BLACK LIQUOR RECOVERY BOILER
ADVISORY COMMITTEE

MINUTES OF MEETING
Crowne Plaza Hotel/Atlanta Airport
October 14, 15 & 16, 2019

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 Cell: 904-753-4523 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.org
IRS Employer ID/Tax ID (IRS E.I.N.T./T.I.N.) ---- #13-366-5137

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BLRBAC SUBCOMMITTEES

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FUTURE BLRBAC MEETINGS

Spring	**April**	**6, 7 & 8 confirmed**	**2020**
Fall	**October**	**5, 6 & 7 confirmed**	**2020**
Spring	**April**	**5, 6 & 7 tentative**	**2021**
Fall	**October**	**4, 5 & 6 tentative**	**2021**

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

BLRBAC has established its own WEB Site which is: www.blrbac.org

At this WEB site 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 — Print and mail to Barbara Holich with appropriate fees before the posted cut-off date.

CROWNE PLAZA HOTEL — 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 QUESTIONNAIRE — Mail/e-mail completed questionnaires to Barbara Holich. These will be given to the Vice Chairman and he will see that your concerns are brought up and discussed during the Operating Problems session at the next meeting.

Mrs. Barbara Holich
BLRBAC Secretarial Services
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Frank's Cell Phone: 630-269-1005
Barbara's Cell Phone: 630-640-1805
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These are available at the **BLRBAC INTERNET ADDRESS**: **www.blrbac.org**

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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‡This subcommittee did not meet in the fall of 2019

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‡ Denotes attendance at meeting October of 2019

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‡Denotes attendance at the meeting in October of 2019.

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‡**No meeting of this Subcommittee was held in the Fall of 2019.**

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‡Denotes attendance at the meeting in October of 2019

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SAFE FIRING OF BLACK LIQUOR SUBCOMMITTEE

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Registered for the meeting were:

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Pyszynski, George, Skiatook, OK

Acuren
Spires, Lawrence, Evans, GA
Stoute, Johnny, Minden, A

ADK Greentech
Holmer, Johan, Munster, IN
Terpstra, Al, Munster, IN

AF&PA
Grilliot, Wayne, Kettering, OH

AIG Insurance
DeBeer, Thomas, Woodstock, GA
Smith, Andy, Atlanta, GA

AirTek Construction
Baines, Troy, Troy, AL

Allnorth Americas
Crisler, Michael, Alpharetta, GA
Fredrick, Ben, Alpharetta, GA

Alloy Cladding
Carver, Dewayne, Jupiter, FL
Stipe, Carl, Jupiter, FL

Andritz
Bunner, Ben, Alpharetta, GA
Imig, Greg, Alpharetta, GA
Johnson, David, Alpharetta, GA
Lappalainen, Heikki, Varkaus, Finland
LeBel, Mark, Alpharetta, GA
Madison, Tobias, Alpharetta, GA
Miikkulainen, Pasi, Alpharetta, GA
Miller, Jason, Alpharetta, GA

Andritz (Cont.)
Morgan, Preston, Alpharetta, GA
Payne, Zack, Alpharetta, GA
Phillips, John, Alpharetta, GA
Shull, Alec, Alpharetta, GA
Silva, Ageu, Curitiba, Brazil
Sousa, Chris, Roswell, GA

Applied Technical Services
Castle, Bill, Marietta, GA
Floyd, Kevin, Marietta, GA
Hills, Jim, Marietta, GA
Kapperman, Thomas, Marietta, GA
Meers, Ben, Louisville, KY
Pratt, Daniel, Louisville, KY
Rawls, Christopher, Marietta, GA

Arauco
Saldivia, Renzo, Arauco, Chile
Soto, Cristion, Arauco, Chile

AXA XL Risk Consulting
Franks, James, Somerville, TN
Sides, Michael, Ocoee, FL

AZZ
DeFusco, John, Yarmouth, ME
Power, Stacy, St. Petersburg, FL
Tipperreiter, Jim, Suwanee, GA

Babcock & Wilcox
Edwards, Tom, Charlette, NC
Hansen, Kenneth, Madisonville, TN
Jenny, Paul, Atlanta, GA
Jin, Eric, Cambridge, Ont.
Krekeler, Daniel, Barberton, OH
Kulig, John, Barberton, OH
Leibel, Greg, Charlette, NC
Mason, Brad, Lancaster, OH
McKelvey, Kenneth, Atlanta, GA
Nicol, Laura, Barberton, OH

Registered for the meeting were:

Babcock & Wilcox (Cont.)
Osborne, Steve, Barberton, OH
Youssef, Simon, Lancaster, OH

Babcock & Wilcox Consultant
Clay, Dean, Simsboro, LA

Boiler Services & Inspection
Call, Fred, Newry, ME

Buckman Laboratories
Karp, Dan, Skokie, IL

Chicago Protective Apparel
Bass, Mike, McGehee, AR

Clearwater Paper
Bourassa, Brent, Lewiston, ID
Haines, Shana, McGehee, AR
Jameel, Ishaq, Atlanta, GA

Clyde Bergemann
Cover, John, Birmingham, AL
Steine, Dana, Atlanta, GA

CORR Systems
Biggs, James, Bay Minette, AL

Crenshaw Machine Systems
Peed, Brandon, Bay Minette, AL
Reyes, JC, Bay Minette, AL
Wasson, Eric, Charlotte, NC

Day & Zimmermann
Crouse, Ray, Bennettsville, SC

Domtar
Dunn, Jonathan, Plymouth, NC
Rogers, Todd, Macon, GA
Stapleton, David, Riceboro, GA
Worsham, Jesse, Bennettsville, SC

DS Smith
Osborne, Brad, Umatilla, FL

Electron Machine
Cassel, Raymond, Denver, CO
Vossberg, C. A., Umatilla, FL

RMIS
Jackson Dwayne, Sumter, SC

Envirovac
Lewis, John, Greenville, SC
Warren, Lance, Garden City, GA

Fluor Daniel Forest Products
Ham, James, Alpharetta, GA

FM Global
Britt, Francisco, Frisco, TX
Chaudhuri, Neil, Toronto, Ont.
Clement, Andy, Dartmouth, NS
Cooke, Craig, Oconomowoc, WI
Huelsbeck, Kevin, Sherwood, WI
Hume, Everett, Norwood, MA
Labonté, Guy, Montreal, Que.
McAdams, Mark, Johnston, RI
Moberg, Eric, Frisco, TX
Paine, Matthew, Norwood, MA
Roberge, Benjamin, Montreal, Que.

Fossil Power Systems
Donahue, Peter, Dartmouth, NS
Dooks, Rick, Dartmouth, NS
Rezaei, Hooman, Vancouver, BC

FPInnovations Paprican
Harmon, John, Windsor, CT

Registered for the meeting were:

GE Steam Power
Franson, Kyle, Pittsburgh, PA
Philo, Daryl, Windsor, CT
Rushing, Mike, Monticello, MS
Schaker, Yoram, Chattanooga, TN

Gecko Robotics
Baugh, Colton, Pennington, AL
Vatz, David, Pittsburgh, PA

Georgia-Pacific
Browning, John, Atlanta, GA
Burns, Gregory, Mt. Pleasant, SC
Daily, Christopher, Atlanta, GA
Flach, Don, Anacortes, WA
Hardy, Steve, Fort Gibson, OK
Harris, Ricky, Pennington, AL
Harrod, Chad, Atlanta, GA
Hill, Wes, Atlanta, GA
James, Douglas, Pennington, AL
Johnston, Jennifer, Atlanta, GA
Kitan, Yahya, Atlanta, GA
Klein, Craig, Green Bay, WI
Kujanpaa, Olli, Atlanta, GA
Macaulay, Charles, Snoqualmie, WA
Meadows, Thomas, Brunswick, GA
Miller, William K., Brunswick, GA
Morency, Karl, Atlanta, GA
Morrison, Steve, Kingsport, TN
Orender, Robert, Atlanta, GA
Sapp, Kevin, Sugar Hill, GA
Sasser, Garrett, Perdue Hill, AL
Sherlock, Bentley, Atlanta, GA

Global Risk Consultants
Bland, Billy, Morrilton, AR

Green Bay Packaging
Eubanks, Ephraim, Morrilton, AR
Long, Brian, Morrilton, AR
Martuzas, Rich, Morrilton, AR
Sowell, Devin, Amherst, VA

Greif Paper
Comeaux, Julia, St. Francisville, LA

Hood Container of Louisiana
Andrews, John, Raleigh, NC
Johnson, Johnnie, St. Francisville, LA
Terrell, Josh, St. Francisville, LA

Independent Consultant
Conley, Clark, Richmond, VA

Integrated Global Services
Bruce, Mike, Loveland, OH
Fitzgerald, Patrick, Richmond, VA

International Paper
Adams, Wayne, Clinton, NC
Blackard, Vernon, Loveland, OH
Childress, Susan, Loveland, OH
Frazier, David, Loveland, OH
Helms, Steve, Selma, AL
Hendrix, Sam, Loveland, OH
Knowlen, Bruce, Federal Way, WA
Navojosky, Frank, Loveland, OH
Thomas, Chris, Columbus, MS
Torres, Alvaaro, Concepcion, Chile
Waagoner, Jeff,
Weikmann, John, Loveland, OH
Wranosky, Tom, Ticonderoga, NY

International Quality Systems
Cantrell, James, Greenville, SC

Jacobs Engineering
Giarde, Doug, Kirkland, WA

Jansen Combustion
Coyne, Joe, Charleston, SC
La Fond, John, Kirkland, WA

Registered for the meeting were:

Kapstone Paper
George, Nori, Roanoke Rapids, NC
Kaufman, Keith, Lancaster, OH

KEPS SPG
Betts, Herb, Naperville, IL
Pezzi, Mitchell, Lancaster, OH

K-Patents
Hamalainen, Arto, Naperville, IL
Holt, Danny, Pensacola, FL
Pyörälä, Keijo, Naperville, IL

Krafat Powercon
Wass, Greg, Redmond, WA

LDX Solutions
Olavessen, Len, Bartow, FL

LENRO, Inc.
Bringman, Lewis, Baltimore, MD

Lewis B. Bringman LLC
Sweeney, Michael, Upton, MA

Liquid Solids Control
Moskal, Max, Indiana Head Park, IL
Vandenburg, Gordon, Upton, MA

M&M Engineering
Ray, Scott, Amherst, VA

Milhous
Dolezal, Scott, Clarkston, WA

Nalco
Gannon, Jim, Naperville, IL
Harville, Steve, Trenton, GA

National Boiler Service
Jackson, Beverley, Fox Island, WA
Mesamore, Mike, Trenton, GA

Nautilus Loss Control
Boulware, Marion, Catawba. SC
Jackson, Christopher Fox Island, WA

New-Indy Containerboard Catawba
Bucher, Wayne, Vancouver, BC
Goggins, Rob, Catawba. SC

NORAM
Breaux, Bob, Jackson, AL
Foan, Jon, Vancouver, BC

Packaging Corp. of America
Acree, Michael, Monroe, CT
Christensen, Chase, Tomahawk, WI
Hartford, Alex, Tomahawk, WI
Strebeck, Jordan, Jackson, AL
Webb, Trey, Valdosta, GA

Peerless
Forry, Jeffrey, Spring Grove, PA

Pixelle Specialty Solutions
Erickson, Leonard, Somers, CT

Power Specialists Associates
Hutton, Katherine, Somers, CT
Lawton, Roger, Alpharetta, GA
Przybylski, Tom, Somers, CT
Zavadoski, Greg, Somers, CT

Poyry LLC
Doyal, Ashley, Pelham, AL

Registered for the meeting were:

ProcessBarron
Bailey, Chris, Bala Cynwyd, PA

Purolite
Downey, Don, Bala Cynwyd, PA
McGregor, Mike, Kingwood, TX
Migliore, Chase, Bala Cynwyd, PA

Radian Chemicals
Dean, Sam, Jesup, GA

Rayonier Advanced Materials
Spangler, Rick, St. Simons Island, GA

Rick Spangler, Inc.
Roy, Bob, Cumming, GA

RMR Mechanical
Fredrickson, John, Cloquet, MN

Sappi North America
Franco, Daniel, Cali, Columbia

Smurfit Kappa,
Johnson, Michael, Pensacola, FL

Southern Environmental
Sullivan, Sean, Bogarat, GA

Southern Power Sales
Dupree, Lee, Clearwater, FL

Suez
Merritt, Brad, Alpharetta, GA

Swiss Re
Gertin, Scott, Sumter, SC

Thompson Industrial Services
Harry, Todd, Sumter, SC
Lantz, Isaac, Sumter, SC
Ruiz de Molina, Eliadio, Birmingham, AL

TTS, LLC
Ward, Mike, Charlotte, NC

Valmet
Baxter, Rick, Charlotte, NC
Bird, Jennings, Charlotte, NC
Corcoran, Robert, Wisconsin Rapids, WI
Evans, Cody, Charlotte, NC
Henke, Sarah, Charlotte, NC
Morrison, Dan, Charlotte, NC
Nichols, Jody, Charlotte, NC
Reed, Ron, Charlotte, NC
Relangi, Ramana, Charlotte, NC
Weir, Cameron, Charlotte, NC
Yoder, Jeremiah, Charlotte, NC

Verso
Culver, Michael, Duluth, GA
Dennis, Keith, Florence, WI
Frost, Robert, Wilton, ME
Hanneman, Doug, Wisconsin Rapids, WI
Klimowicz, Joseph, Wisconsin Rapids, WI
Larsen, Jessica, Wisconsin Rapids, WI
Mitchell, Robert, Jay, ME

Wellons Power Group
Anderson, Blaine, Panama City, FL
Smith, Craig, Duluth, GA

WestRock
Besen, Samir, Brazil
Bridges, Christian, West Point, VA
Cline, Tracey, Stevenson, AL
Cooper, Wayne, Stevenson, AL

WestRock (Cont.)
Fullington, Scott, Sumner, WA
Gaines, Eddie, Jonesboro, LA
Golson, Cobb, Jacksonville, FL
Hedges, Meville, The Woodlands, TX
Kowalczyk, David, North Charleston, SC
Marshall, Thomas, Roanoke Rapids, NC
Mosley, Brandon, Demopolis, AL
Moye, William, Evadale, TX
Moyer, Scott, Green Clove Springs, FL
Murch, Douglas, Richmond, VA
Reed, Elliott, West Point, VA
Sargent, Caleb, Cottonton, AL
Shirley, Wade, Cottonton, AL
Tarpley, Donn, Demopolis, AL
Tavares, Alarick, Slocust Grove, GA
von Oepen, David, Dempoulis, AL

Wood
Hedges, Meville, Woodlands, TX

Woodland Pulp
Spencer, Ian, Baileyville, ME

Yates
Fuglaar, Chip, Birmingham, AL

Zeeco
Floon, Chris, Broken Arrow, OK
Langstine, Bob, Broken Arrow, OK

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MAIN COMMITTEE MEETING

INTRODUCTION – David von Oepen – Chairman

Good morning. Welcome to the Fall of 2019 Main Committee Meeting. Thank you all for being here today and being away from family and work. We had a good week with excellent membership participation. The Main Committee Meeting is now officially open.

This meeting is being held in strict compliance with BLRBAC's Anti-Trust Policy.

I'll begin with introductions of the Executive Committee. We will introduce ourselves one-by-one:

We are a little shorthanded this meeting since David Slagel has taken another position within another industry; therefore, he has resigned from the Chairman's position. Bentley Sherlock, the Operating Company Representative, and Jimmy Onstead, the Insurance Company Representative, both had work commitments which prevented them from being here this week. I'd like to thank John Phillips for helping out and filling in the Vice-Chairman's position for this meeting.

David von Oepen – Chairman – WestRock
John Phillips – Boiler Representative - Andritz
Everett Hume – Executive Secretary – FM Global
Len Olavessen - Treasurer – Lenro, Inc.

May I have all the members with the red ribbons please stand. Based on the number of member companies represented, we will declare that we have a quorum.

I would also like to recognize that George Bodman is not here this week. George is recovering from some medical issues he had earlier this year. He assured me that he will be back for the spring session. George was greatly missed this week. In fact, George has not missed a BLRBAC meeting since 1971. He is quite an icon around here. So, please keep George and his family in your thoughts and prayers. With that, we will move into Old Business.

OLD BUSINESS

1. **ACCEPTANCE OF THE SPRING 2019 MEETING MINUTES** – David von Oepen

   The Meeting Minutes for the Spring 2019 BLRBAC Session have been posted on the WEB site. I am sure that everybody has taken a look at it. Does anyone have any comments regarding the Spring 2019 Meeting Minutes? Can I get a motion to accept the Minutes? We have a motion. Do I have a Second? Anybody opposed? Alright, the Spring 2019 Meeting Minutes have been approved and accepted as posted. Thank you very much.

   Is there any other Old Business to bring to life? If not, we will move on to New Business.

NEW BUSINESS

2. NEW MEMBERS/REPRESENTTIVE CHANGES REPORT – Everett Hume

NEW REGULAR MEMBERSHIP

New Indy
Rob Goggins had been designated as the Representative
David Clemmons has been designated as the Alternate Representative

NEW ASSOCIATE MEMBERSHIP

Crenshaw Machine Systems (CMS)
James Biggs has been designated as the Associate Representative
JC Reyes has been designated as the Alternate Associate Representative

Fireside Coatings
Bill Hammill has been designated as the Associate Representative
Ed Lloyd has been designated as the Alternate Associate Representative

UKKO Steam Southern
Alvaro Danial Parra has been designated as the Associate Representative
No Alternate Associate Representative has been assigned

NEW CORRESPONDING MEMBERSHIPS – None reported at this time

REGULAR REPRESENTATIVE CHANGES GE Steam Power

John Harmon remains the designated Representative
Ivan Semyanko replaces Lee Dupree as the Alternate Representative

WestRock
Scott Moyer remains the designated Representative
Cobb Golson replaces Scott Fullerton as the Alternate Representative

ASSOCIATE REPRESENTATIVE CHANGES

Sandvik
Marcelo Senatore replaces Katie Day as the designated Associate Representative
Claudemir Ribeiro remains the designated Alternate Associate Representative

Verso Paper
Jason Lewis remains the designated Associate Representative
Robert Frost replaces John Walp as the Alternate Associate Representative

Whertec
Kevin Phillips replaces Bill Hammill as the designated Associate Representative
Mark Smith remains the designated Alternate Associate Representative

2. NEW MEMBERS/REPRESENTTIVE CHANGES REPORT

CORRESPONDING MEMBERSHIP CHANGES – None reported

MEMBERSHIP COMPANY NAME CHANGES

General Electric has acquired Alstom Power which no longer exists as a separate company
John Harmon remains the designated Representative
Ivan Semyanko remains the designated Alternate Representative

Babcock Power was formerly known as Boiler Tube Company of America
Suzette Puski remains the designated Associate Representative
Derrick Keller remains the designated Alternate Associate Representative

Hood Container of Louisiana previously known as KPAQ
Carl Terrell remains the designated Representative
Van Strahan remains the designated Alternate Representative

Pixelle Specialty Solutions previously known as Glatfelter per e-mail from Jeffrey Forry
Jeffrey Forry is the designated Associate Representative
Kyle Schneider is the designated Alternate Associate Representative

WestRock was previously known as KapStone
Scott Moyer is the designated Representative
Cobb Golson is the designated Alternate Representative

MEMBER COMPANY ACQUISITION

MEMBERSHIP COMPANY STATUS CHANGES – None at this time.

