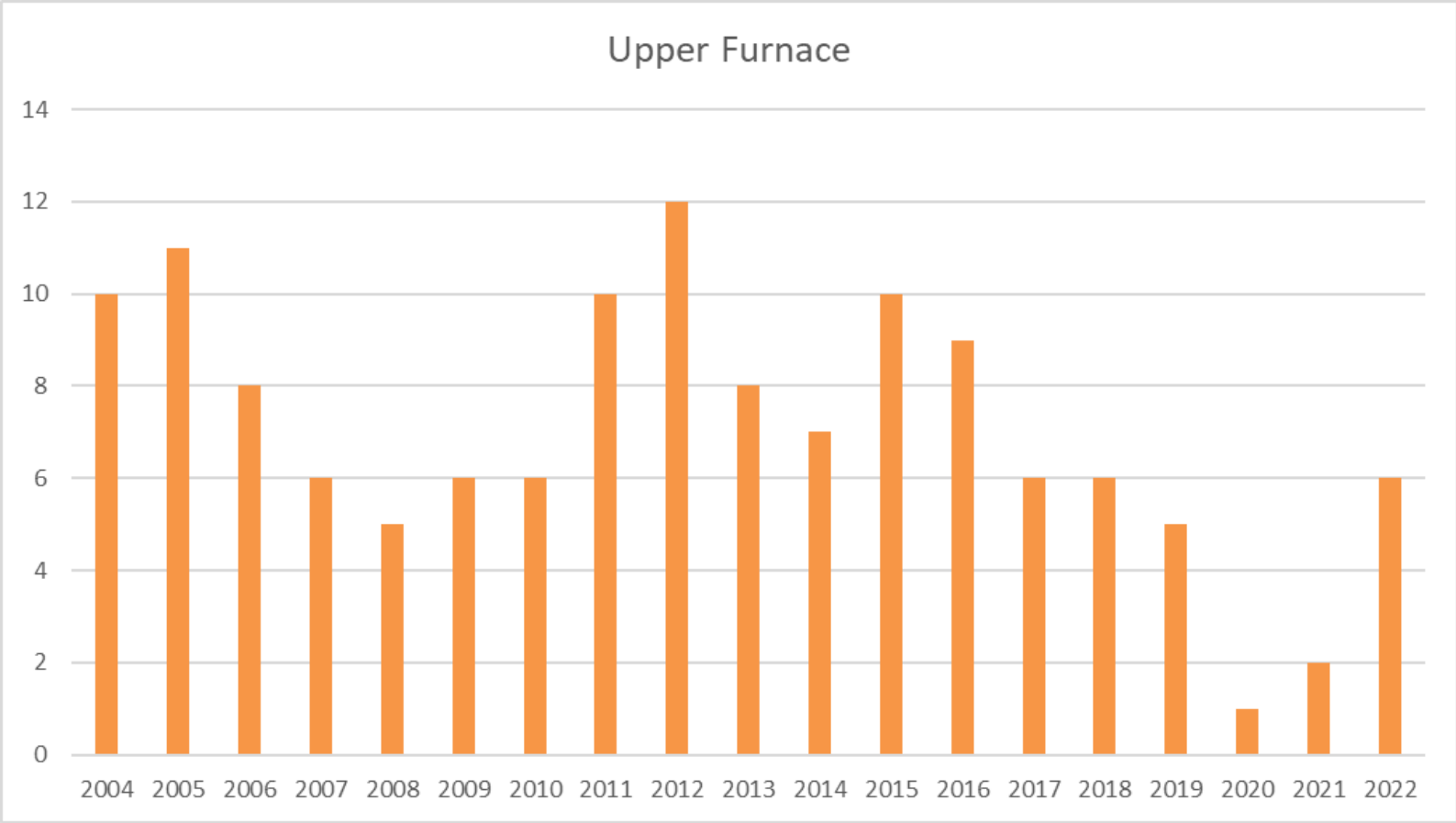
Boiler Component Leak trends



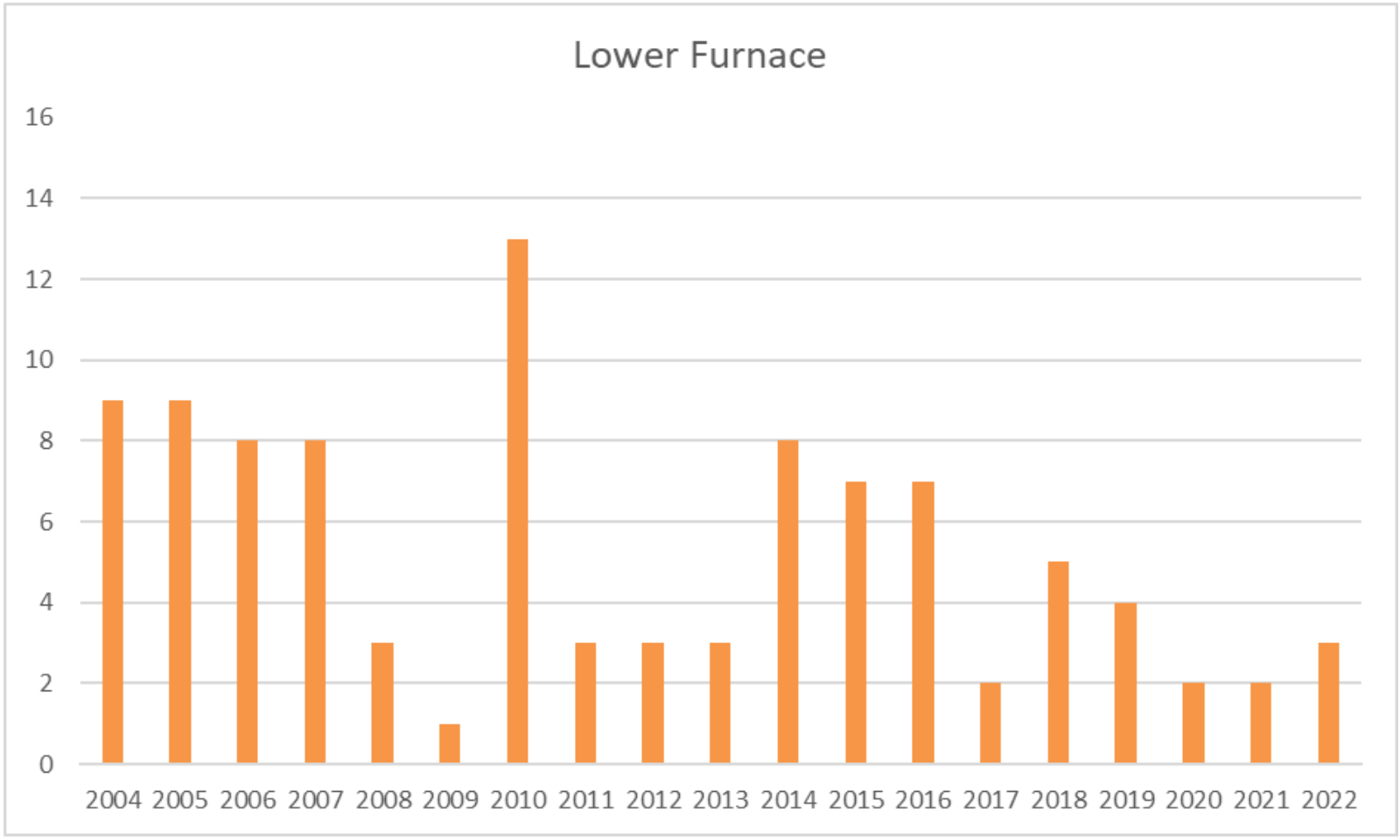
Boiler Component Leak trends



Boiler Component Leak trends



Boiler Component Leak trends



BLRBAC Reported Leaks (US + Canada) 2004 thru 2022

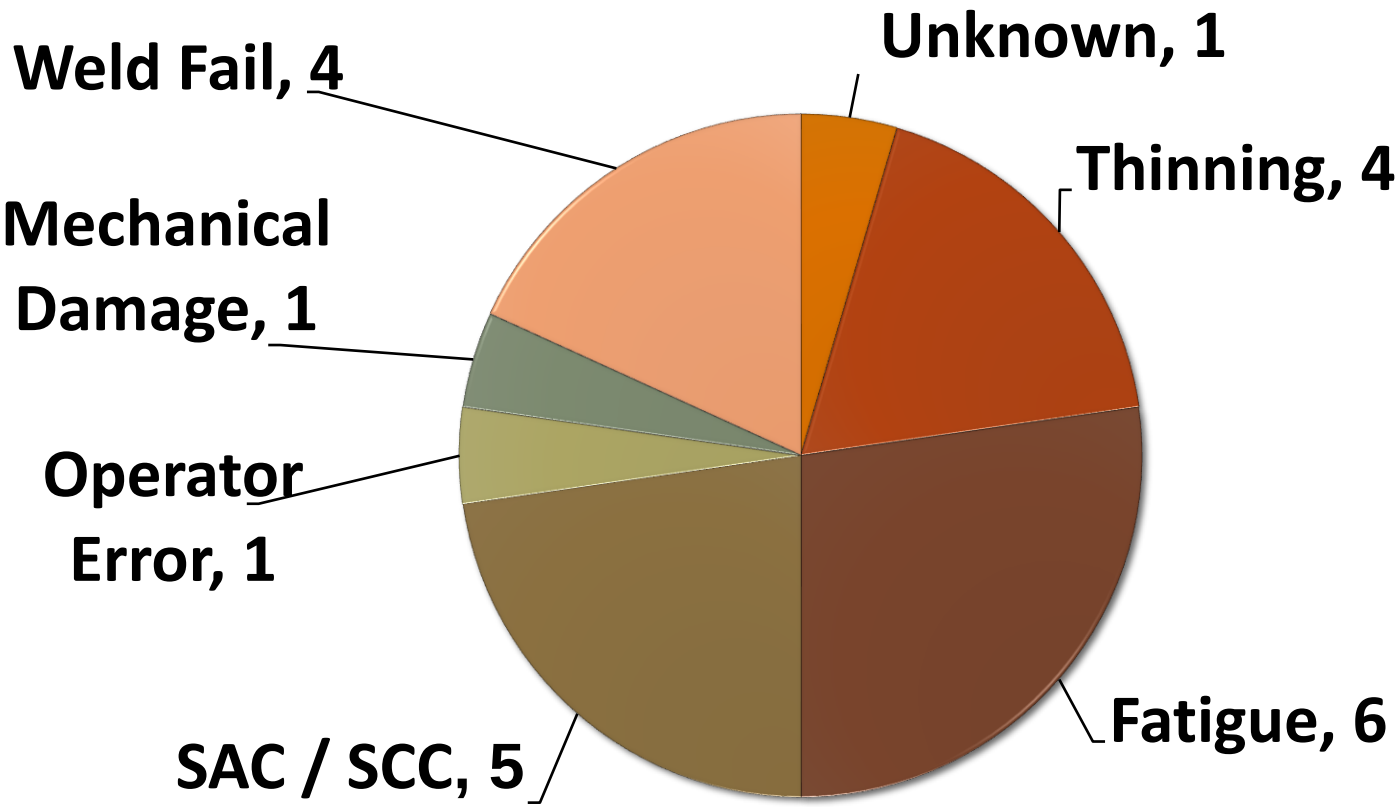
Location	18 Year Total	Average/Year
Economizer	447	24.8
Upper Furnace	134	7.4
Superheater	144	8.0
Lower Furnace*	100	5.6
Boiler Bank*	106	5.9
Screen*	41	2.3
Smelt Spout	31	1.7

*Four Smelt-Water Explosions Recorded 2004 thru 2022,
One from Boiler Bank Leak, Two Screen Tube Leaks, One Floor Leak