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

3. EXECUTIVE COMMITTEE REPORT – Everett Hume - Secretary

I want to thank all of you for bearing with us on our registration issues in the pick-up suite and handling of some of the documentations. As it stood, I think we pulled it off. We managed to cram about three days of registrations into four hours. I think it all worked out okay in the end. I'll give the exact numbers latter on. I was very grateful of all of your patience as we got through the making of all the badges, etc., for a large number of At Door Registrations. We did not have many issues with the people who used the Advance Registrations. Maybe we are making progress on that point.

4. TREASURER'S REPORT – Len Olavessen

Good Morning. The basic shape of BLRBAC financially is really good. Our checking balance as of this morning is $73,322.59. Anticipated expenses for the meeting are $29,500.00. Again, we will have an estimated checking balance once I receive all the invoices for the meeting. It should be approximately $43 822.59. So, we are in good shape.

The one thing that we had pending was on-line credit cards for Advance Registrations. We were unable to complete it in time for this meeting. We had a big discussion about that during the Executive Committee Meeting last night. We are going to try very hard to get this done prior to the Spring 2020 meeting. We are going to get it done; it is just a question of dotting the eyes and crossing the tees. We want to make sure that everything is working correctly.

The meeting statistics for this meeting we had 183 Advance Registrations and 63 At Door Registrations which is an all-time high. This equals a total of 246 total registrations. We had 140 Regular member attendees; 98 Associate member attendees; and eight off-shore attendees. We had representation of off-shore attendees from places like Chile, Sweden and Japan. So, we are still a global organization.

The last thing I want to mention is that I'm going to retire after the Fall 2020 meeting. So, BLRBAC will need a new Treasurer as a result. Anyone interested in volunteering for this position is encouraged to contact me or anyone else on the Executive Committee. The Treasurer's position is an appointed post to the Executive Committee. You would be responsible for managing the meeting, maintaining the bills, signing any contracts for the meetings and preparing and submitting the tax documentations. The tax documentation is very straight forward. We are a cash in and cash out organization. We don't have any weird accounting procedures. So, it is very simple. Again, I am going to retire in the fall of 2002, so we need somebody to volunteer to get a little experience before they take over the job. Please consider that and let us know. Any questions? (None.)

5. SECRETARY'S REPORT –Everett Hume

The Executive Committee met yesterday in "closed" session. We discussed the budget and we are in good shape financially. We had a few other issues to discuss. One of those was pursuing actively accepting Advance Registrations via credit cards. We also discussed some of the older materials that BLRBAC has over its history; the storage of that material and what we plan to do with them; whether we would digitize them or whatever we decide. We are looking at the cost of digitizing them. It is quite high; so, there will be more to come on that subject. We, also, have acceptance of Materials & Welding bulletin and it's ready to vote on. The subject matter was on copper induced cracking. This was introduced by Laura Nicol yesterday during the Operating Problems "open" session. The bulletin had been previously posted on BLRBAC's WEB site. We have received no comments on it.

With that, may I have all the voting members please stand again so that we may vote on the new bulletin. Those opposed to the new bulletin that was reviewed yesterday, say "nay"; those in favor say "aye". The Welding Bulleting has been accepted.

COMMENT by David von Oepen: The first bulletin we are actually issuing will be posted on the WEB site under a new category; under Documents. It will be listed as Bulletin 2.

5. SECRETARY'S REPORT – (Cont.)

SECRETARIAL SERVICES REPORT – Barbara Holich

Things always change! Therefore, I will have to learn new procedures just like everyone else. But for those who will continue to submit their completed Advance Registration Forms via U.S. mail, the form should be mailed with your personal or company check. Do not request a signature if mailing via UPS or FedEx as we may not be home to receive this package and your registration may be returned to your company as "undeliverable". It has happened in the past. Advance Registrations are the only ones guaranteed to receive a complete meeting packet.

Also, if you are going to attend BLRBAC, get your registration in early and have the Registration Form filled out completely because this form is the only data on who you are, your city/state and other pertinent information, such as, a working e-mail address, which goes into the BLRBAC database. When e-mail addresses come back to me at least two times as "undeliverable" that address is removed from the BLRBAC database. For every meeting, that is every six months, I receive approximately 90 to 100 e-mails that are undeliverable for one reason or another. Somebody could be retired, passed away, left their company, just changed their e-mail address, mailbox is full, or misinterpretation of what was written on a new application for membership. Please be very careful with handwritten Registration Forms.

Late comers who register as At Door, but mail forms and payment to me after the cut-off date, are harder to register than 50 or 60 who get their registration to me prior to the posted cut-off date. When I put a sheet of eight badges in the computer for one name, the other seven blank badges are wasted. I can't use that page again because my printer will lock-up or the badge page will get stuck in the printer due to perforated paper.

Just a reminder to all Subcommittee Chairmen and other attendees to the BLRBAC Main Committee meeting who are responsible for giving a verbal report, please submit a copy of your report to me (fhholich@aol.com) as soon as possible after either the spring or fall meetings. This report should be a Word document, 12 pitch, Times Roman type. This would help greatly in getting the Meeting Minutes prepared and on-line as soon as possible after each session.

6. SUBCOMMITTEE REPORTS

6.1 AUXILIARY FUEL REPORT – Bruce Knowlen

This subcommittee did not meet in the fall of 2019, but they will have an "open" session in the spring.

6.2 ESP SUBCOMMITTEE REPORT – John Andrews

(See ***Appendix I*** – Incident List and ***Appendix II*** – PowerPoint Slides)

The ESP Subcommittee met in closed session on Monday October 14, 2019 with 11 members represented and one guest. Dave Slagel resigned from the committee and will not be replaced to get back to the usual 13 members on the Subcommittee. The Subcommittee met in open session on Tuesday morning October 16th, 2019 with 11 members represented and about 190 guests.

During the open session, the Subcommittee reviewed 20 incident reports from North America and two (2) International Incidents. Of the 20 incidents, there were no Smelt Water Explosions reported and no Dissolving Tank Explosions reported during this session. Five (5) of the reported leaks were classified as critical incidents and 14 were non-critical incidents. There was one ESP with no leak reported. An ESP was performed in 7 of the incidents including 1 of the 2 critical incidents that should have been ESP'd. Two of the critical leaks were identified during an outage while performing a hydrostatic pressure test and a third was found during a hydrostatic test after repairing a superheater leak.

The basic definitions of Explosions, Critical Incidents and Non-Critical Incidents were revised by the Executive Committee in September 1999. They are summarized as follows:

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

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

Non-Critical Incidents: Those cases that did not admit water to the boiler cavity defined above.

Appendix A contains a summary of the incidents reviewed during the meeting.

Incident Locations
The incident locations are summarized as follows:

- 8 – Economizer
- 6 – Superheater
- 1 – Screen
- 2 – Upper Furnace
- 2 – Lower Furnace
- 1 – Lower Vestibule
- 1 – ESP No Leak

The general locations of the leaks for boilers in North America are shown in Figure 1, which displays a typical boiler, not representing any particular style or model. The yellow circles are the non-critical incidents and the red circles indicate the location of the critical incidents.

Two of the critical leaks are shown in the economizer section where it would be possible for water to get into the furnace through the generating bank since there are no solid baffles to stop the water spray. The blue dot by the spout represents the ESP with no leak that was due to suspected water coming out of furnace through the spout. It was determined later that the indication was due to clear smelt.

The attached bar graphs (Figures 2 – 7) show the number of leaks reported by boiler location over the past 14 years in order to see if there is a trend in leaks occurring in a specific area. There does not appear to be any significant trend from any area during that time.

Incidents by Boiler Type

The incidents by the number of drums and the back-end arrangement were reviewed. There were 2 incidents reported in single drum units and 18 incidents reported in two drum units.

Three (5) of the reported incidents were in boilers with Cascade Evaporators and 2 of the units had a Cyclone Evaporator. Thirteen (13) of the incidents were from low odor units with extended economizers.

Leak Cause

The cause of the leak is a determination by the Subcommittee based on information in the reports and should not be considered the root cause of the incident. The breakdown is listed below:

- 6 –Fatigue either Mechanical or Thermal
- 3 - Weld Failure
- 2 - Erosion or Corrosion Thinning
- 5 - Stress Assisted Corrosion or Stress Corrosion Cracking
- 2 – Overheat
- 1 – Mechanical Damage

How Discovered

Boiler Walkdown continues to be the major way leaks are discovered showing that operators maintain their diligence for leak detection. Thirteen (13) of the leaks (65%) were initially indicated by operators during walkdowns. Three leaks were detected by Control Room Instrumentation observations and three leaks were discovered during Hydrostatic Testing. One of the incidents reported that the boiler trip was the initial indication of the leak. None of the leaks were initially indicated by the leak detection system but one report stated the leak detection system confirmed the presence of the leak during continued investigation.

Leak detection systems were reported to be installed on units in 13 of the incidents (65%).

Time to Initiate the ESP

The time to initiate the ESP system after the initial indication of the leak ranged from less than 1 min to 2 hours. The median time from the incident reports that provided information on the timing was 15 min which is faster than in recent years.

Incident Review

Figure 8 shows the Critical Incidents reported each year. There were 5 reported this meeting which brings the total for the year to 12. Figure 9 shows the history of Recovery Boiler Explosions showing the last reported smelt water explosion in 2017.

Figure 10 shows the history of reported dissolving tank explosions with the last one reported in 2017. Following the recommendations from Section 10 of the Safe Firing of Black Liquor document would prevent many of the reported dissolving tank incidents that have occurred in the past and maybe there has been some improvement in smelt spout and dissolving tank operation as a result of these efforts.

Figure 11 the five-year rolling average which is now at 0.2 indicating only one explosion in the last 5 years.

Figure 12 is a plot of explosion history per 100-boiler operating years. This is a statistical summary of the experience across the industry. The smelt water explosion experience has dropped slightly to 0.46 explosions per 100 boiler operating years due to the explosions in the last couple of years, but the total explosions, which includes all boiler explosions and dissolving tank explosions, decreased slightly to .84 explosions per 100 boiler years. The factor is calculated by a summation of all reported explosions since 1948 divided by a summation of the number of boilers reported in service each year during the same period. We have accumulated over 19,010 total recovery boiler operating years in the BLRBAC database for North America and have recorded 88 smelt water explosions with resulting damage to the boiler. We all need to continue to keep those trends going down.

List of Operating Boilers

The BLRBAC Boilers in Service Database currently has 182 active recovery boilers listed, 142 in the US and 40 in Canada with a decrease of one boiler in the US. In the US, the average age is 40.9 years and the oldest is 67 years. The average age in Canada is 41.3 years and the oldest boiler is 72 years which is a 1947 CE unit at Three Rivers, PQ.

The list is available on the BLRBAC web site. We urge you to look over the list and if there are any changes or corrections, contact Dean Clay at **dclay@bsimail.com**.

Learnings

There are several learnings and suggestions that come from review of the incident reports that may be of value for the industry. This is not a complete list but a few items that stood out during the incident review.

- Shatter jets should remain in service while the boiler is on aux fuel after burning out the bed in case boiler deposits that fall from the upper furnace melt and discharge through the spouts.
- Molten salt cake from boiler deposits has a different appearance than normal smelt and may look clear or light blue rather than the normal red smelt color.
- Steam cooled wall panels should be drained of condensate before and during startup to minimize stresses from differential temperatures due to condensate blocking steam flow through the panel.
- Extra care is needed to clear superheater tubes after boilers are bottled up for long periods while maintaining pressure because condensed steam may fill the superheater elements completely.
- Mills with hot air dryers or pulp dryers that have copper heating coils should be mindful of possible copper deposits in boilers.
- Deposit Weight Density (DWD) readings are nice but how do you know that you found the worst tube? Deposits tend to be very localized
- Significant changes in boiler loading and firing patterns can alter the high heat transfer zones and cause accelerated corrosion and localized internal deposition in different areas of the boiler.
  - May need to increase the elevation of protection from composite tubes by applying stainless weld overlay or replacement with composite tubes.
- Flowing liquid smelt on studded carbon steel tubes with no frozen smelt layer may result in accelerated wastage of studs and tubes
- Smelt flowing over refractory and on to tubes may cause localized corrosion – the "waterfall effect". Maintaining a bed is very important to keep these tubes protected.
- "Sootblowers do two things in a recovery boiler – they clean it and destroy it" - Frank Navojosky
  - Repair leaking poppet valves to prevent condensate buildup and dripping in the furnace
  - Maintain proper condensate drainage to prevent excessive moisture in steam when blowers start to run
  - Check blower pressures regularly to make sure they are high enough for good cleaning but not too high to cause erosion and tube fatigue
  - Stay away from angled nozzles that cause excessive movement in platens and tubes resulting in fatigue failures

ESP Guideline Changes

The revised ESP Document that combined the ESP Guidelines and the Post ESP Guidelines was approved last Fall and is posted on the BLRBAC Website.

The Subcommittee has recommended a further revision to clarify that the bypass of the motor protection circuits only includes those internal to the valve actuator and does not include breaker protection circuits.

6. SUBCOMMITTEE REPORTS – (Cont.)
6.2 ESP SUBCOMMITTEE REPORT – (Cont.)

> "The torque limits, and any other device internal to the actuator, designed to protect the motor or valve, should not be included in the motor control open circuit for the rapid drain valves so that the motor will exert maximum effort to open the valves until the open position limit is reached. The torque limits may be used in the valve test mode if desired."

This change was approved by the Executive Committee.

We are discussing further revisions to the document recommending that mills create boiler side view diagram that clearly indicates sections of the boiler where leaks would be potential Critical Incidents and post the diagram in the control room for operator reference.

We are also discussing if it appropriate to recommend bypassing the torque limits and selector switches of other motorized valves that are part of ESP – not just the Rapid Drain Valves. There is a concern that not having any limitation on closing a motorized valve may result in catastrophic failure if the close limit switch does not function.

Incident Questionnaires

The Incident questionnaires are key to the operation of the ESP Subcommittee. We appreciate the good job that the mills have done in filling them out for their incidents.

Dean has updated the questionnaire to be more interactive and should be easier to complete. There has been a problem with the Questionnaire form that is available on the web side so to get the latest Questionnaire send an email to Dean Clay at dclay@bsimail.com and he will send you the latest form that is fully functional. When you have completed the report, send the file to Dean Clay at **dclay@bsimail.com**.

Please remember that when you are adding pictures into the questionnaire document, it is best that you import the picture as .JPG files rather than cut and paste to minimize the resulting file size.

Karl Morency has announced his retirement for early next year and this will be his last ESP Subcommittee Meeting. Thank you, Karl, for your many years of service and valuable contribution to BLRBAC and the ESP Subcommittee! We also welcome Greg Burns of GP who will be Karl's replacement on the Subcommittee.

Figure 1

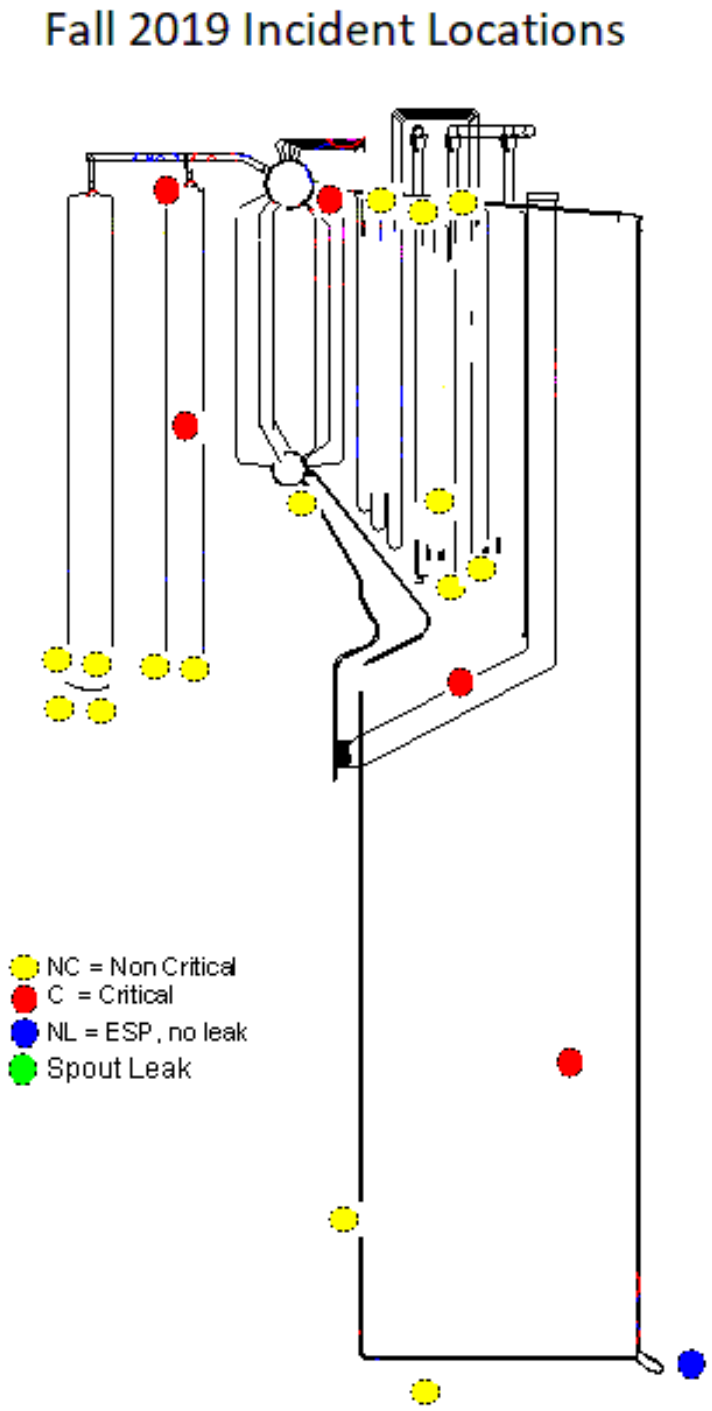

Fall 2019 Incident Locations
NC = Non Critical
C = Critical
NL = ESP, no leak
Spout Leak