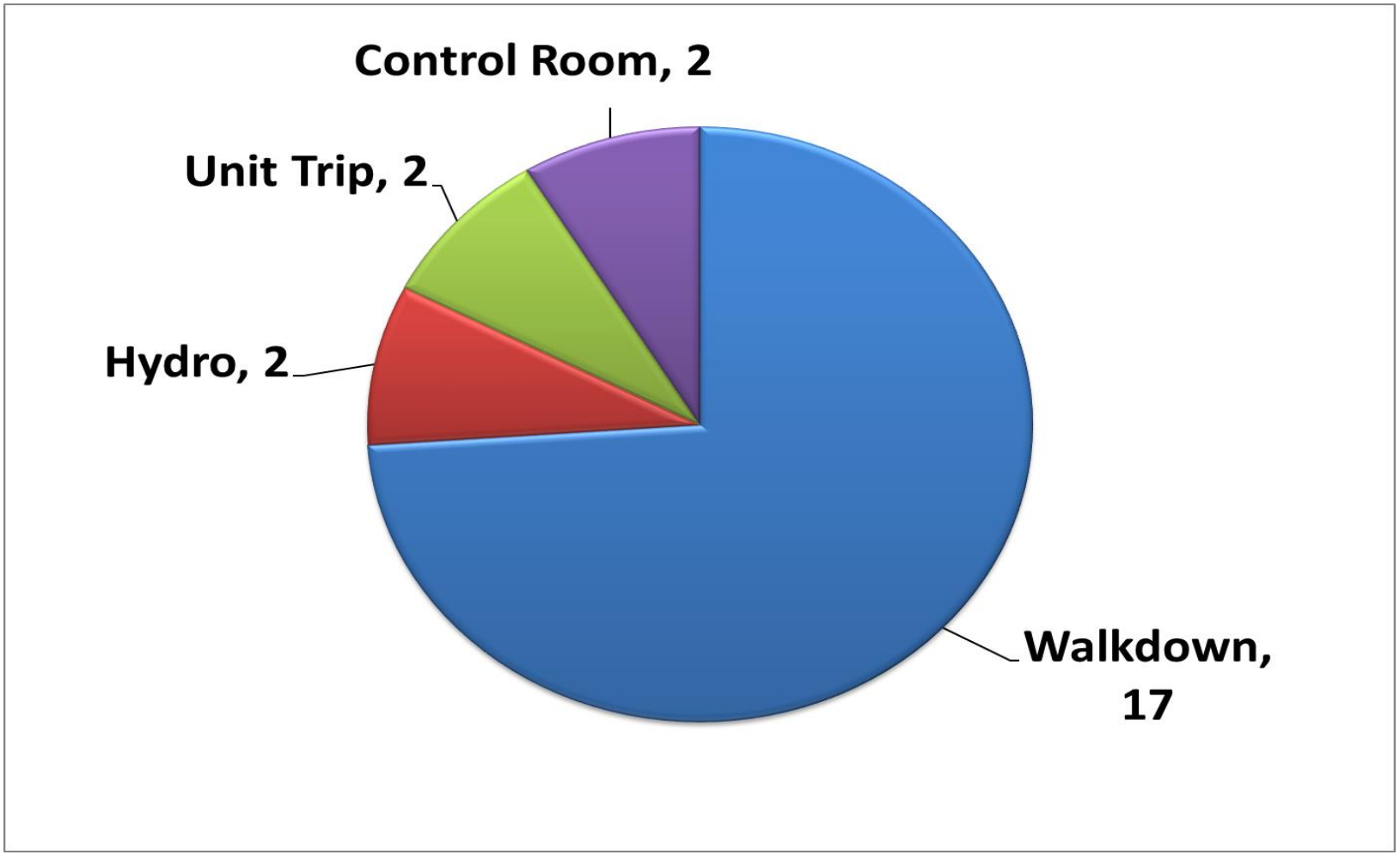
Incidents by Boiler Type

- Drums
  - 1 - 12
  - 2 - 11
  - 3 - 0
- Back End
  - Large Economizer - 20
  - Cascade - 3
  - Cyclone - 0

Leak Cause


Unknown, 1
Thinning, 4
Fatigue, 6
SAC / SCC, 5
Operator Error, 1
Mechanical Damage, 1
Weld Fail, 4

How Discovered



Leak Detection Systems

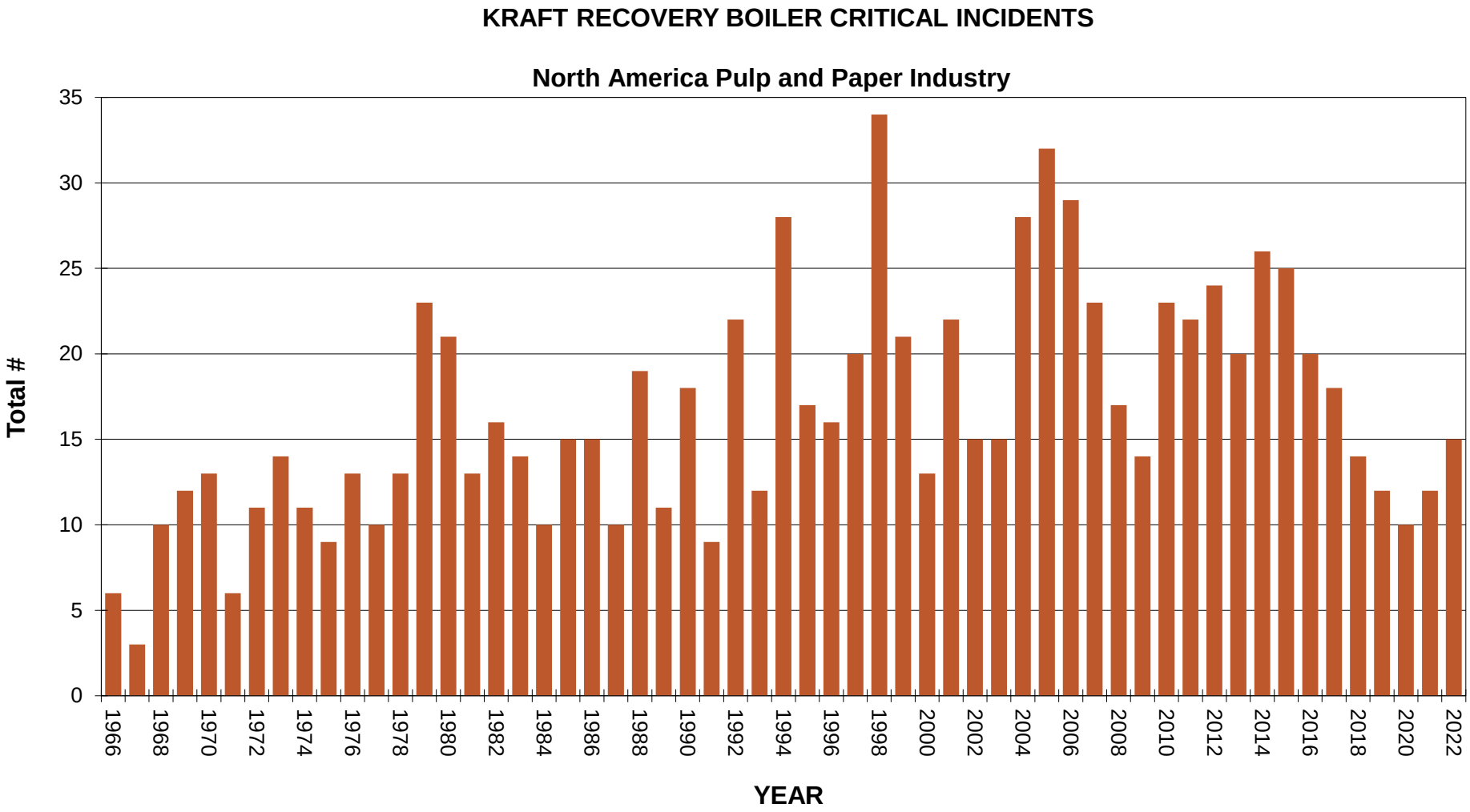
- Leak Detection Systems installed – 13 (65%)
  - Identified leak – 0
  - Confirmed leak - 1