Figure 2

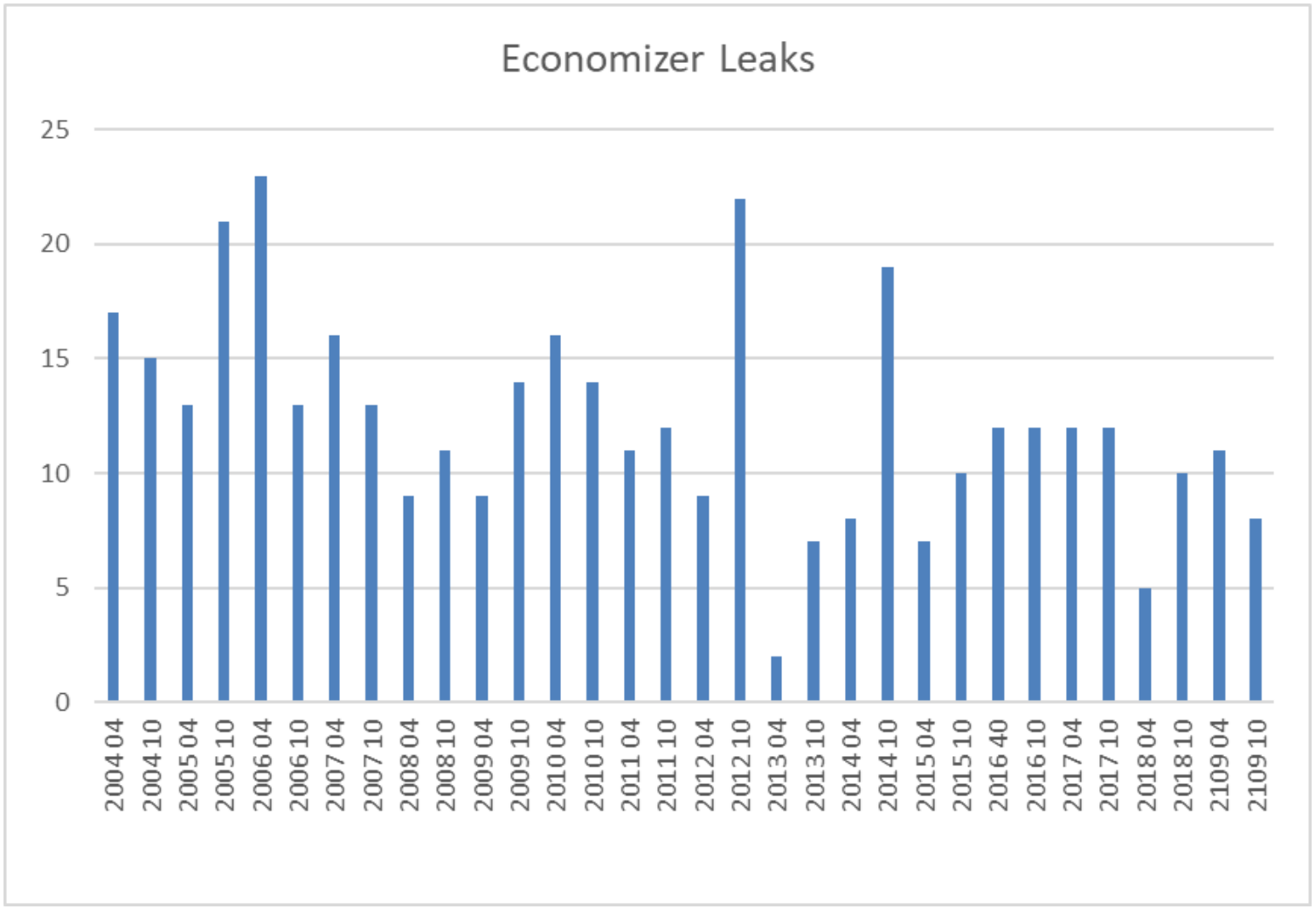
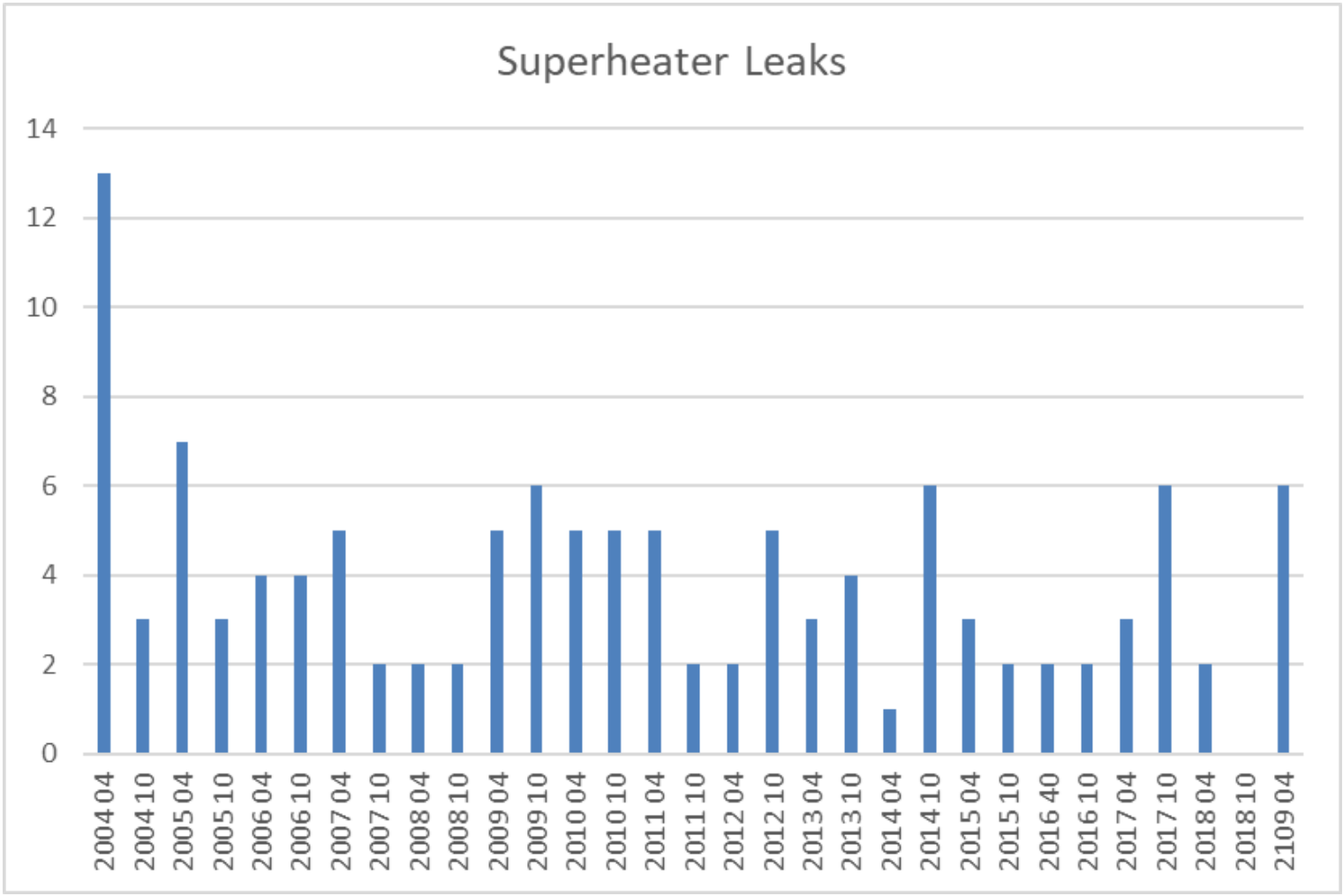

Economizer Leaks
25
20
15
10
5
0
2004 04
2004 10
2005 04
2005 10
2006 04
2006 10
2007 04
2007 10
2008 04
2008 10
2009 04
2009 10
2010 04
2010 10
2011 04
2011 10
2012 04
2012 10
2013 04
2013 10
2014 04
2014 10
2015 04
2015 10
2016 40
2016 10
2017 04
2017 10
2018 04
2018 10
2109 04
2109 10

Figure 3


Superheater Leaks
14
12
10
8
6
4
2
0
2004 04
2004 10
2005 04
2005 10
2006 04
2006 10
2007 04
2007 10
2008 04
2008 10
2009 04
2009 10
2010 04
2010 10
2011 04
2011 10
2012 04
2012 10
2013 04
2013 10
2014 04
2014 10
2015 04
2015 10
2016 40
2016 10
2017 04
2017 10
2018 04
2018 10
2109 04

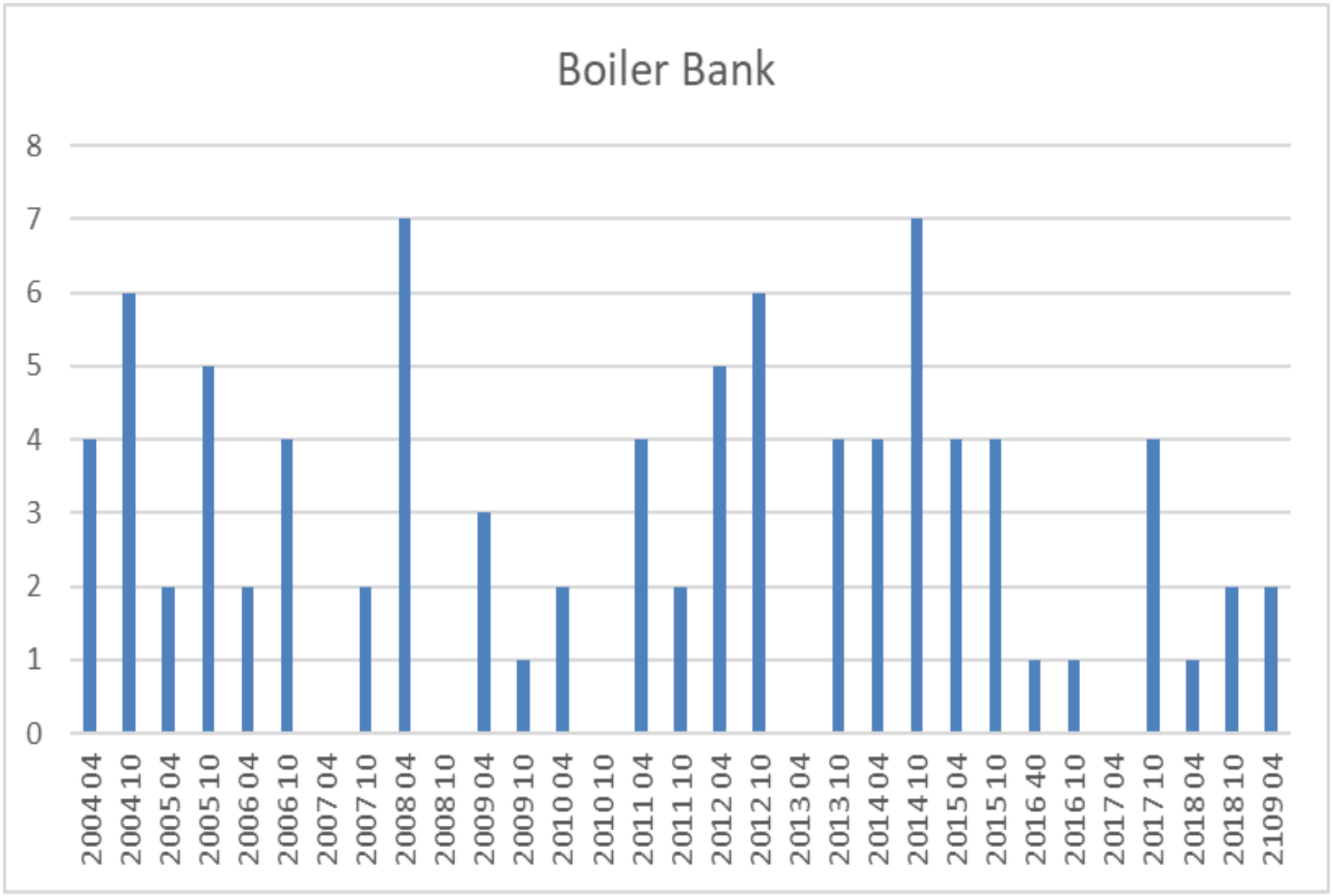

Boiler Bank
8
7
6
5
4
3
2
1
0
2004 04
2004 10
2005 04
2005 10
2006 04
2006 10
2007 04
2007 10
2008 04
2008 10
2009 04
2009 10
2010 04
2010 10
2011 04
2011 10
2012 04
2012 10
2013 04
2013 10
2014 04
2014 10
2015 04
2015 10
2016 40
2016 10
2017 04
2017 10
2018 04
2018 10
2109 04

Figure 4

Figure 5

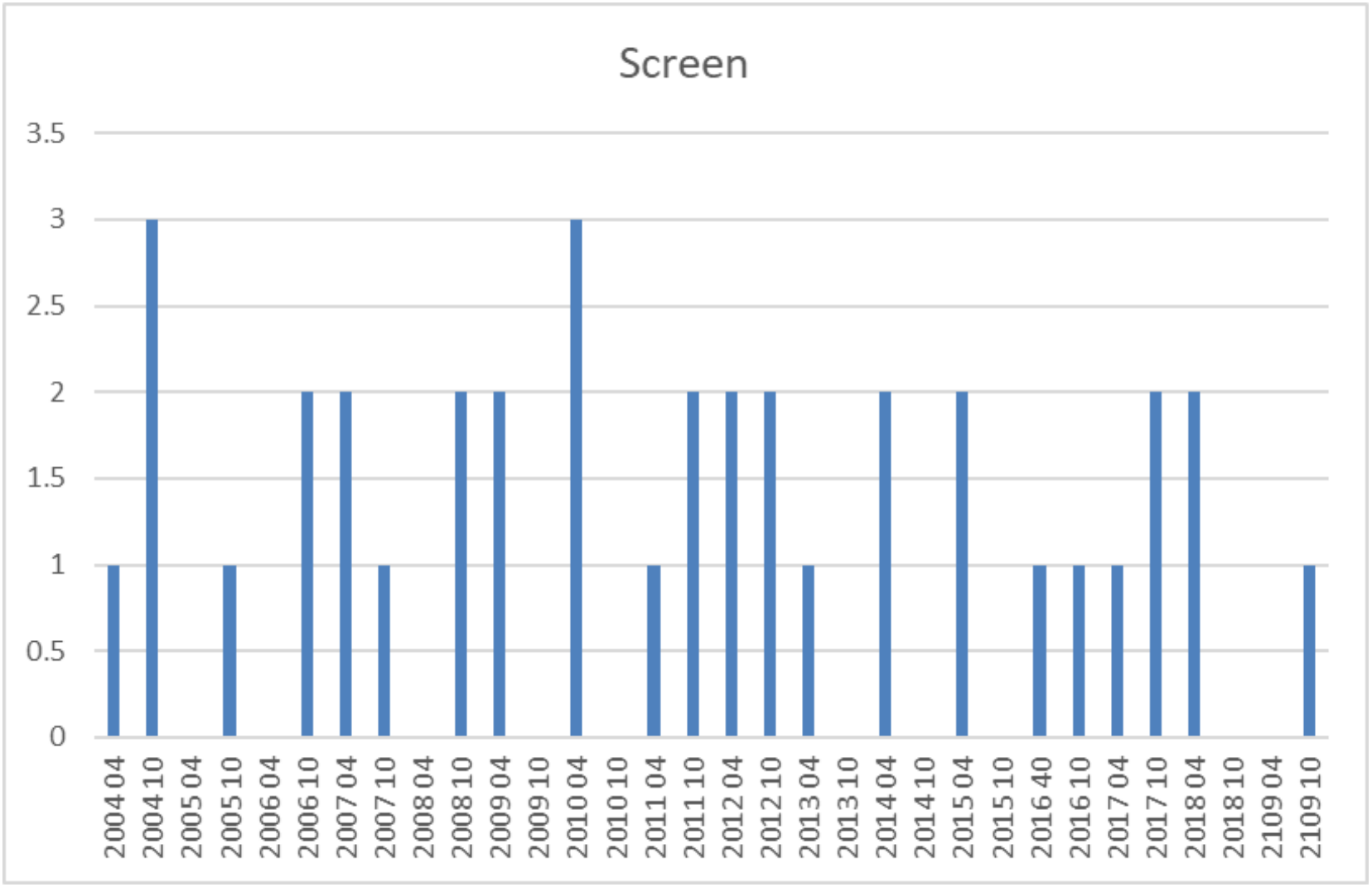
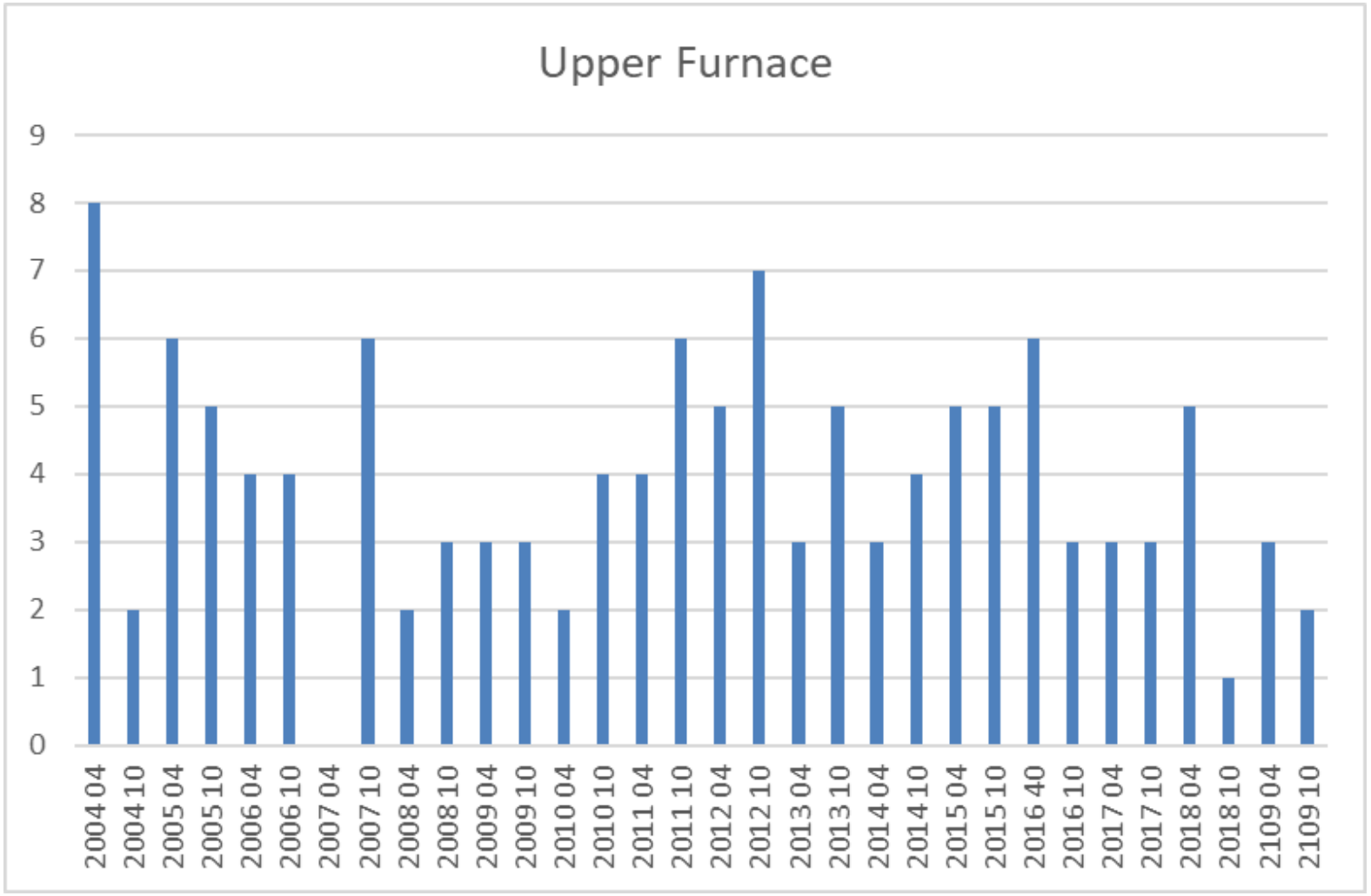