Time to ESP from Initial Indication

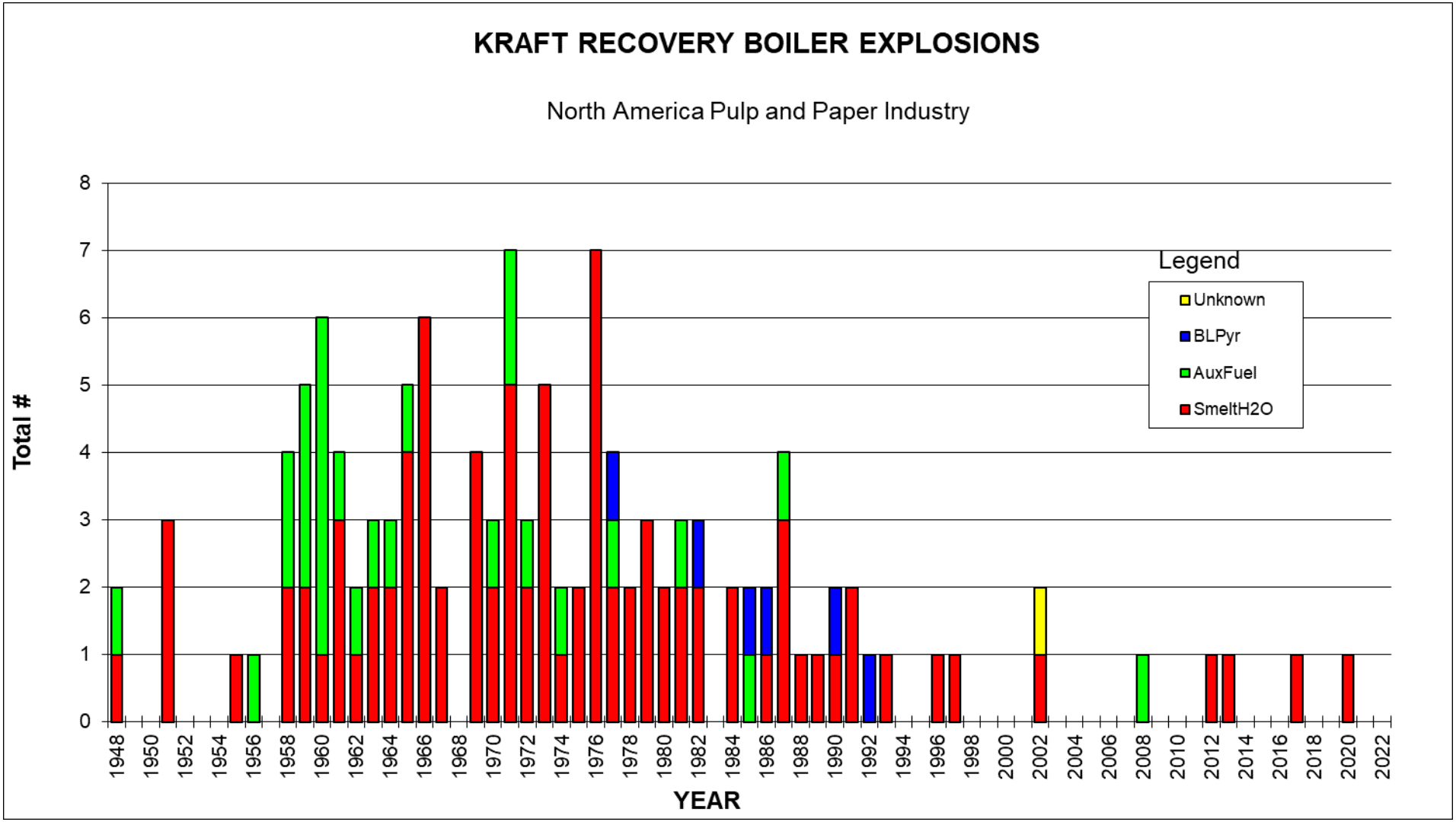
Ranged from 1 minutes to 113 minutes (1, 6, 10, 65, 113)