Screen
3.5
3
2.5
2
1.5
1
0.5
0
2004 04
2004 10
2005 04
2005 10
2006 04
2006 10
2007 04
2007 10
2008 04
2008 10
2009 04
2009 10
2010 04
2010 10
2011 04
2011 10
2012 04
2012 10
2013 04
2013 10
2014 04
2014 10
2015 04
2015 10
2016 40
2016 10
2017 04
2017 10
2018 04
2018 10
2109 04
2109 10

Figure 6


Upper Furnace
9
8
7
6
5
4
3
2
1
0
2004 04
2004 10
2005 04
2005 10
2006 04
2006 10
2007 04
2007 10
2008 04
2008 10
2009 04
2009 10
2010 04
2010 10
2011 04
2011 10
2012 04
2012 10
2013 04
2013 10
2014 04
2014 10
2015 04
2015 10
2016 40
2016 10
2017 04
2017 10
2018 04
2018 10
2109 04
2109 10

Figures 7

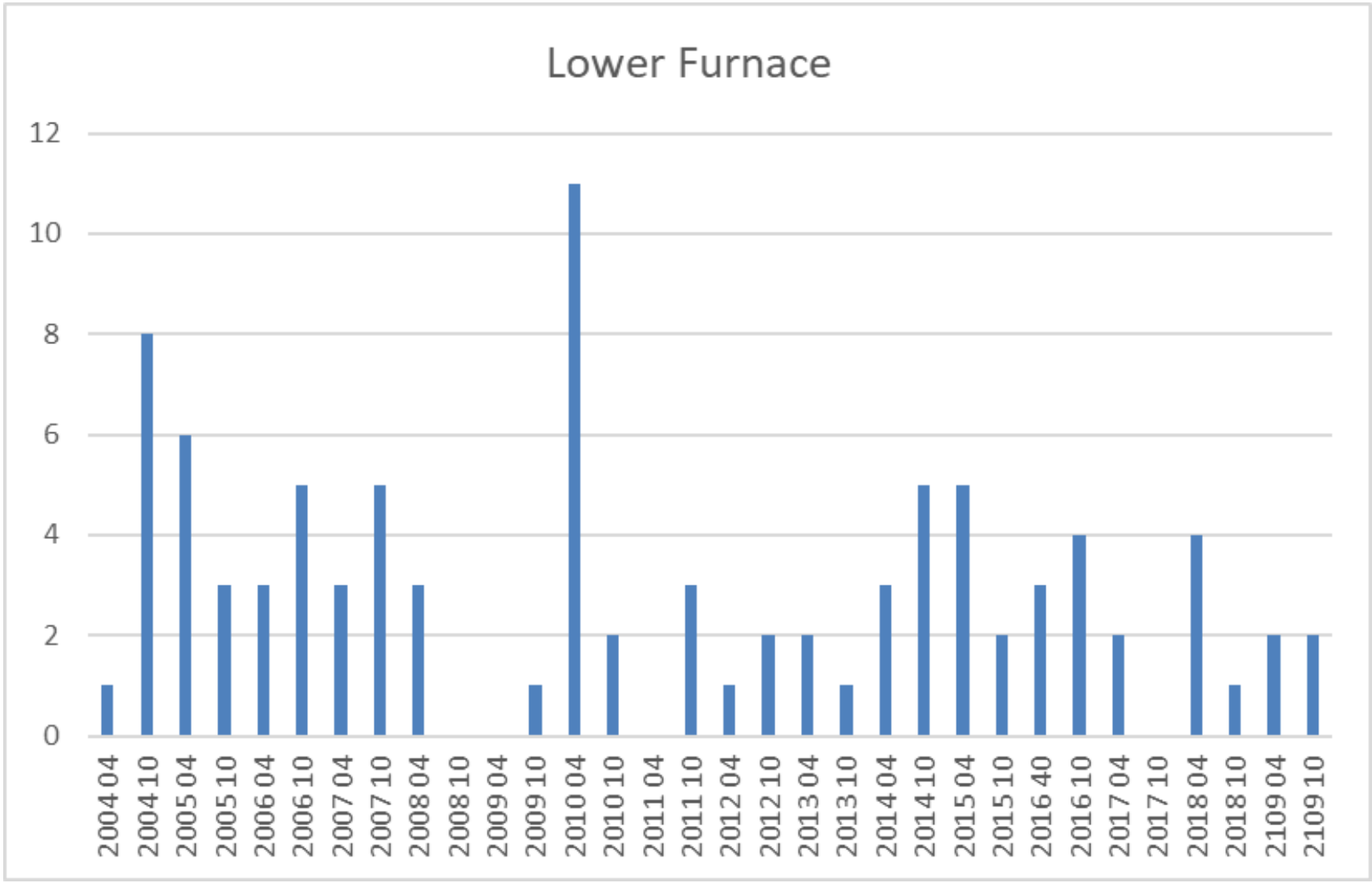

Lower Furnace
12
10
8
6
4
2
0
2004 04
2004 10
2005 04
2005 10
2006 04
2006 10
2007 04
2007 10
2008 04
2008 10
2009 04
2009 10
2010 04
2010 10
2011 04
2011 10
2012 04
2012 10
2013 04
2013 10
2014 04
2014 10
2015 04
2015 10
2016 40
2016 10
2017 04
2017 10
2018 04
2018 10
2109 04
2109 10

Figure 8
(Critical Exposure Classification Began in 1965, Changed to Critical Incident in 1999)

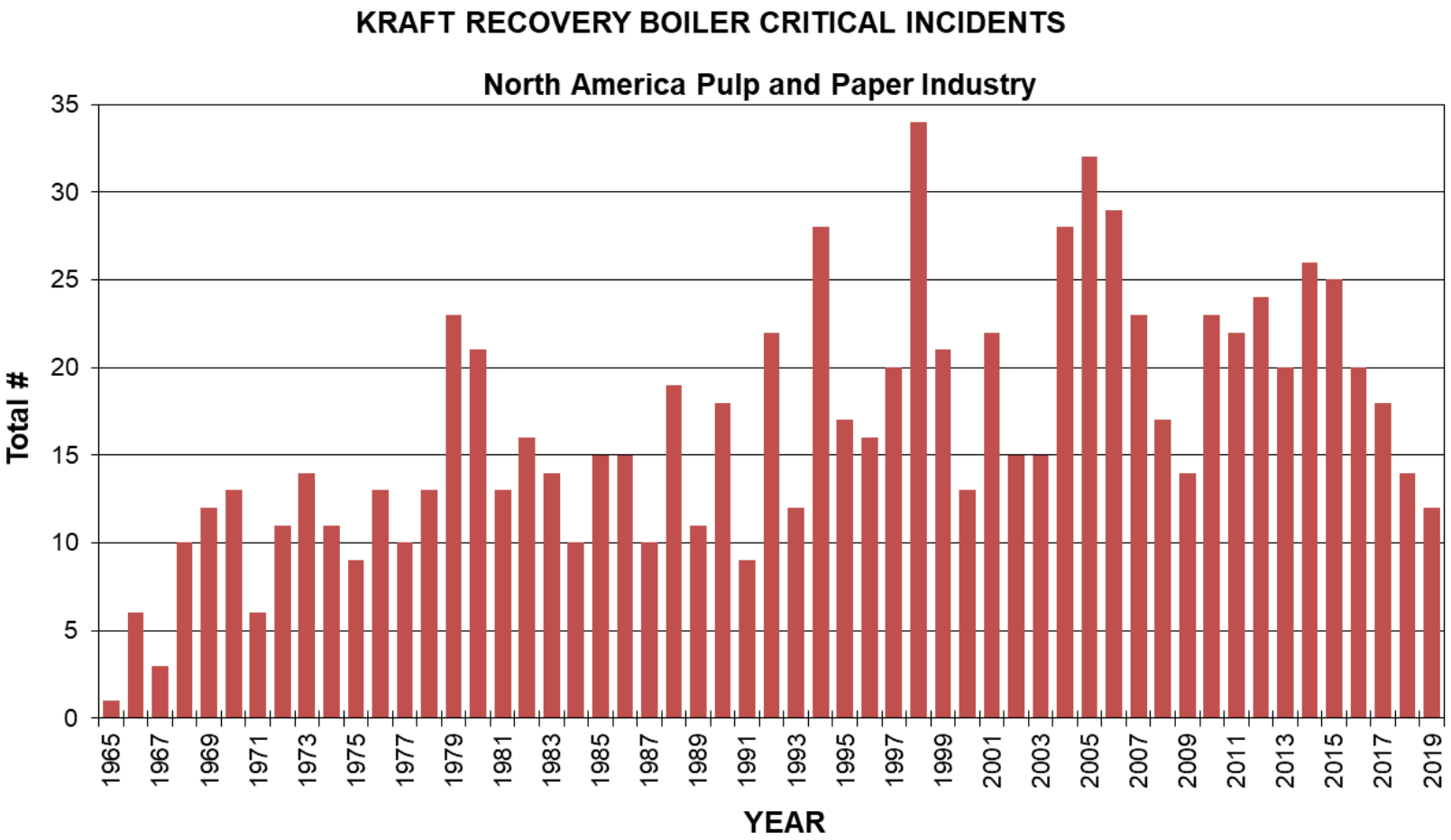
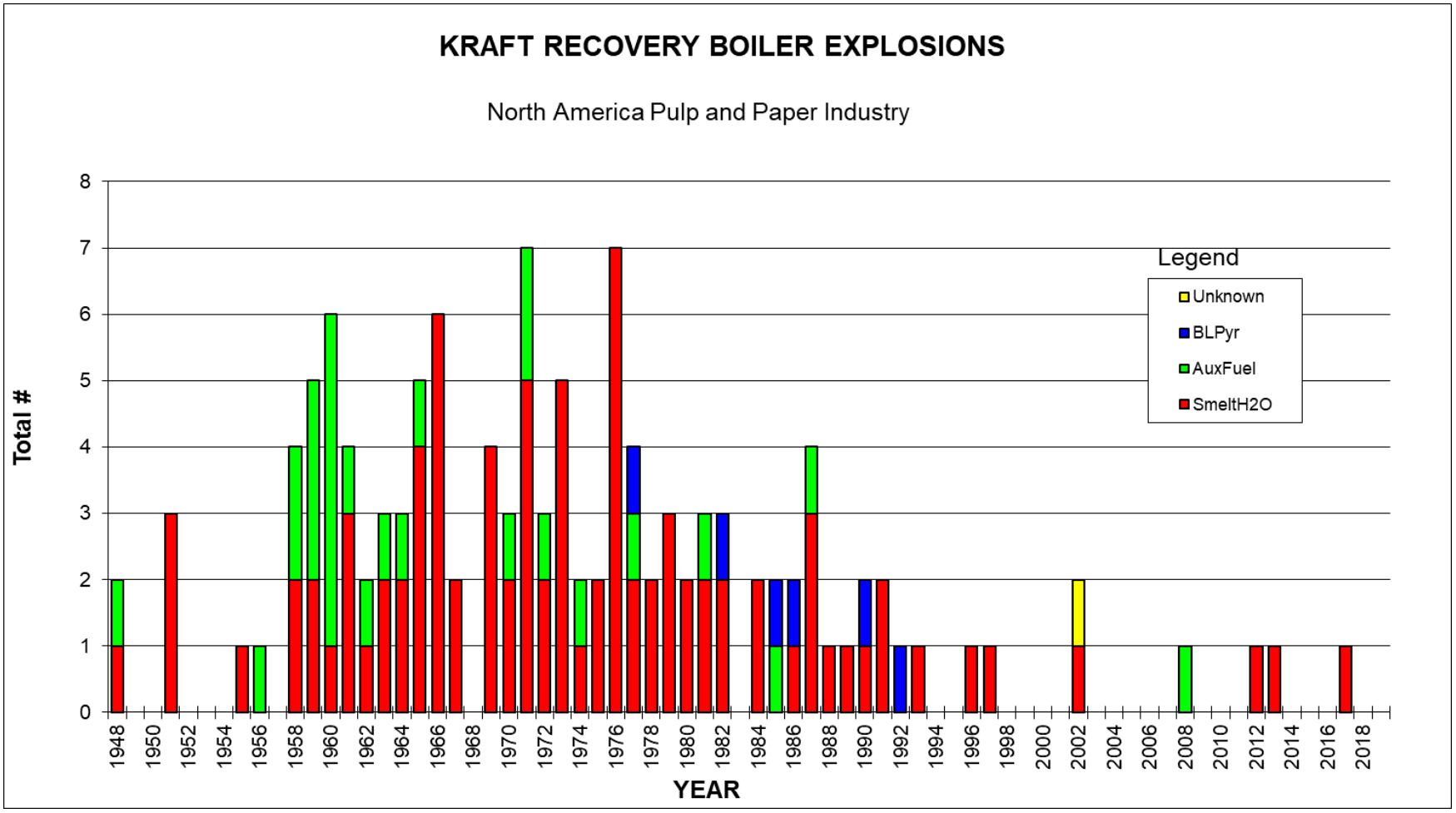


Figure 9


KRAFT RECOVERY BOILER EXPLOSIONS
North America Pulp and Paper Industry
Total #
YEAR
Legend
Unknown
BLPyr
AuxFuel
SmeltH2O
0
1
2
3
4
5
6
7
8
1948
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018