Median time was 39 min

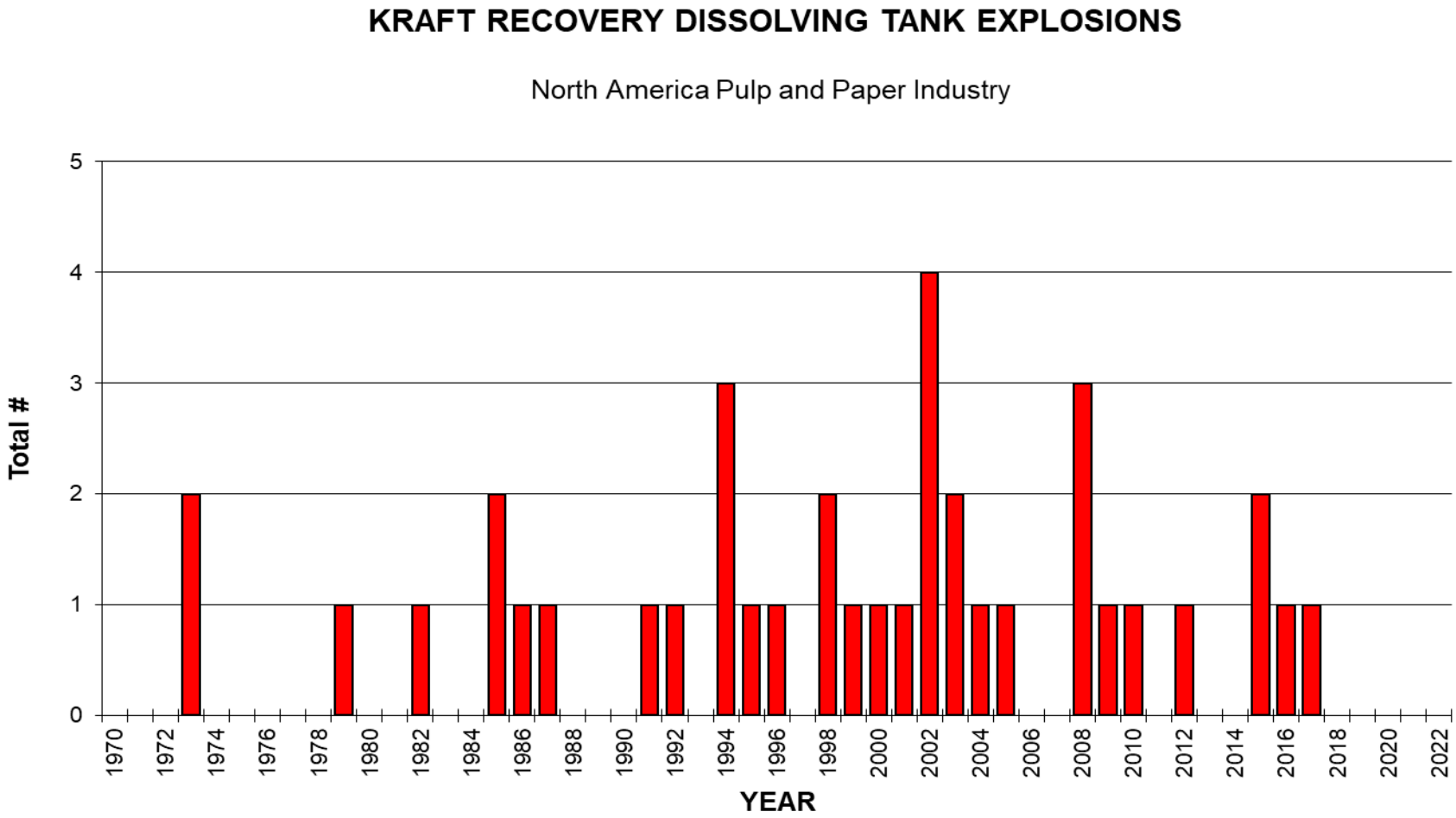
Critical Incidents to Date



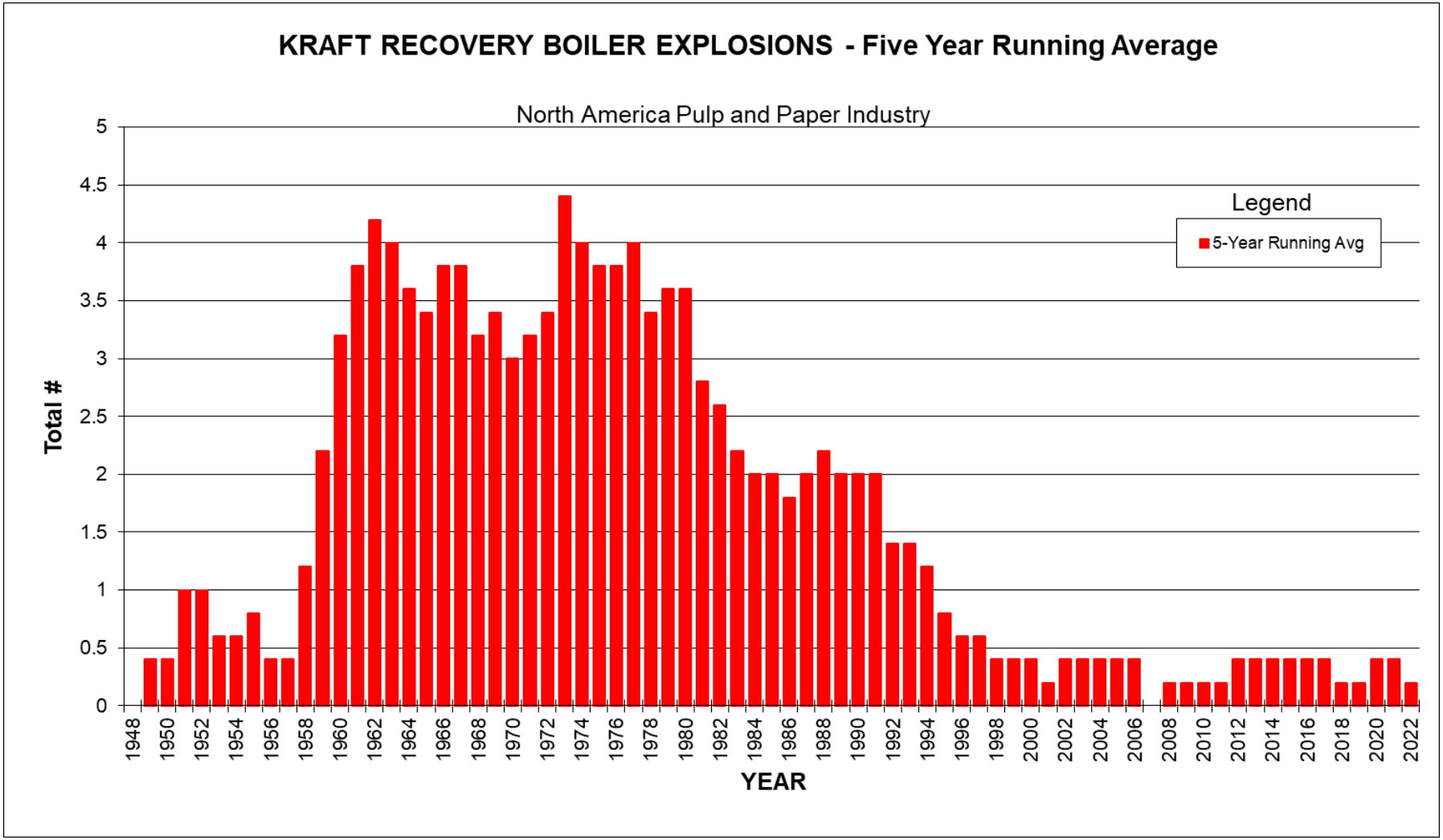
Boiler Explosion History



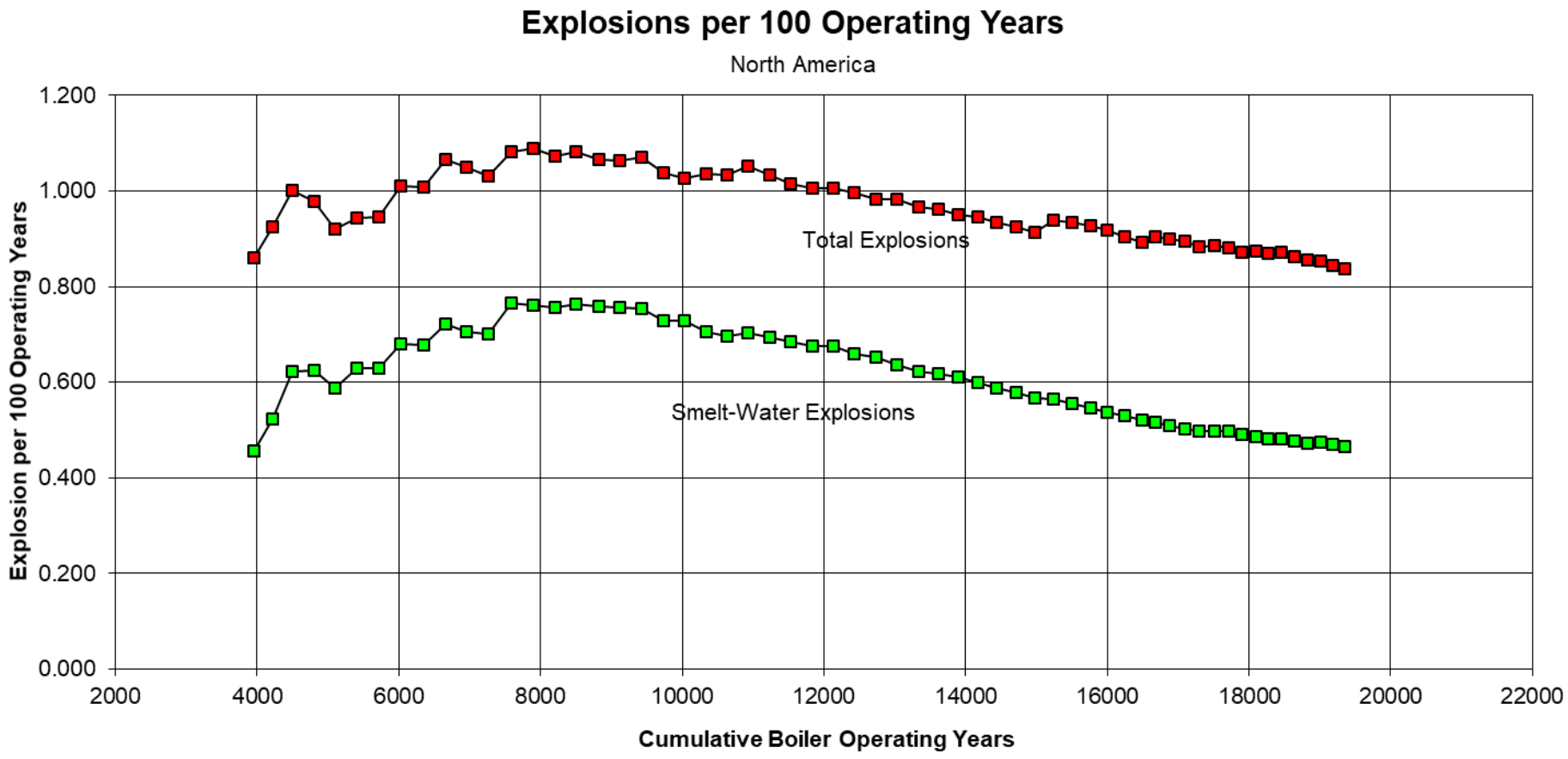
Dissolving Tank Explosions



Explosion History - Five Year Avg



Explosion History per 100 Oper Yr



Boilers in Service

- North American Total - 169
-

	US	Canada
Number	131	38
Avg Age	43	45.6
Max Age	70	75

- Oldest
  - Kruger Three Rivers, PQ
  - 1947 Alstom
- Contact Dean Clay with any Corrections or Updates

Learnings

- Salt sheds from the SH and or Screen can add enough material to the floor area that it can flow to the DT and cause violence. It is typically Sulfate rich, highly viscous and will tend to dam and jelly roll. This material must be watched for accumulation and must be controlled and be considered bed material.
- The senior most knowledgeable management personnel must be involved in overseeing the situation when spout are having plugging issues.
- Ensure Leak detection systems/Alarm are being checked on a regular basis, Some were reported to be in alarm for an extended period and not reacted to, some reported to not have active alarms.
- Consider testing the sensitivity of your leak detection system by cracking a drain and simulating a leak. Do not desensitize your system to avoid nuisance alarms such that an actual leak would not be detected. Utilize an MOC process to approve adjustment to any critical alarm settings.

Learnings

- Do not leave hoses around a RB unattended where they may spray into a RB or confuse operations as to the source of the water.

- If multiple past leaks have been occurring on a unit in a certain section, do not become complacent and assume the present leak is in the same area. A leak may have occurred in a different area that may be critical, such as the upper section of an economizer exposed to the rear section of a 2 drum generating section or the top section of a Single drum boiler generation section.

- Do not run with an economizer leak unless you know for certain (and can see) the leak is in a non-critical area. It may be in a critical area. It may be in the economizer area exposed to the furnace with no baffles in between.

- Do not assume sound in a boiler SH section is a non critical SH leak. Even if it is, it can be impinging on a Critical wall tube, roof tube or screen tube. “If you can’t see it ESP it”. “When in doubt, punch it out”. Assume the worst situation is happening and then convince yourself it is not vs. assuming you are dealing with a non-critical situation only to find out it is critical

Learnings

- Consider replacement of pad welded tubes on future outages. Especially if the tube had indication of possible SAC (stress assisted corrosion), which is almost always waterside initiated, and may have produced other waterside cracks that have not reached the OD surface yet.
- Large leak logic states if Furnace trips on High furnace pressure and the drum level gets to the trip point within 45 seconds, the BLRBAC large leak logic will activate. This will shut the FW valve and put it in manual and trigger a “Possible large leak” alarm. This logic is under revision as 45 seconds has been found to be too long. FW systems may be able to supply high flow out of the leak and also recover drum level.
- The longer a boiler goes without acid cleaning, the more tenacious and hard to remove the deposits will become.
- Ensure low drum level trip points do not allow exposure of upper level generating section and phase separation

Learnings

- The number of smelt spouts requiring to be open for liquor firing must be established and adhered to.

- An ESP has not been found by BLRBAC to cause a defect or damage a boiler. An ESP may cause a previously existing defect to propagate to failure. The defect is there prior to ESP and the root cause of the defect should be determined and similar areas examined for similar defects.

- Smelt bed temperatures must be determined through probing the bed through the surface crust with a rod and thermocouples. Surface temperature measurements are not sufficient.

Reporting RB Incidents to BLRBAC

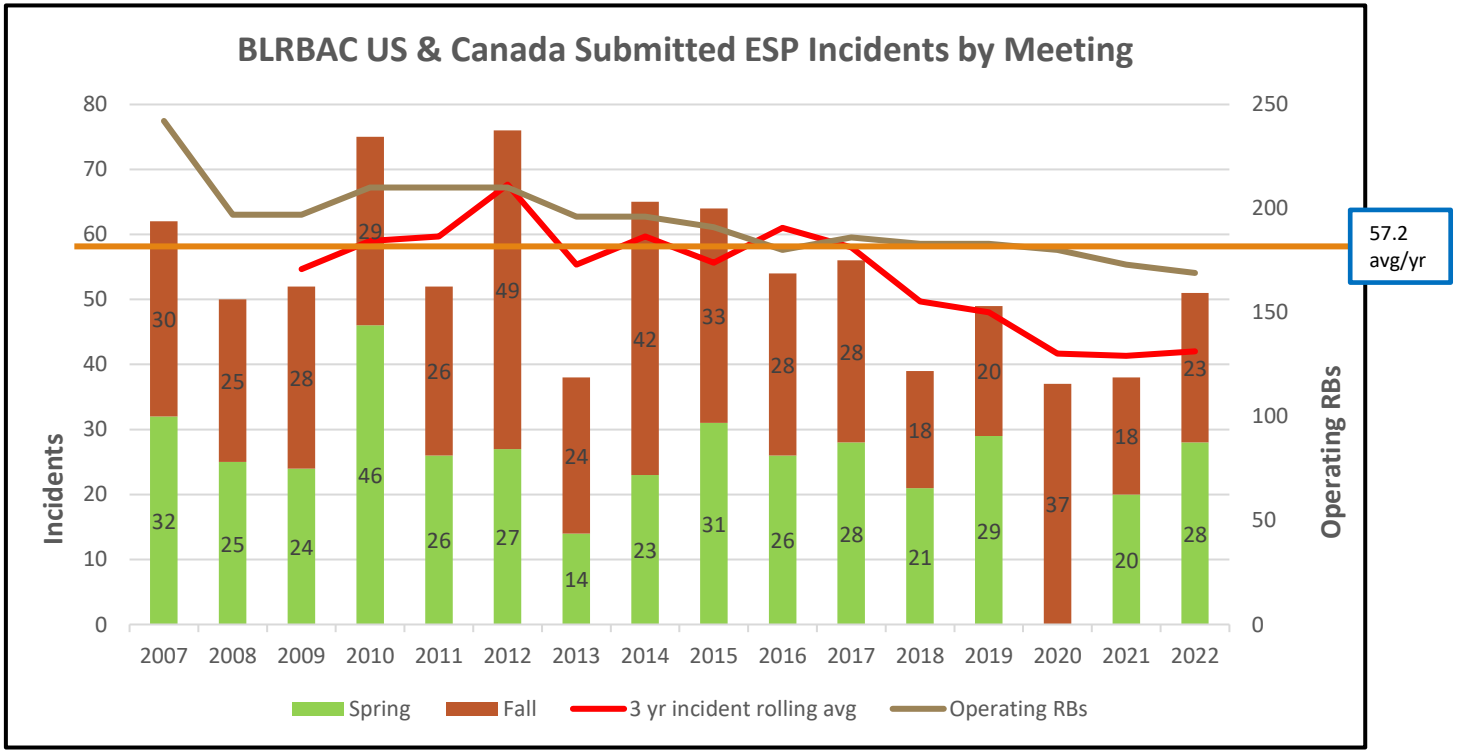
Per BLRBAC "Operating Policies and Procedures" our first primary function is: Analysis, classification and reporting of incidents.