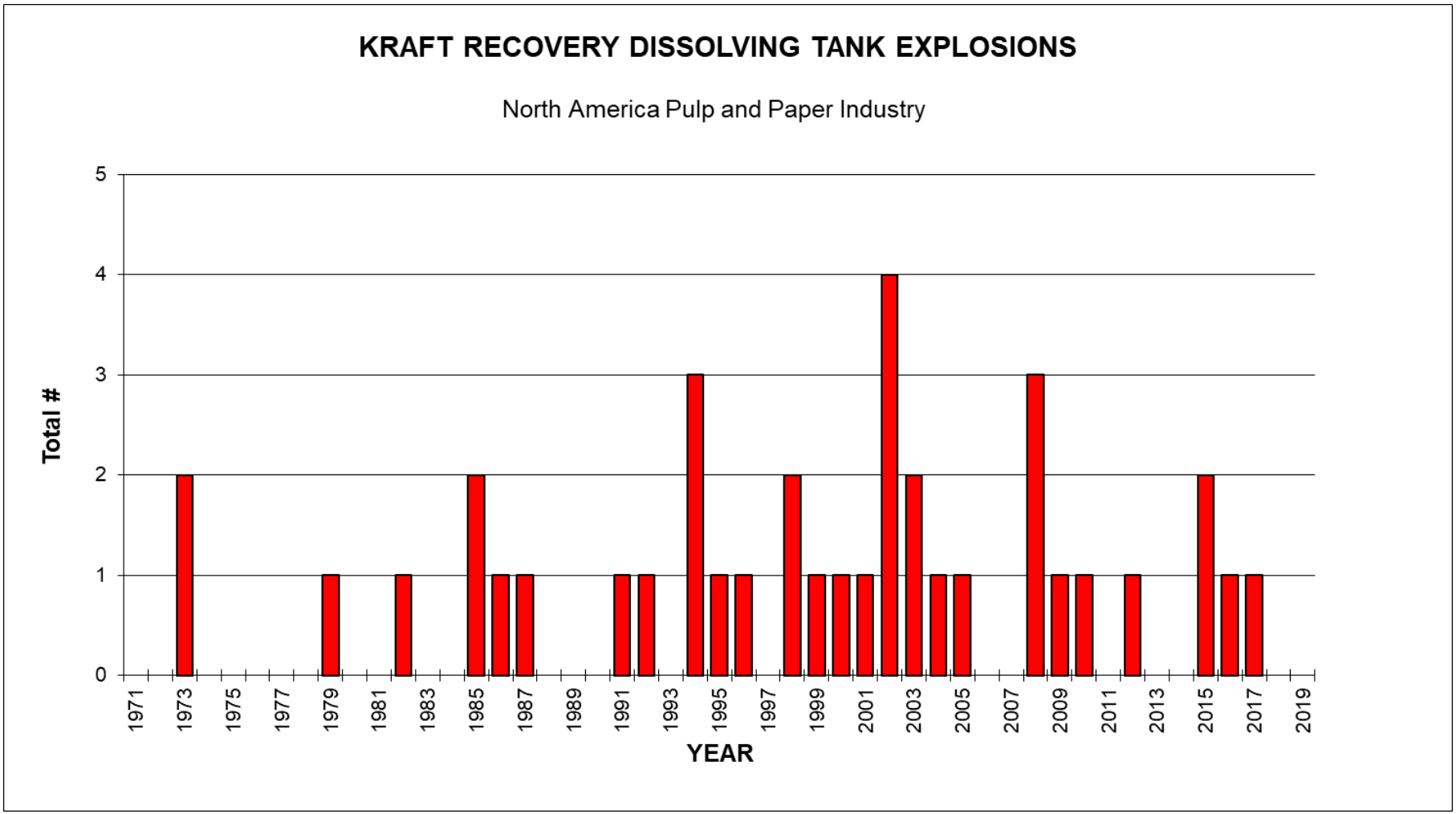
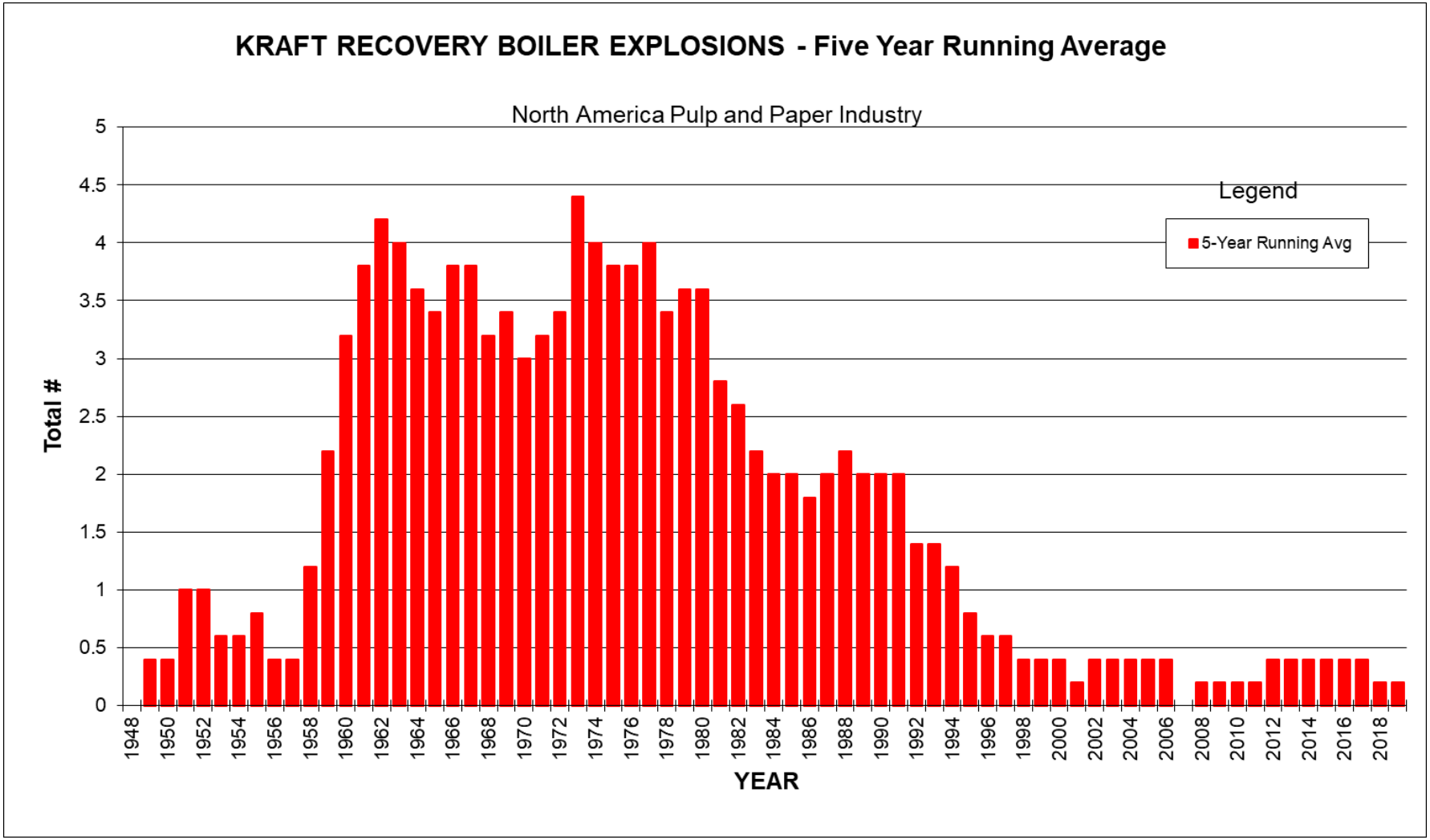

KRAFT RECOVERY DISSOLVING TANK EXPLOSIONS
North America Pulp and Paper Industry
Total #
0
1
2
3
4
5
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
YEAR

Figure 10

Figure 11


KRAFT RECOVERY BOILER EXPLOSIONS - Five Year Running Average
North America Pulp and Paper Industry
Legend
5-Year Running Avg
Total #
YEAR
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
1948
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018

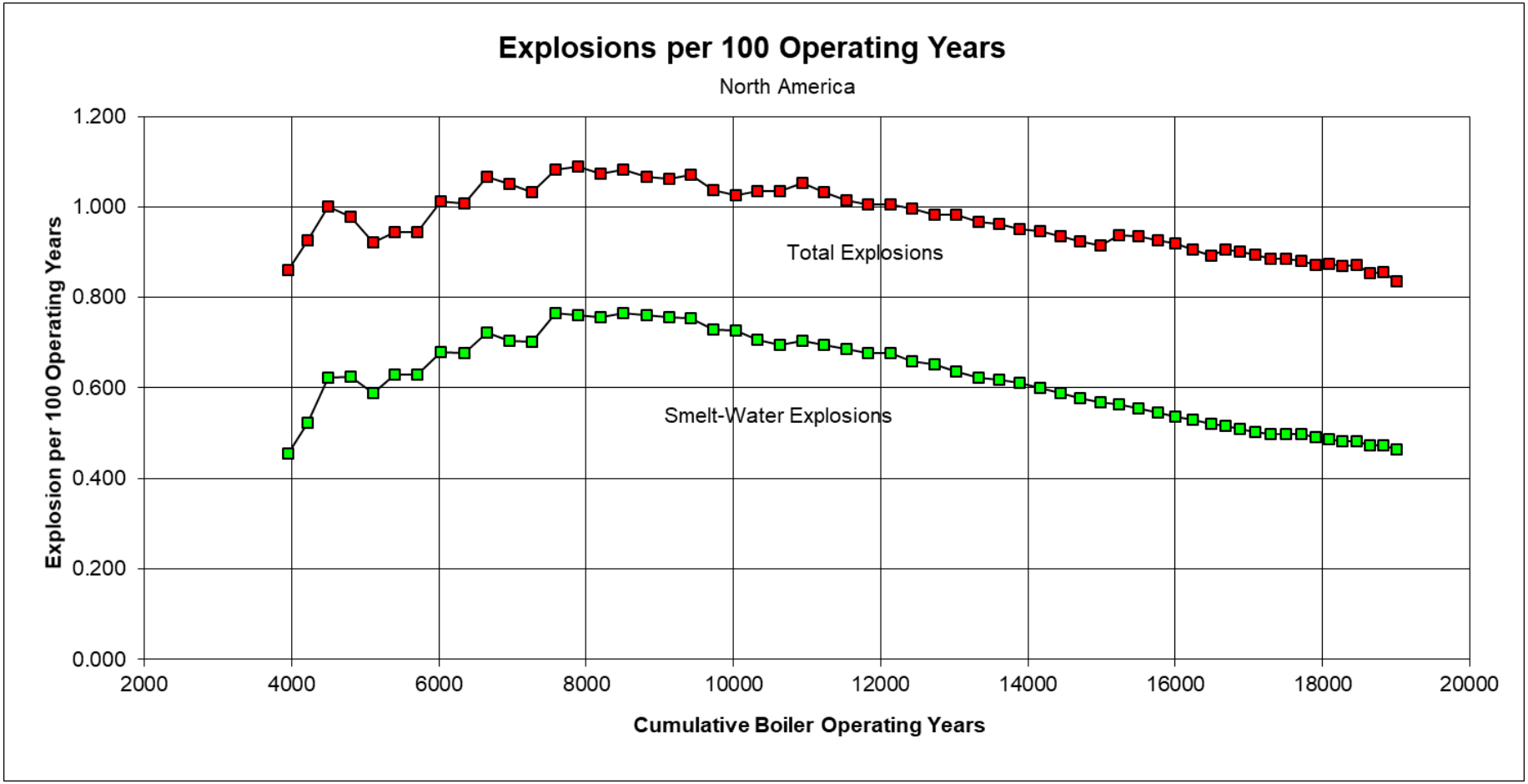

Explosions per 100 Operating Years
North America
Explosion per 100 Operating Years
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Total Explosions
Smelt-Water Explosions
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Cumulative Boiler Operating Years

Figure 12

6. SUBCOMMITTEE REPORTS – (Cont.)

6.3 FIRE PROTECTION IN DIRECT CONTACT EVAPORATORS REPORT – Craig Cooke

Good Morning, the Fire Protection in Direct Contact Evaporators Subcommittee meets in Spring and did not meet during this session.

I have been coming to BLRBAC for well over 30 years. I have learned so much from attending these meetings and feel this organization has had such a positive influence and impact on Recovery Boiler Safety and Protection.

I am retiring after 46 years with FM Global. The Fire Protection in Direct Contact Evaporators Subcommittee is being left in extremely capable hands. Stephen Cox of International Paper has stepped forward to assume the Chair and Kevin Huelsbeck of FM Global will stay on as Vice Chair.

AND it is important to note: The reason I am retiring is NOT because they quit serving Fried Okra at the Tuesday Lunch!!

Please carry on the Good Battles and I will go fishing with my grandchildren. Thanks!

The only loose ends of importance:

- Some minor guideline additions related to keeping fire protection nozzles unplugged were sent to the Executive Committee and will likely be posted for membership review. Hope to vote on these minor changes in April.
- There was a fire incident and it has been distributed to our membership for review. I provided some of my initial thoughts. Our guides appear to be supported by the incident. There are a few questions the incident raises and some follow-up may be needed with the mill. It is an IP incident so I am sure Stephen will be able to help facilitate that additional communication.
- No changes to our membership, so the current membership list continues to be valid. (Just drop me from the membership; show Stephen as Chair)

It has been an awesome experience being involved with BLRBAC! I will miss you all.

6.4 INSTRUMENTATION REPORT – John Browning reported for Dave Avery

Morning Session:
Attendance: - 23 attendees, 10 Members and 13 Guests
-Read and reviewed Anti-trust statement.
-Read and reviewed the Spring 2019 minutes, it was motioned to accept and seconded to approved.

Old business:

- Drum level: We have a team consisting of Bruce Knowlen, John Cover, Eladio Molina, and John Browning developing a drum level guidance document.

  The document will address, drum level measurement, measurement devices, both circulating and no-circulating, device installation, pressure / temperature compensation, and tuning, control and be added to our document when complete and approved.

6. SUBCOMMITTEE REPORTS – (Cont.)

6.4 INSTRUMENTATION REPORT – (Cont.)

The group will meet again prior to the Spring 2020 BLRBAC Session meeting. The team has done work between meetings as well as meeting Sunday evening prior to the Monday committee meeting.

Mr. Len Erickson with PSA engineering shown interest and has offered to work with the team also.

- <u>New Q3 Rotork valve demonstration and discussion</u>
  Mr. Bob Toth of Rotork set-up and demonstrated the set-up and capabilities of the new Q3 valve actuator.

  Demonstration included, use of Bluetooth remote device for setting limits, displays, bypassing limits, torque settings, and setting up for ESP or ESP functions. The BLRBAC version will be set so that the ESD will over-ride the local selector switch.
  Other notes:

  - They are working on a document specific to BLRBAC for the valve.
  - They offer a hardwired remote head feature that can work as an alternate means and can be 100 meters away from the valve.
  - The valve can log how often the valve is tested for ESP functions.
  - You can send an alarm to DCS based on several parameters, including selector switch.
  - Bluetooth can be programmed so that IR contact/Communication is established before Blue-tooth can work. BT can also be shut off.

Note: during demonstration, Mr. Brian Long with Green Bay Packaging (visitor) brought to the committees and Mr. Toths attention that the LOCAL / REMOTE switch had a dead area in between that may cause neither to be selected. (Switch physically set up to break contact before making) This would cause the valve to hold existing position, regardless of commands. We were able to duplicate this on the demo unit. Basically, the firmware knows what to do if "Local" or "Remote" is sensed, but no firmware (Logic) provisions if either both or neither position is sensed. Mr. Toth collected this information and will further research and report back to the committee.

- What are options for setting up the units?

- Q: Can they have a package configuration to update/modify several valves at one location.

- A: The unit allows you to read the configurations of the valves through Bluetooth to the program.

- BLRBAC vs NFPA-85: discussion
  - Instrumentation Document has a RBSS reference to use NFPA for guidance.

6. SUBCOMMITTEE REPORTS – (Cont.)

6.4 INSTRUMENTATION REPORT – (Cont.)

To better align our document with the BLRBAC Disclaimer,

> USERS OF BLRBAC GUIDELINES AND RECOMMENDED PRACTICES SHOULD CONSULT APPLICABLE FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS RELATING TO THE SAFE MANUFACTURE AND OPERATION OF RECOVERY BOILERS. BLRBAC DOES NOT, BY THE PUBLICATION OF ITS GUIDELINES AND RECOMMENDED PRACTICES INTEND TO URGE ACTION THAT IS NOT IN COMPLIANCE WITH APPLICABLE LAWS, AND ITS PUBLICATIONS MAY NOT BE CONSTRUED AS DOING SO.

The committee recommends changing the following in our document:

Existing: 4.3 Recovery Boiler Safety Systems Applied to Burner Management

1. The use of a RBSS for Burner Management on a recovery boiler shall conform to the requirements of the appropriate standards committee such as BLRBAC, FM, NFPA, UL, etc.

Proposed: 4.3 Recovery Boiler Safety Systems Applied to Burner Management

1. For RBSS Burner Management System requirements, users and designers should consult the appropriate standards, codes, and guidelines such as BLRBAC, NFPA-85, FM, UL, etc.

Afternoon Attendance: 22 Attendees, 9 Members and 13 Guests

- New Business:

- Discussion around 2oo3 drum level trip devices.
  Can you have a common failure mode of 2 like technologies that prevent tripping?
  of having 2 transmitters and 1 Aquarian for drum level control:
  - If transmitters are set wrong, boiler won't trip on 2 of 3 voting.

- Need to assure that sight-glasses are in service.
  - Some replace or rebuild every outage to assure sight glasses are in service.
  - Safety issues with gauges giving way. If there are cuts??? They need to be refinished???
  - Make sure to reduce heat-curve when valving in gauges.
    -circulate steam before pressurizing
  - If glass/port is white or opaque, don't blow down. Needs to be rebuilt.

- Q: Should an independent MFT relay and trip pushbutton be used with a new BMS that has redundant I/O and display pics?
- A: Our standard as well as NFPA-85 calls for an MFT relay, the relay not only trips out fuels, but kills power to the ignitors power sources. The hardwired pushbutton and MFT relay provide an independent layer of protection, (LOP).

- Q: For calculations for drum level and steam (Compensation) should they go through the BMS processor or to the DCS?

6. SUBCOMMITTEE REPORTS – (Cont.)

6.4 INSTRUMENTATION REPORT – (Cont.)

- A: Inputs should be directly to the RBSS/BMS. If done through DCS, a HAZOP should be conducted as well as the signals being hardwired to the BMS.

- Q: When do you know when to do the Rockwell FIRM-ware updates?

- A: Expensive and often needs several Revision upgrades. Could be issues downstream, i.e. HMI's. Seek SME assistance.

Discussed different practices for furnace pressure protection and control. Redundant devices with independent taps, 2oo3 best practice.

Committee further discussed issues with finding E&I and process control personnel. Many facilities use E&I to coordinate outage work now.

Spring meeting action item:

- Status and review of drum level document.
- Mr. Brian Long with Green Bay Packaging, Arkansas Kraft Division has shown interest in joining the committee.

Meeting adjourned around 3pm.

Many thanks to all that attended and participated.

6.5 MATERIAL & WELDING REPORT – Laura Nicol for Mike Blair

MORNING SESSION:

The Materials and Welding Subcommittee met in Open Session on Monday morning, October 14, 2019 at 8:00 am.

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

Attendance

9 members and about 14 guests attended the morning session.

Old Business

The meeting minutes from the spring 2019 Subcommittee meeting were reviewed and accepted.

Dave Fuhrmann did not attend. No update was given on the Materials and Welding Guidelines formatting.

New Business

Jesse Worsham provided an update on the combination of Section 3 of the Personal Safety Guidelines and the Materials and Welding Guidelines. The committee worked and provided feedback to Mr. Worsham.

Members

There was no change in membership discussed at this meeting.

6. SUBCOMMITTEE REPORTS – (Cont.)

6.5 MATERIAL & WELDING REPORT – (Cont.)

Items Discussed

- Clad cold side corrosion
  - Q. How do other mills handle this issue?
  - A. Chad Harrod (GP) – monitor and replace. Do not weld repair.
- Welds in the floor
  - Q. Has this been discussed by the Material and Welding Subcommittee?
  - A. Typically dictated by the mill.
- Clad overlay welding
  - Q. Do people not peel back the weld overlay before the root pass?
  - A. Chad Harrod (GP) – prefer to not peel back. Examine the root pass before cap pass. Prefers to have the original applied clad material over field applied cladding. Need to have qualified welder.
- Issues with using phased array.
  - Wayne Adams (IP) has had issue with calibration blocks, false positives, etc. Others have had issues as well.
  - Looking to have a presentation in April 2020 to discuss what mills can do to prepare if using phased array. Applied Technical Services (ATS) – Jim J. Hills (jhills@atslab.com)
- Alvaro Daniel Parra (daniel@univecc.com) of Universal Certification Center would like to give a presentation in April 2020 to discuss their predictive maintenance modeling and new software.

AFTERNOON SESSION:

Afternoon session was not held this meeting.

Presentations

There were no presentations this meeting.

Next Meeting Agenda

- ATS presentation on phased array
- Universal Certification Center presentation on predictive maintenance.

6.6 PERSONNEL SAFETY REPORT – John Fredrickson

The Personnel Safety Subcommittee met in an "open" session on Monday, October 14, 2019. There were 8 members (out of 15) plus 41 guests in attendance during the meeting.

Representation at our meeting by regular members and guests included original equipment manufacturers Andritz, and Valmet. Service Providers 3-S Team, WL Gore, Chicago Protective Apparel, and Gulf Coast Automation. Engineering Companies, Jansen Combustion & Boiler Technologies.