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*.
- Reporting incidents of smelt rushes and minor damage will be benficial to prevention of DT explosions


BLRBAC US & Canada Submitted ESP Incidents by Meeting
Incidents
Operating RBs
57.2 avg/yr
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Spring
Fall
3 yr incident rolling avg
Operating RBs

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 REPORT

BY

WAYNE GRILLIOT

October 5, 2022

2022 Fall 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

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

AF&PA Recovery Boiler Program

Documents developed by the Program:

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

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**

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

Membership

The AF&PA Recovery Boiler Program Membership

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

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 Safety Seminars to be an important part of their **Safety & Training Programs**

Operational Safety Seminars

- The dialogue among the attendees and monitors of the Safety Seminars provide attendees with valuable information and insight
- **Team Exercises** help operators and supervisors make the important decision: **When to ESP a Recovery Boiler**
  - The Case Studies are based on recent **actual BLRBAC Recovery Boiler Incidents**
  - **Six (6) new Case Studies** for each Safety Seminar Series has been the norm
  - **Increasing to Eight (8) new Case Studies** for the 2022 Fall Safety Seminars as a Trial!
- Over **4,200** 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 seminars

Operational Safety Seminars

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

- April 20, 2022 - (7:45 am – 4:30 pm) Eastern Time – **99 Attended**
- May 18, 2022 - (7:15 am – 4:00 pm) Pacific Time – **77 Attended**
- September 21, 2022 - (7:45 am – 4:30 pm) Eastern Time – **78 Attended**
- October 13, 2022 - (7:15 am – 4:00 pm) Pacific Time – **103 Registered!**
- 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 (50%)
- **+** No travel time or cost, and less time off the job!

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. Many cancellations due to Covid.
- 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!!!

Smelt Dissolving Tank Studies

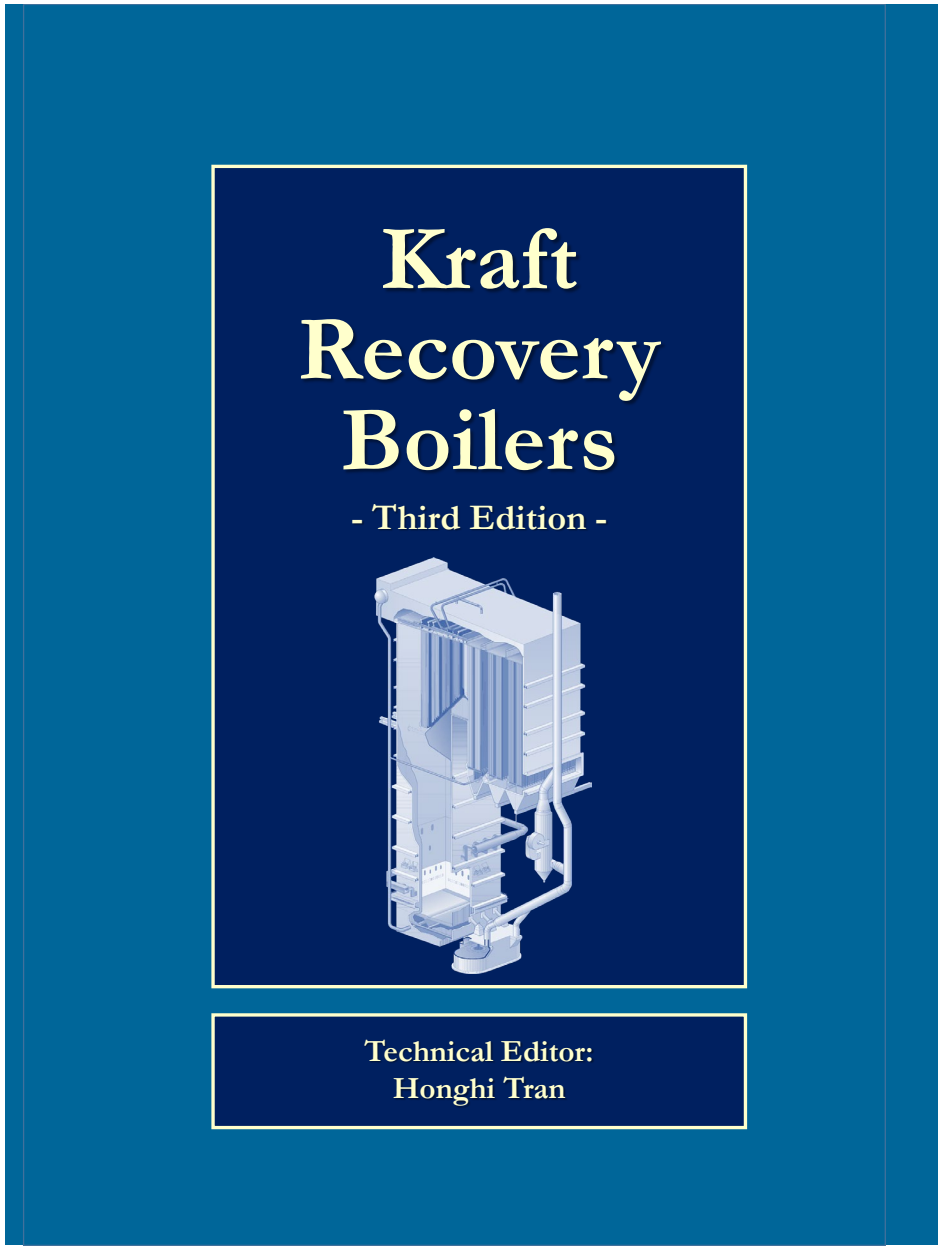
- The **O&M and R&D Subcommittees** are both working to develop best practices around Dissolving Tank related issues
- The **R&D Subcommittee** is sponsoring some important research projects at the University of Toronto for improved safety and reduced operating risk of Dissolving Tanks
  - The 4 projects 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
- Book sales have been very strong, with over **600 copies sold!!!**
- Available through **TAPPI Press.** In its **4th Printing Already!!!**
- The book is also used for the **TAPPI Kraft Recovery Operations Course**
- **AF&PA is offering a 25% Discount this October for Members!!!**



Kraft Recovery Boilers

- Third Edition -

by

Terry N. Adams
W. James Frederick
Thomas M. Grace
Mikko Hupa
Andrew K. Jones
W.B.A. Sharp
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Technical Editor & Chapter Author

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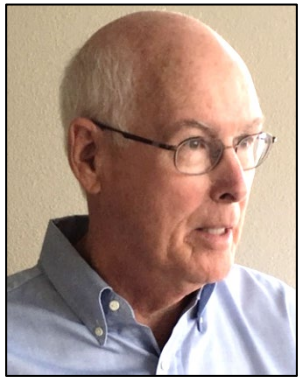
Chapter Authors



TERRY ADAMS was an independent technical consultant to the pulp and paper industry in the area of chemical recovery until he retired in 2017. He obtained a B.Sc. from the University of California at Santa Barbara, a M.Sc. from the University of Michigan, and a Ph.D. from Drexel University with a specialty in combustion. Terry has worked as a Professor at the University of British Columbia, a Combustion Scientist at Weyerhaeuser Co., and since 1986 an independent consultant with a client base of over a hundred mills. He co-authored Kraft Recovery Boiler Physical and Chemical Processes, TAPPI Press, published in 1988 with Dr. Jim Frederick, and is the editor and co-author of Kraft Recovery Boilers, TAPPI Press, published in 1997.

Chapter Authors

MIKKO HUPA is a Chemical Engineering Professor at the Åbo Akademi University (ÅAU) in Turku, Finland. Mikko has supervised more than 40 PhD Theses and authored or co-authored more than 350 journal papers in the areas of high temperature chemistry, biomass and black liquor combustion and gasification, and fluidized bed combustion. Mikko has wide experience as an industrial consultant on issues of chemical aspects of combustion and energy processes. He has served as President of the International Flame Research Foundation, an international organization on industrial combustion with 250 member organizations in nearly twenty countries around the world. Mikko was named a TAPPI Fellow in 2005. Since 2015 he has worked as the President of his university ÅAU.

WILLIAM J. (JIM) FREDERICK, Jr. received his BS, MS, and PhD degrees in Chemical Engineering from the University of Maine. Jim has been active in kraft chemical recovery since 1975, both in industry, research, and consulting. Jim has been active with both TAPPI and the AIChE Forest Products Division throughout his career. He received the AIChE Forest Products Division's award in 1998, and he was named a TAPPI Fellow in 2007. He co-authored the book Kraft Recovery Boiler Physical and Chemical Processes (American Paper Institute, 1988), was a contributing author to Kraft Recovery Boilers (TAPPI Press, Atlanta, 1997). He is the lead author on a new book, Black Liquor Evaporation, to be published by TAPPI in 2019.

Chapter Authors

THOMAS M. GRACE obtained a B.S. in chemical engineering at the University of Wisconsin and a Ph.D. from the University of Minnesota. He was a faculty at the Institute of Paper Chemistry (now IPST at Georgia Tech) for 22 years, and an adjunct professor at the University of Toronto for 15 years. He formed T. M. Grace Company in 1988, consulting on recovery boilers and chemical recovery. Tom has a long involvement with BLRBAC and the AF&PA Recovery Boiler Committee, investigating recovery boiler explosions for 25 years. He authored many papers and book chapters on chemical recovery. Tom was awarded the TAPPI Gunnar Nicholson Gold Medal in 2001 and inducted to the Paper Industry International Hall of Fame in 2003.

ANDREW K. JONES is a Senior Engineering Fellow at International Paper (IP) where he fosters the implementation on new process innovations. Previously he was the recovery boiler SME. He has been with IP since 1997. Previously he worked for ABB/Combustion Engineering leading an R&D group. He received his PhD from the Institute of Paper Chemistry in 1989. Andy is active in TAPPI, having led the Engineering Division, and was conference chair for the TAPPI PEERS conference. He won the TAPPI Engineering Leadership and Service Award in 2004. He was the conference chair for the ICRC (International Chemical Recovery Conference). Andy was named a TAPPI Fellow in 2016 and he received the Engineering Division Technical Award and Beloit Prize in 2018.

Chapter Authors

W.B.A. (SANDY) SHARP is a consultant specializing in solving corrosion and materials problems in pulp and paper mills and chemical plants. He has master's degrees in Metallurgy and in Corrosion from Cambridge and London Universities in the U.K. and a Ph.D. in Chemistry from the University of Ottawa. Sandy's materials engineering experience includes 28 years leading corrosion control efforts within Westvaco (now WestRock). He has published 62 technical papers in refereed journals. He developed TAPPI's short course on solving corrosion problems and has won TAPPI's Joachim Leadership and Service Award and Engineering Division Award. Sandy is a TAPPI Fellow, a Materials Technology Institute Fellow, and the first NACE (Corrosion Engineers' Association) Fellow from the pulp and paper industry.

DOUGLAS SINGBEIL holds a BSc in Chemistry and an MSc in Metallurgy from the University of British Columbia. He began his career with FPInnovations (formerly Paprican) in 1982 as a research scientist. He has since served in numerous roles, including Corrosion Group Leader, Research Leader for Bioenergy & Corrosion, Research Manager for Process Engineering, and is currently Industrial Sector Leader for BioProducts. Over his career, Doug has addressed corrosion in recovery and biomass boilers, digesters and other process equipment. He has authored/co-authored more than 60 papers. He received awards for several of these, including the 1998 and 2004 ISCPPI Walter Mueller Awards and 2005 PAPTAC Weldon Medal. He was appointed a Fellow of NACE International in 2009.

Recovery Boiler Program Information

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

Contact Information

- AF&PA Website:

  http://www.afandpa.org

- AF&PA Recovery Boiler Program Website:

  https://www.afandpa.org/get-involved/industry-programs#RecoveryBoiler

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Questions?

Thank You!

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