6. SUBCOMMITTEE REPORTS – (Cont.)

6.6 PERSONNEL SAFETY REPORT – (Cont.)

Representation from FM Global attended the meeting. Operating company representation was present at this meeting with representatives from Georgia-Pacific, Green Bay Packaging, International Paper, SAPPI NA, Rayonier AM, Clearwater Paper, Woodland Pulp, Arauco, PCA, Smurfit Kappa, Verso, and WestRock. Consultant representation included PSA, RSA, AF&PA.

The BLRBAC anti-trust statement was read.

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

New committee members – Greg Zavadoski – PSA
Alec Shull – Andritz

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

A sheet to capture topics of discussion from members/guests for group participation was sent around.

The minutes of the last meeting were read and approved by the Committee.

- Recent smelt splatter injury – Nine Dragons, Rumford, ME
  - BLRBAC contacted initially by OSHA – asking about industry best practice for PPE, how well shared / used
  - OSHA also asked about how prevalent is use of chainmail at spouts
  - Injured employee was wearing green welder jacket and Hex-Armor gloves. Company policy was leather gloves.
    - SAPPI testing gloves with “smelt pour test” – will share results once available
  - Companies should update PPE matrix as appropriate
  - OSHA statement that site leaders should’ve known what folks were wearing and that it was appropriate for the task

- Review Personnel Safety Subcommittee suggested practice
  - Committee to review and update Personnel Safety recommended practice document
    - Consider adding ergonomic risks and mitigation
    - A reminder to the group that smelt spout rodding robots are being used successfully by operating companies reducing the employee exposure.
    - GCAS is partnering with ABB to offer new options for automatic spout rodding

- www.GulfCoastAutomations.com
- Contact info:
  - Brandon Peed, Director of Engineering,
  - GCAS (Gulf Coast Automation Solutions),
  - 111 South Hoyle Avenue, Bay Minette, AL, 36507.
  - Cell: 251-747-1445, office 633-333-4227,
  - Email: Brandon@gulfcoastautomations.com

6. SUBCOMMITTEE REPORTS – (Cont.)

6.6 PERSONNEL SAFETY REPORT – (Cont.)

- Update on smelt PPE
  - Chicago Protective Apparel (CPA)
    - www.chicagoprotective.com
    - Contact info:
      - Dan Karp, Sales Manager
      - 3425 Cleveland St., Skokie, IL 60076
      - Cell: 847-564-0847, office 847-674-7900
      - Email: dan@chicagoprotective.com
    - Discussion of various fabrics – Repel, Marlan, Oasis
      - Testing data available from University of Alabama for charring, shrinkage, Adherence, Break Out, temperature increases, **time to second degree burn**, etc.
    - New face shield material option – nylon, in addition to polycarbonate (not recommended) and propionate.
    - Customizable designs for PPE (jacket with/without hood, coveralls, pants, radio loops, Velcro or snap closures, pockets, etc.)
      - CPA will bring fabric samples to mill for review, then develop garment that meets mill needs.
    - Options for other pulp mill chemical splash protection (layering of fabrics)
      - H2O2, BL, GL, WL, Sodium Chlorate, NaOH (50%), H2SO4 (93%)
      - Testing data available per ATSM F729-12 – all times acceptable (>15 min)
    - Glove options – inside of hand – leather, back of hand – CarbonX
    - Sold through Grainger, Motion, other distribution vendors

  - WL Gore
    - www.gore.com
    - Contact info:
      - Jim Ellis, Sean McDearmon
      - Multi-hazard garment contacts: Ketan Panse (410-506-5163, kpanse@wlgore.com), Mark Aboff
    - Vulcan buying opportunity:
      - All PO are non-cancelable and non-refundable
      - Orders must be placed by 10/31/19 and should be shipped by Dec 30, 2019 (depending on number or orders)
      - Debra Fitzgerald, dfitzgerald@wlgore.com, 410-506-5279
      - Some sites have expanded use of Vulcan PPE around RB for maintenance folks, not just operators
      - Vulcan is the only product on the market designed for smelt – it was mentioned that based on experience, others in the market "can work"
    - Garment for pulp mill chemicals for protection – GORE-TEX PYRAD®

multi-hazard garment

- Commercially available – designed for oil / gas industry known hazards.
- Gore would like to better understand broad range of threats/hazards in P&P to meet needs
- NOT FOR SMELT!!

6. SUBCOMMITTEE REPORTS – (Cont.)

6.6 PERSONNEL SAFETY REPORT – (Cont.)

- ❖ Pulp and paper industry still asking for one PPE that protects from all hazards, including smelt (develop the "next" green jacket that will be widely used to protect)

- o Current mill practices – open conversation with CPA and Gore

- Open Discussion
  - o SDT relief discussion – OSHA and BLRBAC expectations – Jen Johnston
  - o Will need to be handled by Executive Committee for next steps

- Next BLRBAC: April 20-22, 2020

The meeting ended at 11:35 am.

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.

COMMENT: Chris Jackson – Nautilus Loss Control: John, that was a terrific presentation and good reminder that injuries are still possible even with all that we talked about. There was an injury some time ago that has been talked about and an issue which we need to keep clear about. When you have an injury from smelt, it is not just temperature that makes it burn, but it is also chemical. In this previous incident, the hospital that this patient was delivered to was focused on the thermal nature of the injury, but was oblivious to the chemical nature of the injury of which they were not informed. One thing which I try to do is to make sure that people in the mills are aware that there are two mechanisms of failure and that should be clear in everyone's mind whenever there is such an incident. We don't want to lose track of that.

COMMENT: John Fredrickson - Chairman: It is an excellent point and this is reason why Wayne Grilliot (AF&PA) and I have been trying to find a way that we can influence the approval of diphoterine in the USA for the intervention of the chemical part of burns. If approved, it could be very significant and valuable in preventing life changing injuries in the recovery operating area. Our counterparts in Canada have the ability to use diphoterine to treat a chemical burn in the mill without a prescription but in the USA, we cannot.

So far, AF&PA has not found a way to influence that. We need to, so we are going to continue to do what we can through the AF&PA.

COMMENT: Frank Navojosky – International Paper: Just one question. We are always looking for materials that are better as we are part of testing materials. We are always looking for something that is better than what we have been using for years and years. Now we are kind of getting into a quandary with the material not being quite as available as it was and so now people are wondering well what do they use? Should they go back to using aluminized suits. They are receiving questions of what is acceptable. What doesn't melt as easily. Do we have any histories of injury with the aluminized suits?

COMMENT: John Fredrickson - Chairman: There is nothing that I would have on record within the committee. I personally don't remember any over my years, but I would open it up to the group. Are there any known injuries known from folks who were wearing the aluminized suits? I'm not sure how we can get our arms around that.

COMMENT: Frank Navojosky – International Paper: I'm just thinking that we need a back-up plan. The back-up plan might logically be that we should go back to what we were using before. I think from an operator's standpoint and a corporate maintenance people's safety standpoint, we put them in a quandary about well we don't need that anymore and this is not available anymore so we have to go back to use that. Going back to an inferior material only hurts and really the thought process is well if we don't have any data that says we didn't actually get hurt with that material, it is not saying we can't use it, but we found something that is actually better. So, I was just wondering about that thought process and is there any new data.

COMMENT: John Fredrickson - Chairman: I don't know of any data, but I would be open to having anyone with any data sending me their comments. When we have the committee meeting next April, I will put it on the agenda that we will have our document at least show some of the different things that have been tested and maybe rank them in order of protection and then comfort becomes the next question. Just how comfortable are they compared to each other and at least make sure that we have a number of smelt pour tests that are on the aluminized materials to see what happens on them I think that some might be in our documents, but I know I have some from the pour tests that I did and others might as well. Any photos of any pour tests or any testing that you might have had done, even if it is rudimentary low-level testing, that we can include in our photos. Just to make people aware of this.

COMMENT: John Fredrickson - Chairman: Anything else.
Comment: Not identified: One of the problems that we had when convincing our operators that they should wear Gore suits; better than all the other stuff they were wearing and how it pretty much protected them from being burned. We had to show them how it performed compared to all the other stuff they were wearing. Now we got the Gore suits and if they don't keep making them, we'll have to go back to what we told them was

inferior. I'm faced with hoping they don't run out. It is an uncomfortable situation as far as to put somebody back in something that they could conceivably get burned.

6. SUBCOMMITTEE REPORTS – (Cont.)
6.6 PERSONNEL SAFETY REPORT – (Cont.)

COMMENT: John Fredrickson - Chairman: I think you made a good point. I know that in our mill we have the Petrolite orange suit as a back-up. It is protective too, but not as comfortable in the event that we don't have Gore jackets available. That was one of the garments that the committee has done a review on prior to the Gore option being available. So, you are right. You have to have some kind of back-up and as Frank was talking about, discussion of a whole list of things that you work with your folks on. You are right it is kind of a mind bender after having to do all of this convincing and then not having the material available that helps to protect them. So, hopefully, Gore will step up to the plate, but if not, we will continue to look for those options.

We are running out of time here, but I'm going to see if I can come up with a quote that competes with Frank Navojosky sootblower quote. So, here goes… "Smelt when it goes into the right place, it makes your recovery process possible. When it goes into the wrong place, it hurts your people and it blows up your boiler". So, preventing smelt dissolving tank explosions is a pretty big focus for all of us and like smelt water explosions we want to drive them to zero.

. **6.7 PUBLICITY & NEWS REPORT** – Matt Paine

No report given at this meeting, but will have one in the spring.

6.8 SAFE FIRING OF BLACK LIQUOR REPORT – Vernon Blackard

SFBL Subcommittee Meetings – Monday 8:30 AM (CLOSED) and 01:00 PM (OPEN). Sub- Chair meeting on Monday 4 pm. Main meeting reports out Wednesday 8 am.

Agenda:

Review BLRBAC Anti -Trust statement

Introduce members. 13 MEMBERS CLOSED AND 67 MEMBER AND GUEST OPEN MEETING.

Review and approved the SPRING 2019 meeting minutes. APPROVED.

Reviewed draft document, scrubbed with several changes. Too many changes to allow vote at this main meeting; so voted again to submit it to Exec Committee for possible posting on BRBAC website for main committee vote in Spring 2020 meeting. Tom Wransosky cleaned up document during closed meeting as we went through it again.

6. SUBCOMMITTEE REPORTS – (Cont.)

6.8 SAFE FIRING OF BLACK LIQUOR REPORT – (Cont.)

New Business –

Items brought up since last meeting.

- Nuisance alarms for low solids with high (> 70 percent DS firing). Alarm if below 70 percent. No wiggle room if firing right at 70 percent solids. No changes to our document recommended.
- Would blending a low amount of liquor into the oil system of a recovery boiler firing oil auxiliary burners be considered liquor firing? NO work planned for this idea.
- Spout discharge valve discussion with Guy L. Control valve proposed for discharge side of spout cooling water. NO work planned for this idea. Concern that entire cooling water system needs to be design checked if done. Safeguard in place.
- Eric Jin of B&W showed some smelt water reaction videos in both closed and open meetings.

6.9 WASTE STREAMS REPORT – Paul Seefeld

The Waste Streams Subcommittee met at 9:00 on Monday with full attendance of the ten members. The Anti-Trust Statement was read. Mark Cooper of FM Global has retired and is off the subcommittee. He is being replaced by Neil Chaudhuri. Mark was the Vice-Chair of the subcommittee and there were no volunteers willing to permanently take his place. In addition, a Westrock representative, Cobb Golson, has asked to be on the subcommittee. The members/attendance list will be updated and sent to Barbara.

Morning (Closed) Session topics:
We read the anti-trust and approved the minutes from the April 2018 meeting. We did not have a quorum to conduct business in the October 2018 meeting.

We are going to be adding two sections to chapter 4, BLOX system sources and CTO system sources. Both are to be classified as weak gas sources. The BLOX system will be treated as a separate source due to the large volume of flow makes it impractical to combine with any existing DNCG system. The CTO system sources are also to be classified as weak gasses and will be documented in a similar fashion as the chip bin gas source.

We have converted figure 4 and figure 5 to Visio and are updating the two documents. We will probably have figure 6 converted for distribution and review by the subcommittee before the October 2019 meeting. The intent is to make any

changes via email before the fall meeting and have the figures ready to submit to the EC for approval into the document. We are not planning to make any significant process related changes that would require a vote by the membership.

The document on the site is still labelled as April 2016. There have been two updated documents submitted and approved since then. We need to confirm that the site document reflects the changes submitted on 1/18/2018 and approved in the April 2018 meeting.

6. SUBCOMMITTEE REPORTS – (Cont.)

6.9 WASTE STREAMS REPORT – (Cont.)

There were no questions submitted to the subcommittee in the last 18 months. Our current document has been reviewed and updated chapter-by-chapter since 2015 so it is pretty robust. There are no foreseen topics to address that would require us to meet more than once per year after we incorporate the BLOX and CTO acidulation sources.

Afternoon (Open) Session:
We had seven committee members and seven guests in the afternoon session. The anti-trust statement was read. We reviewed our discussions related to the BLOX and CTO reactor sources being incorporated into the document. There were no questions related to the BLOX or CTO sources. We discussed the proposed updates to the drawings and there were no related questions.

6.10 WATER TREATMENT REPORT – Tom Przybylski

The water treatment subcommittee met in open session for both morning and afternoon sessions. There were 8 of 17 subcommittee members in attendance for the morning session along with 10 guests. The afternoon session included 8 subcommittee members and approximately 12 guests. We did not have a quorum in either session, so motions on any changes will be postponed until spring.

There were no membership changes.

The morning and afternoon sessions started with a review of the BLRBAC antitrust statement.

Meeting minutes from last spring were approved

We discussed questions posed to the subcommittee since the last meeting.

- One was a question whether an online chemical cleaning by introduction of a chelant to boiler treatment chemicals was good practice. Our group added a clause to the chemical cleaning document stating that it is intended as an off-line process.
- A second request came from an someone who inspected a deaerator that went through an acid excursion. The acid attacked the nylon nozzle guides and froze everyone in place. We made a note to the deaerator inspection document about checking the function of these following an inspection.

We continued with a final pass of the chemical cleaning document. We made minor

wording tweaks to this document, with changes on hold until the subcommittee can achieve a quorum.

We moved on to initial production of the testing and sampling document. We spent the remainder of the morning on the system overview and basic system path sections. We adjourned the morning session at 11:50AM

6. SUBCOMMITTEE REPORTS – (Cont.)

6.10 WATER TREATMENT REPORT – (Cont.)

The afternoon session was dedicated to continuation of the sampling and testing document. After briefing audience members on the general layout of the entire water treatment guideline document, we worked through the Basic System Components section of this document. This included discussions about technologies for:

- Detecting and measuring iron
- pH meter temperature compensation versus temperature correction
- Starch detection
- Cation conductivity versus standard conductivity
- Dissolved oxygen
- Proper sample line and conditioning recommendations

We made a note to compare our work to ASTM and ASME to ensure we complement rather than duplicate their published documents. We concluded the afternoon session at 3:30 P.M.

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

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

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

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

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

7. AMERICAN FOREST & PAPER ASOCIATION RECOVERY BOILER REPORT – (Cont.)

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

The Operation & Maintenance Subcommittee sponsored two (2) Recovery Boiler Operational Safety Seminars, in April & May 2019. A total of 101 attendees participated in these Safety Seminars. Operators, supervisors, superintendents, process engineers, and maintenance professionals from 13 companies and 29 mills attended. Also, a 3rd Safety Seminar is scheduled for November 14, 2019 in Richmond, British Columbia, after the Fall Western Canada BLRBAC Meeting. Over 3,800 people have attended the seminars since they were started in 1985. We continue to receive excellent comments and ratings from the attendees. The attendees receive valuable information and insight from the dialogue among the attendees and monitors of the seminars. The six (6) tabletop exercises or case studies, used in the Safety Seminars, are based on recent actual Recovery Boiler Incidents and help operators and supervisors make decisions when to ESP a recovery boiler. As more senior operators and supervisors retire, training will continue to increase in importance. Companies are finding these seminars to be an important part of their safety & training programs. We recommend that all companies and mills seriously consider sending people to these valuable seminars.

The 2020 AF&PA Recovery Boiler Operational Safety Seminars are scheduled for April 21-22 and May 12-13 at the Atlanta Airport Marriott Hotel. A 3rd Safety Seminar will be held on the West Coast, if there is enough interest. Dean Clay and John Andrews of Boiler Services & Inspection LLC (BSI) are the Safety Seminar Monitors. The Safety Seminar cost is only $350 per attendee for member companies and $700 per attendee for non-member companies. Attendance is limited, so Register Early!
The 2019 AF&PA Recovery Boiler Annual Conference & Meetings were held on February 5-6 in Atlanta. We had a record turnout with a great mix of Operating Companies, Manufacturers, Research Specialists, Vendors, and Insurers. The 2019 Conference Theme was Dissolving Tank Safety. Presentations included reports on new developments in our industry, currently sponsored AF&PA Recovery Boiler Program projects, Subcommittee reports on their accomplishments, reports from Canada, Sweden, Norway and Finland on their Recovery Boiler committee activities, as well as other Recovery Boiler related research being done in the industry.

The 2020 AF&PA Recovery Boiler Annual Conference & Committee Meetings are scheduled for February 4-5, 2020 at the Atlanta Airport Marriott Hotel. We schedule these for the 1st Tuesday & Wednesday of each February. The Conference is open to everyone interested in Recovery Boilers. The objective is to keep the members and the recovery boiler community informed about new developments and industry best practices. Mark your calendars! We hope to see you there!

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

7. AMERICAN FOREST & PAPER ASOCIATION RECOVERY BOILER REPORT – (Cont.)

The Operation & Maintenance Subcommittee completed its work on developing the "Recovery Boiler Functional Checks Document". It is a great reference document for helping mills develop procedures for functional testing of interlocks and trips on Recovery Boilers. The new document is available for downloading from the AF&PA Recovery Boiler Program website. We encourage all mills to review the document.

The Operation & Maintenance Subcommittee is currently working to formalize recommendations from the Dissolving Tank Survey and BLRBAC Incidents Study completed by Dr. Tom Grace. Great progress was made at the February 5, 2019 meeting and it will be finalized at the February 4, 2020 annual meeting. Like the "Recovery Boiler Functional Checks Document", it will be distributed to the members and posted on our website. Given the number of Dissolving Tank issues, we feel this will be a great help to the industry. The next Operation & Maintenance Subcommittee Project will be "The Impact of extended run time on Recovery Boiler operation, maintenance, risk, areas of concern, & criteria for allowing extensions".

The "Kraft Recovery Boilers" Textbook (Blue Book) was sold by TAPPI. Three thousand books were originally printed, and the inventory is sold out. The "Kraft Recovery Boilers" Textbook is getting a major update for the next printing. We are very pleased to have Dr. Honghi Tran of the University of Toronto leading this project. This project is nearly complete.

Dr. Tran and other well-known recovery boiler experts have completed the 16 chapters for the new book, which are currently being reviewed by TAPPI and the publisher. We are very excited about this new Textbook and feel it will advance the knowledge and understanding of Recovery Boilers and will be a great help to the industry. The new "Kraft Recovery Boilers" Textbook will be included as part of the TAPPI Kraft Recovery Operations Course. The new Textbook will be available for sale in late-2019.
The Research & Development Subcommittee developed an industry survey on recommended clothing for safe use around recovery boilers. Clothing must be Heat resistant, Resistant to chemical attack, Provide mobility, and be Comfortable. We did a limited distribution of the survey in the USA and Canada for testing. The comments and feedback were incorporated, and we are ready to distribute the survey to all North American mills.

The Research & Development Subcommittee is very interested in doing Generating Bank and Screen tube studies. One (1) in eight (8) Screen tube leaks reported to BLRBAC resulted in an explosion. Also, one (1) in twenty-five (25) Generating Bank tube leaks reported to BLRBAC resulted in an explosion. These studies will build on earlier work by the AF&PA Recovery Boiler Program. The start date for these studies will be considered after the funding requirements for publishing the new "Kraft Recovery Boilers" Textbook is determined.

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

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

8. **TAPPI STEAM & POWER/ENERGY MANAGEMENT REPORT** - Energy Recaust Committee Chair

No report was given at this meeting.

9. **WESTERN CANADA BLRBAC REPORT**

No report was given at this meeting.

10. **ACTIVITIES OUTSIDE NORTH AMERICA REPORTS**

No report was given at this meeting.

11. **OPERATING PROBLEMS SESSION REPORT** – John Phillips reporting for Bentley Sherlock

At the Operating Problems session yesterday, we reviewed 18 questions from the audience. Topics covered included acid cleaning intervals, superheater clearing on start-up, dissolving tank draft, dissolving tank explosion doors/vents, smelt spouts run intervals and loading, sootblower nozzle types, floor designs, economizer pluggage, and automatic spout cleaners.

Reminder that there will be two presentations after the main committee meeting tomorrow on "Visual Analysis for Recovery Boilers" by Andritz and "New Technologies in Flame Detection" by Zeeco.

CLOSING COMMENTS:

ACTING CHAIRMAN: David von Oepen: That concluded the Main Committee meeting this morning.
Just a reminder that the next meeting of BLRBAC is going to be April 6, 7 & 8, 2020. Our fall meeting will be held on October 5, 6 & 7, 2020. They will be held here at the Crowne Plaza Hotel.

We had a change in the Executive Committee membership which we voted on in the closed session. New chairman is David von Oepen; Vice-Chairman is Bentley Sherlock and we do have an opening for the Operating Representative, which we will be filling within the next couple of months.

I'll now entertain a motion to adjourn the meeting? Do I have a second? I finally got a motion to second that. I'm not sure you folks want to leave yet. All in favor? Anybody opposed? The Main Committee Meeting is officially over. Thank you for coming and we will see you in the spring. Everybody, enjoy the rest of the day and travel safe!

APPENDIX I
INCIDENT LIST

NO LEAK

FALL 2019-01	
Classification:	No Leak
Co, Mill, Location:	**Clearwater Paper, Lewiston ID**
Unit Data:	RB#4,1971, Babcock and Wilcox, PR-149, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	1.48 MMlb DS/day, 235,000 lb/hr steam, 600 PSIG, 740ºF, 720 PSIG Design
Incident Date/Time:	January 16, 2019,11:40AM Earliest Indication: 1/16/2019 at 11:30AM
Downtime hrs, leak/total:	46
ESP?	YES
Leak/Incident Loc:	Other, No leak
How discovered:	Walkdown, 5th round of the day
Wash adjacent tube:	NO
Root cause:	No Leak, Smelt melting off superheat tubes from not sootblowing once on gas
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Sep-17
Sequence of events:	1/14/19 @ 20:19 – Power boiler tube failed, sagged mill steam headers 1/14/19 @ 20:41 - #4 Recovery boiler tripped due ID Fan not having steam on 170# header side 1/15/19 @ 2:30 - #4 Recovery boiler brought online, running on gas with no sootblowers due to mill liquor and steam balance 1/16/19 – Boiler still running on gas, junior field operator was on 5th round of the day at approximately 11:35 AM, individual had the intent to clean up some crusted smelt that was on the south spout. Employee noticed what appeared to be water exiting the boiler bed through the spout along with residual red smelt. Employee exited boiler and went to supervisor office to report the incident. Shift supervisor went with employee and confirmed what appeared to be water running out of the spout at 3-5 GPM rate and smelt bridged over top of it, popping was observed from the clear liquid entering the dissolving tank. Employees left the area and went to the control room and supervisor made the call to initiate ESP. ESP was initiated at 11:50 Operator at the panel noted no alarms occurred for leak detection, furnace pressure, etc. No abnormalities were found with PI, Parkview trends and talking with operators during waiting period. In interviews with the involved individuals discussing the clear liquid it was noted there was no visible steam present. Boiler was water washed once bed cooled. Post water washing boiler was hydro tested and inspected with no leaks detected. Air heaters were pressurized and inspected; no issues found. Boiler was then drained and steam drum inspected, no issues found. 1/18/19 @ 9:38 AM - #4 recovery back online on gas 1/18/19 @ 5:15 PM – Boiler back on liquor
Repair procedure:	N/A

Future prevention:	Discontinue practice of shutting off shatter jet steam when on gas and bed has burned out. Additional training and awareness about clear smelt conditions and what signs and symptoms to look for with water and weak wash not reacting violently, clean liquid and smelt not reacting, and no visible steam.

ECONOMIZER

FALL 2019-02	
Classification:	Noncritical
Co, Mill, Location:	**IP, Orange, TX**
Unit Data:	RB#1,1967, B&W, PR-108A, Drums - 2, DCE - Cyclone, Floor - Sloped to Front
Unit Size:	2.7 MMlb DS/day, 254,000 lb/hr steam, Operating: 850 PSIG, 835^{o}F, MAWP: 975 PSIG
Incident Date/Time:	April 16, 2019, Earliest Indication: 4/16/2019 at 7:32 A.M.
Downtime hrs, leak/total:	72 hours
ESP?	YES
Leak/Incident Loc:	Economizer, Economizer Tube #18 on RB#1 near the feedwater base header.
How discovered:	Control Room, Operator saw increased furnace pressure and loss of steam drum level.
Wash adjacent tube:	YES
Root cause:	Weld Failure, Pinhole leak below the economizer inlet header in the feedwater line washed out tube number 18 in the economizer.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Jan-18
Sequence of events:	At approximately 7:32 a.m. on 4/16/2019, boiler was firing at 212 gpm and steaming app. 215 kpph. During normal operations, the operator noticed a spike in the recovery boiler furnace draft from -.05 to 2.8 followed by the loss of level in the steam drum level while feedwater flow to the boiler increased from 220 kpph to 290. An ESP was initiated less than 1 minute after initial indications. All ESP procedures were followed correctly. All ESP functions worked properly. Investigation revealed a catastrophic failure of a cold side economizer tube at the lower bend coming out of the header. A pin hole leak in the feedwater supply header spraying in the direction of the ruptured tube was also identified.
Repair procedure:	Plugged tube #18 at lower and upper header and also plugged 9 additional adjacent tubes where low thickness readings were found. Replaced reducer and a section of the feedwater inlet header where the weld failed. Repaired another weld downstream in the feedwater header where an indication was found by RT.
Future prevention:	Include that area in the feed water piping inspection.

ECONOMIZER

FALL 2019-03	
Classification:	Noncritical
Co, Mill, Location:	Domtar, Windsor, Québec, Canada
Unit Data:	RB#1, 1987 CE, CA8412, Drums - 2, DCE - No, Floor - Decanting
Unit Size:	4.65 MMlb DS/day, 645 000 lb/hr steam, 610 PSIG, 750^{o}F, 800 PSIG Design
Incident Date/Time:	April 30, 2019, Earliest Indication: April 29, 2019 at 06h30 pm
Downtime hrs, leak/total:	34.5
ESP?	No
Leak/Incident Loc:	Economizer lower rear/left header, at one tube connection weld.

How discovered:	Visual on site in economizer ash hopper
Wash adjacent tube:	No
Root cause:	Fatigue cracking
Leak detection:	No commercial system installed, only in-house feed water/steam high differential
Bed cooling enhanc	No
Last full inspection:	2017
Sequence of events:	On April 29, 2019, normal operation firing 1425 Kg/min of black liquor DS. At 6h30 pm, east side economizer ash conveyor tripped. Visual on site: salt cake in conveyor is white and looks normal. Conveyor is started and look ok. At 10h00 pm, same conveyor tripped again. Another visual on site: salt cake in conveyor is white and still look normal. Conveyor is started and look ok. On April 30, 2019 at 2h30 am, same conveyor tripped again. Another visual on site: salt cake in conveyor is white and still look normal. Conveyor is started for the third time and look ok. At 02h45 am, east conveyor tripped again but control operator found that the west economizer ash conveyor is also tripped (said he did not get an alarm for that one). The field operator when arriving on site of the ash hopper found this time one conveyor inspection door opened with a projection and trail of grey mud on a distance of some 20 feet on the building floor towards nearby HVAC unit. The shift supervisor, along with field operator both observed on site that the 2 economizer ash conveyors were now filled with grey mud and came to the conclusion that there was an economizer leak. Up to that point, no sign of water leak anywhere in the furnace, Gen Bk or economizer was apparent from the control room. But with the discovery of grey mud in both conveyors, the decision was made immediately to do an orderly shutdown of the boiler. Reducing liquor flow too fast, from normal operation at 1425 Kg/min of DS, the boiler tripped on low water level at 3h00 am. The control operator did not want to restart the boiler and so decision was made not to burn the bed down. The Power and Recovery Manager and the assistant 1st class Power Engineer were called in and at around 4h30 am, the leak was found in the lower rear/left corner of the economizer, tube #6 in row 8 at welded connection to the rear left lower header. Boiler was depressurized the normal way and at around 7h00 am, the GE superintendent (who was mobilizing on site for the up-coming maintenance shut-down) also confirmed the leak location. Boiler depressurizing was completed at 10h00 am. Cooling with tempered demin water and final economizer draining was done at 7h00 pm (boiler proper not drained). Tube repair and die checked completed at 11h10 pm. Decision was made not to hydro the boiler but make regular checks during the boiler heating curve using the nearby access door. Also, the boiler was scheduled for it's18 months shut down 3 days later, with usual hydro test before maintenance work. First gas burner lit on May first at 3h45 am. Boiler on line on natural gas at 12h13 pm and first liquor at 1h22 pm. Total downtime liquor to liquor: 34.5 hours.
Repair procedure:	Removed circumferential crack in tube, penetrant testing, weld and penetrant testing again
Future prevention:	More NDE in same area during present and future outages

ECONOMIZER

FALL 2019-04	
Classification:	Critical #912
Co, Mill, Location:	**Georgia-Pacific Toledo, Oregon**
Unit Data:	RB#2,1959, CE, 5959, Drums - 2, DCE - Cascade, Floor - Decanting
Unit Size:	1.44 MMlb DS/day, 170,000 lb/hr steam, 600 PSIG, 750ºF, 750 PSIG Design
Incident Date/Time:	March 7, 2019, Earliest Indication: 3/3/2019 at 1:30Pm
Downtime hrs, leak/total:	30
ESP?	NO
Leak/Incident Loc:	Economizer tube leak on the north side of RB2 6th floor. Water on the buck-stay and water at lower economizer bottle header
How discovered:	Walkdown, Operator discovered water on the 6th floor buck stay
Wash adjacent tube:	NO
Root cause:	Weld Failure, Weld on tube plug developed pin hole leak
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	April 2019
Sequence of events:	Operator noticed water on a buckstay behind the steam drum on walkdown. Water was tested and positive for Trasar was in the water which meant it was boiler water and not flue gas condensation.
Repair procedure:	Installed new tube plug
Future prevention:	Sustainability plan to replace economizer 2021

ECONOMIZER

FALL 2019-05	
Classification:	Noncritical
Co, Mill, Location:	**Hood Container of Louisiana, LLC, St. Francisville, LA**
Unit Data:	RB#1,1965, Babcock & Wilcox, PR85, Drums - 2, DCE - NO, Floor - Sloped to Front
Unit Size:	3.0 MMlbs DS/day, 481,000 lb./hr steam, 600 PSIG, 750^{o}F, 675 PSIG Design
Incident Date/Time:	May 31, 2019, Earliest Indication: 5/31/2019 at 8:20 PM
Downtime hrs, leak/total:	65.75 hours liquor to liquor
ESP?	NO
Leak/Incident Loc:	Economizer, Crossflow Economizer, tube leak just above lower/inlet header, 2nd bundle
How discovered:	Walkdown, discovered on operator's normal walk down of the boiler
Wash adjacent tube:	NO
Root cause:	Thinning Internal, pitting, both internal and external pitting, thinning of tube near header
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	May-19
Sequence of events:	Operating Data @ Time of Discovery: DBLS Firing Rate – 2.0 MMlb/day, Natural Gas flow – 0 MCFH, ID Fan Speed – 602 rpm, Steam flow – 305 kpph, LVHC and HVLC gases to the RB. 5/31/19 8:20 pm – Superintendent was notified of possible leak in the Longflow economizer (water coming out of the north hopper). Generating bank ash hoppers were dry. 5/31/19 9:15 pm – Superintendent arrives at the mill, found water pooled in north Longflow economizer airlock. Starts looking throughout the Longflow economizer. 5/31/19 10:00 pm – Found water dripping down side of northern most manway of the Longflow economizer 2nd floor. 5/31/19 10:15 pm – Halted sootblowers and valved out the steam. 5/31/19 10:40 pm – No change, still dripping down north side of Longflow economizer. 5/31/19 11:25 pm – Looked in 6th floor Longflow economizer northern most door and found water. Went up to the 7th floor, found the generating bank ash hoppers dry. Opened manway above inlet header of the 2nd bundle crossflow economizer and found leak. 6/1/19 12:00 am – Pulled liquor, began controlled shutdown of mill assets (pulp mill, Evaporators, Concentrator, Steam Turbine Generator) 6/1/19 3:30 am – Pulled fire The crossflow economizer was drained. Repairs were made by cutting the leaking tube out and welding in plugs at the lower and upper headers. Final hydro was complete on 6/3/19 at 10:25 am (held 550# drum pressure for 45 minutes) Recovery Boiler on warmup curve 6/3/19 at 12:00 pm Recovery Boiler on liquor 6/3/19 at 5:45 pm Total Liquor to Liquor Downtime: 65.75 hours
Repair procedure:	Plugged tube off at inlet and outlet headers
Future prevention:	Replace the crossflow economizer in 2020

ECONOMIZER

FALL 2019-06	
Classification:	Critical #913
Co, Mill, Location:	**Verso Wisconsin Rapids**
Unit Data:	RB#3, 1989, Alstom, 86107, Drums - 2, DCE - Cascade, Floor - Decanting
Unit Size:	1.6 MMlb DS/day, 200,000 lb/hr steam, 1275 PSIG, 900ºF, 1450 PSIG Design
Incident Date/Time:	February 1, 2019 Earliest Indication: 2/1/2019 at 6:25pm
Downtime hrs, leak/total:	97
ESP?	**NO**
Leak/Incident Loc:	Economizer, Elements 20 & 21
How discovered:	Walkdown, Operator heard a noise like a leak in the economizer.
Wash adjacent tube:	YES
Root cause:	Mechanical abrasion, Baffle rubbed tubes.
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	June 2018 (June 2019)
Sequence of events:	**2/1/2019 Friday** 6:25pm The operator heard a noise in the economizer. After walking down the boiler with another operator, they found water leaking into the back side of the economizer. 6:30pm The operators verified the water was not reaching the gen back and entering the furnace. They notified the shift supervisor that they would be doing an orderly shutdown of the boiler. 6:35pm The operator started burning down the bed. 8:05pm Liquor was pulled out. 8:15pm Gas was pulled out and the bed temperature probes installed for the bed cool down. All air ports were opened to assist with bed cool down. **2/2/2019 Saturday** 12:00pm Bed cool down completed. Installed boiler wash spool piece. Began demin hydro with Jamar on sight to assist. 2:00pm Hydro completed. Began water wash for only the economizer. Began fire side lockout. 6:00pm Water wash completed. Fire side lockout completed. After discussion with management, elected to not dry out the boiler due to the small area that needed to be clean. Began building scaffolding from 4th floor oval doors and 5th floor. 8:00pm Scaffolding completed. Inspected the area to pin point the leak. Leak was identified in element 21. Drained the water from the steam drum, mud drum, and economizer. Did not drain the water walls. Began water side lockout. 10:00pm. Water side lockout completed. Jamar began tube repairs. Small weeping leak identified on tube in element 20. This leak was attributed to wash from the original leak. **2/3/2019 Sunday** 4:00pm Jamar completed tube repairs. Acuren inspected all welds and they all passed. The welds on E-21 were x-rayed. The pad weld on E-20 was tested with dye penetration. Unlocked water side for hydro. 5:00pm Hydro tested the boiler at 1100psi. All repairs were dry. External inspection completed and boiler passed. 6:00pm. Removed scaffolding. Finished unlocking water side. 8:00pm Unlocked fire side. 10:00pm All unlocking completed. Fired off boiler on gas on warm up curve. **2/4/2019 Monday** 1:00am • Filled cascade with liquor to begin building solids.

	5:30am. Fired off on liquor after 3 hour delay to realign cascade sprocket.
Repair procedure:	The baffle was cut and the primary leak was repaired with a dutchman. The washed tube had a small weeping leak repaired with a pad weld.
Future prevention:	The economizer baffles were realigned with added support to prevent them from rubbing on the tubes.

ECONOMIZER

FALL 2019-07	
Classification:	Noncritical
Co, Mill, Location:	**International Paper, Eastover Mill, Eastover, South Carolina**
Unit Data:	RB#1,1984, CE, 31381 V2RE, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	2.35 MMlb DS/day, 348,900 lb/hr steam, 1500 PSIG, 900^{o}F, 1670 PSIG Design
Incident Date/Time:	November 27, 2018, Earliest Indication: 11/27/2018 at 1:00 AM
Downtime hrs, leak/total:	52 hrs
ESP?	**NO**
Leak/Incident Loc:	Economizer, Economizer tubes within 2" of lower header
How discovered:	Walkdown. Problems with low ash dissolving tank solids supplying the saltcake recovery plant prompted troubleshooting that did identify the leak. The ash solids had been low for over 24 hours. Additional troubleshooting included opening the economizer hopper doors for inspection. The operator could see water running down the economizer walls and hear noise from the leak. With the economizer doors closed no abnormal noise was heard.
Wash adjacent tube:	YES
Root cause:	Fatigue, Suspected root cause is corrosion fatigue (SAC) from the ID since a circumferential crack approximately ¾" long was observed on the ID of one tube sample at the leak location.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Oct-18
Sequence of events:	RB1 economizer hoppers are water flushed and feed the Chemical Ash Tank. The Chemical Ash Tank feeds the SRP Ash Dissolving Tank which is also fed with RB2 dry ash purge. Around 24 hours ahead of identifying the leak, the team was having a hard time keeping the Ash Dissolving Tank level in control and assumed issue was flow restriction due to line pluggage. The line from the Ash Dissolving Tank to the Crystallizer Feed Tank had not been acid cleaned in a long time so it was done at that point. After re-establishing improved good flow from the Ash Dissolving Tank, the team continued to have issues with level control. Technicians verified several water sources were closed / in control that are part of ash system prior to opening an econ 1 ash hopper door and recognizing water getting in to the hopper. Technicians then backtracked up the next 2 floors to verify water was not above the 7th floor by opening boiler doors. At approximately 1:00 am on November 27, 2018 Technicians identified the leak was coming from the Cold Side of Econ. 1 (i.e. Rear Economizer) around 30 feet below the Mud Drum and close to the Right Side wall. At this point operating technicians began orderly shutdown of unit. Management team was also contacted and agreed with assessment to shut unit down in an orderly fashion while monitoring leak visually and using steam / feedwater balance. Operating technicians had also verified with demin / lab technician that boiler chemistry was normal confirming economizer leak. The last liquor gun was pulled at 0850 on November 27, 2018 and Confined Space Entry was initiated around 2330 the same day. Two Economizer tubes were plugged in both the upper and lower headers then, the unit was hydrostatically tested and returned back to service firing the first liquor gun at 1305 on November 29, 2018.
Repair procedure:	Cut out sections of two Economizer tubes and installed four tube plugs. Two plugs were installed in the lower Economizer Header and two plugs were installed in the Upper

	Economizer header.
Future prevention:	During future Outages, perform NDE of select Economizer tubes near lower header connections using technology capable of discovering ID cracks and/or pits (i.e. RT, UT-Phased Array, etc.). Plug tubes or install replacement tube sections as warranted based on inspection results.

ECONOMIZER

FALL 2019-08	
Classification:	Noncritical
Co, Mill, Location:	**International Paper, Pensacola Mill**
Unit Data:	RB#1,1975, B&W, PR171A, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	3.05 MMlb DS/day, 455,000 lb/hr steam, 850 PSIG, 850ºF, 1000 PSIG Design
Incident Date/Time:	January 13, 2019, Earliest Indication: 1/13/2019 at 6:00 AM
Downtime hrs, leak/total:	30.13
ESP?	NO
Leak/Incident Loc:	Economizer, Economizer I, crack on lower bend of Tube #39
How discovered:	Walkdown, Operator recognized water in the east ash hopper
Wash adjacent tube:	NO
Root cause:	Fatigue, After subsequent tube leak on 3/21/19, the tube was cut out for further analysis. Determined the root cause was corrosion fatigue cracks emanating from waterside corrosion pits.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	May-18
Sequence of events:	On the morning of January 13, 2019 a leak was suspected in the economizer section on RB1 due to an operator seeing water leaking around the insulation of the east hopper while making his rounds. Visual confirmation from the hopper door was not possible due to the hopper being plugged. At approximately 6:00am the hopper was cleared and there was water visible in the east hopper on the back hand corner. The decision was made to pull liquor at 6:58am to get a visual of the leak from the economizer boiler door. After reviewing the leak findings with IP Technology the decision was made to run the boiler and liquor firing was reestablished at 11:42am. A plan was put in place to monitor the economizer and boiler until the scheduled outage the following week. On January 15, 2019 at 6:00am the boiler was shutdown to make the economizer repair. The defect was found on tube #39 in Econ 1 and was repaired with weld repair. The boiler was offline for 30.13 hours.
Repair procedure:	Weld repair
Future prevention:	X-Ray all bends in the economizer during the annual outage

ECONOMIZER

FALL 2019-09	
Classification:	Noncritical
Co, Mill, Location:	**International Paper, Pensacola Mill**
Unit Data:	RB#1,1975, B&W, PR171A, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	3.05 MMlb DS/day, 455,000 lb/hr steam, 850 PSIG, 850^{o}F, 1000 PSIG Design
Incident Date/Time:	March 21, 2019, Earliest Indication: 3/21/2019 at 12:30 AM
Downtime hrs, leak/total:	59.5
ESP?	NO
Leak/Incident Loc:	Economizer, Economizer I, crack on lower bend of Tube #39
How discovered:	Walkdown, Operator recognized water in the east ash hopper
Wash adjacent tube:	NO
Root cause:	Fatigue, Tube #39 had corrosion fatigue cracks emanating from waterside corrosion pits
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	May-18
Sequence of events:	On the morning of March 21, 2019 at approximately 12:30am a leak was suspected in the economizer section on RB1 due to an operator seeing water in the east hopper while making his rounds. Liquor was pulled from the boiler at 10:30am and operations inspected the economizer section. The leak was identified from the lower economizer door. It was a small leak blowing down into the hopper from Econ I on a lower bend approximately in the middle of the boiler. The decision was made to continue to fire liquor and monitor the leak until the next scheduled outage. The monitoring plan included: • Bypass mix tank to protect firing liquor from dilution. • Stressed the importance to not become complacent with this leak before the repair is made. • Every 2 hours the Tech II recovery will be expected to monitor the economizer hopper for visual inspection and indication of whether the leak is growing. • TLB Recovery will be expected to trend the steam/feed water split for indications that the leak is growing. • Both of these observations are documented • FLL are to follow up and ensure these actions are taking place every 2 hours. • Any abnormal changes shall be communicated immediately to the FLL and APM. • Continue to react to boiler upsets with respect to ESP as we always have. DO NOT ASSUME THAT A SUDDEN BOILER UPSET IS DUE TO THIS ECONOMIZER LEAK AND DOES NOT REQUIRE AN ESP. Sudden changes in furnace pressure, drum level, steam flow, furnace stability, etc., must be evaluated as they always have been, and the decision to ESP or not will be based on these observations. The leak worsened and the leak detection system indicated a small separation on April 7, 2019 at approximately 12:30am. A boiler walk down was completed, liquor was pulled from the boiler at 3:00am and with visual confirmation we were confident that the economizer leak had worsened. The leak detection alarmed cleared and we resumed firing liquor. The leak detection once again indicated a small separation and at that time the decision was made to shut the boiler down in a controlled manner and repair the leak. Liquor was pulled from the boiler at 9:00pm on April 7, 2019. A Dutchman was installed

	on tube #39. RB1 achieved a good hydro at 7:29am on April 9, 2019 and the boiler resumed firing liquor on April 10, 2019 at 8:30am.
Repair procedure:	Installed a dutchman
Future prevention:	X-Ray all bends in the economizer during the annual outage

TUBE BELOW FLOOR

FALL 2019-10	
Classification:	Noncritical
Co, Mill, Location:	WestRock, Panama City Florida
Unit Data:	RB#2, Combustion Engineering, Contract No. 27070, 1971 Startup, Drums - 2, DCE - Cascade, Floor - Decanting
Unit Size:	2.7 MMlb DS/day, 398,000 lb/hr steam, 450 PSIG, 750 ^{o}F, 570 PSIG Design
Incident Date/Time:	May 21, 2019 6:39 am., Earliest Indication: 5/20/2019 at 5:30 pm.
Downtime hrs, leak/total:	72.9 hr offline / 77.0 hr off liquor
ESP?	**YES**
Leak/Incident Loc:	Leak in a wall tube in the lower vestibule under the boiler floor
How discovered:	Operator round.
Wash adjacent tube:	No
Root cause:	Stress crack at termination of a membrane weld
Leak detection:	Yes
Bed cooling enhanc	Yes
Last full inspection:	May 2019.

Sequence of events:	• The boiler was started up from the annual outage on 5/16/19 at 11:30 pm and was on liquor 5/17/19 at 12:55 pm. • Around 5:30 pm on 5/20/19 an operator observed a mist of water in the #1 spout area which is the spout on the right wall closest the front side of the boiler. The shift supervisor investigated and notified the Powerhouse Superintendent. The area maintenance supervisor was called out and came to the mill to evaluate the spout area. No water was observed entering the smelt bed. The boiler continued in operation through the night and the area was monitored. • At 6:15 am on 5/21/19 the Powerhouse Superintendent and the Recovery Assistant Superintendent inspected the spouts and observed a mist and water vapor around the spouts and the spout attachment plates to the boiler at all six spouts. The ESP on the boiler was initiated at 6:39 am on 5/21/19. • Called Southland Fire to cool the smelt bed. They arrived at 6:00 pm on 5/21/19 and had the bed cooled at 2:00 am on 5/22/19. • Hydro tested the boiler and found a leak on the 1st tube on the rear end of the middle wall tube bottom header of the left hand wall. The leak was under the boiler floor in the lower vestibule at the termination of the membrane. • The leak was ground out and weld repaired. • The bed was removed from the boiler by Deep South Industrial to inspect the floor of the boiler. • The boiler was hydro tested and no additional leaks were found. • The spouts were repacked and the lime bed put back in the boiler. • The boiler was fired at 1:35 am on 5/24/19, online at 7:30 am 5/24/19 and on liquor at 11:40 am 5/24/19.
Repair procedure:	Ground out the crack and weld repaired
Future prevention:	None

SUPERHEATER

FALL 2019-11	
Classification:	Noncritical
Co, Mill, Location:	**Verso Wisconsin Rapids**
Unit Data:	RB#2, 1976, Alstom, 27074, Drums - 2, DCE - Cascade, Floor - Decanting
Unit Size:	1.6 MMlb DS/day, 200,000 lb/hr steam, 1275 PSIG, 900^{o}F, 1450 PSIG Design
Incident Date/Time:	April 6, 2019 Earliest Indication: 4/6/2019 at 2:10am
Downtime hrs, leak/total:	108
ESP?	**YES**
Leak/Incident Loc:	Superheater, LTSH II Platen 19
How discovered:	Walkdown, Operator heard extremely loud sounds on 1st through 3rd floors.
Wash adjacent tube:	NO
Root cause:	Short term overheating, Did not clear the superheater during startup
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	June 2018 (June 2019)

Sequence of events:

4/3/2019 Wednesday 9:05pm

- Liquor out of recovery boiler for cascade wash and precipitator repairs.
- Boiler was maintained at 100lbs pressure during maintenance work.

4/6/2019 Saturday 1:41am

- Fired liquor in the boiler for the first time after precipitator maintenance.

2:10am Tripped due to low drum level.

- High furnace pressure which blew 1st floor primary doors.

2:23am ESP executed due to extremely loud, unusual sounds coming from the gun and spout areas.

2:34am – 6:34am 4 hour safety hold

6:34am Preliminary inspection

- Began 12 hour bed cool down

7:34am – 11:34am Developed a repair plan with Jamar

5:30pm Checked the bed temperature. The bed was flat with a max surface temperature of 110°F.

- Installed the backfill spool piece.

6:30pm Started backfilling SH to identify leak.

- Leak identified in lower section of intermediate SH at the north side.
- Full hydro was not performed.

8:00pm Started the water wash for confined space entry.

- Water wash focused on the center of the generating bank through to the front wall. The back of the gen bank and the economizer were not washed.
- Fireside and waterside lock out started. The boiler could not be fired on gas to dry because it could not build pressure with the SH leak.

4/7/2019 Sunday 7:00am

- Initial water wash completed.
- Inspected the boiler and determined that the remaining buildup was significant and needed further washing.

8:30am Resumed water wash

- Focused on cleaning buildup from the boiler floor

12:00pm Manually ran IK6 to remove the remaining clinkers on the south east and south west corners.

1:00pm Water wash completed.

- Externally inspected the boiler.

2:00pm Fireside lockout completed and verified.

- Waterside lockout completed and verified.
- Not necessary to drain the boiler.

2:30pm Gas gun removed for vacuuming.

- Platinum built scaffolding for the Hydroblasters to reach the second floor to vacuum.

3:30pm

- Hydroblasters vacuumed the boiler floor

4:30pm Platinum began building scaffolding up to the leak with access on the 5th floor.

9:30pm Scaffolding completed.

- Jamar began tube repairs.

4/8/2019 Monday 11:30pm

- Jamar completed tube repairs with guidance from BSI. Acuren x-rayed all welds and they passed.
- Unlocked waterside for hydro

4/9/2019 Tuesday 12:30am

- Filled boiler for hydro and began building pressure.

1:45am Reached 1150 psi. External inspection passed.

	2:10am Dropped pressure to 400 psi. Internal inspection passed. • Began hydroblasting spout refractory to clean spouts for patching.
Repair procedure:	Repairs consisted of replacing the lower hockey loop, realigning the loop, and adding a single tube dutchman to close the resulting gap from the alignment.
Future prevention:	Revised the warm up curve to be more conservative at 75°F/hr when starting up a dirty furnace. During the DCS upgrade, superheater thermocouples will be added to the operator's controls to monitor tube clearing trends during start up.

SUPERHEATER

FALL 2019-12	
Classification:	Noncritical
Co, Mill, Location:	**Verso Wisconsin Rapids**
Unit Data:	RB#1, 1967, Alstom, 1166, Drums - 2, DCE - Cascade, Floor - Decanting
Unit Size:	1.6 MMlb DS/day, 200,000 lb/hr steam, 1275 PSIG, 900^{o}F, 1450 PSIG Design
Incident Date/Time:	April 25, 2019 Earliest Indication: 4/25/2019 at 9:55am
Downtime hrs, leak/total:	105
ESP?	**No**
Leak/Incident Loc:	Superheater, LTSH II Platen 2 Tube 5

How discovered:	Walkdown, Operator heard leak on 5th floor
Wash adjacent tube:	NO
Root cause:	Stress cracking, External thermal fatigue crack
Leak detection:	NO
Bed cooling enhanc	NO
Last full inspection:	June 2018 (July 2019)

Sequence of events:

4/25/2019 Thursday 9:55am

- Operator was doing boiler walk down inspection when he heard what sounded like a superheater leak on the 5th floor. He confirmed what he had heard with another operator and then began an orderly shutdown and bed burn-out.

11:51am Liquor out of the boiler.

- Installed bed thermocouples

12:00pm Preliminary inspection from oval door on the second floor – SE side.

- Started bed cooling

1:00pm Worked with boilermakers and scaffolders to develop repair plan.

- Contacted BSI

4/26/2019 Friday 4:00am

- Checked the bed temperature. Bed below 800°F and cooling complete.

5:00am Installed backfill spool piece.

- Backfilled the superheats to identify the leak location.
- Leak location not identified at this time.

6:30am Began water wash for confined space entry. The back of the generating bank and the economizer were not washed.

7:00am Fireside lock out started

- Waterside lock out started

8:00am Inspected the spouts

4:00pm Opened all the superheater doors to inspect the water wash progress.

- Directed crew to target build-up areas along the secondary superheater loops by running sootblowers 6, 7, and 8.

5:00pm Inspected the spouts again.

- Determined that the refractory on the smelt spouts needed repacked.

8:00pm Water wash completed.

- Closed all furnace doors.

8:30pm Began drying out the boiler using steam coiled air heaters. Tube temperature measured 76°F. Air temperature maxed out at 238°F.

9:30pm Tube temperature retested and measured 118°F.

4/27/2019 Saturday 1:50am

- Completed drying the furnace. Temperature reached 191°F at the 5th floor manhole.
- Began boiler cooling using fans.
- Began externally inspecting the boiler.

2:30am Finished external inspection.

- Determined the boiler did not need to be drained.

3:30am Opened doors as needed to assist with cooling.

4:45am Boiler internal temperature at 106°F. Tested at 2nd floor manhole.

- Thermal probes were removed from the bed.

5:30am Boiler cooling complete.

6:30am Removed the FD fan jumpers.

- Met with Platinum to discuss scaffolding plan. They will build from the ground floor and deck the low temp SH section, and then they will backfill as needed.

7:30am Fireside lock out complete. Extra time and discussion was necessary to confirm the cards from the igniters had been properly locked out.

- Removed the NE gas gun burner for vacuuming. The igniter was not removed.
- Vacuumed the water from the furnace.
- Platinum began scaffolding

8:30am Confined space air check passed both on the 1st and 2nd floors.

12:00pm Scaffolding built.

- Backfilled the superheats to identify the leak location.

1:00pm Leak identified with RMR and BSI. Location: SE pendant 2nd row in LTSH II.
3:30pm Completed waterside lockout.

- RMR began tube repairs. Piping, hinge pins, and loop were prepared for RMR to use. Leak was in Platen 2 Loop F1.

10:20pm RMR completed initial tube repairs. Ready for Acuren inspection.
4/28/2019 Sunday 1:20am

- Acuren inspected 3 welds using x-ray. 2 welds passed, and 1 weld failed inspection.
- RMR repaired the failed weld.
- Acuren retested the weld and it passed x-ray inspection.

2:00am RMR installed hinge pins.

- Unlocked waterside.

2:30am Began hydrotest procedure.
5:40am Boiler pressure increased to 1100 psig. Pressure was held for 20 minutes while BSI and mill management performed an external inspection. No leaks were found.
6:00am Boiler pressure was reduced to 450 psig. BSI and mill management performed an internal inspection, and no leaks were found.

Repair procedure:

Repairs consisted of replacing the lower loop designated as the F1 loop. An old weld line would have been left approximately two inches above the new cut line, mill elected to consume this weld at BSI's recommendation by installing an eighteen inch dutchman in tube two directly above the loop weld line. Old loop material was specified as .240 wall SA213 T11 and was replaced with .240 wall SA213 T22, an

	upgrade to the existing.
Future prevention:	Replaced 5 F1 loops and 1 inner hockey stick during the annual outage. More material is onsite. The platens will be monitored closely during each annual outage using NDE testing and replaced as needed.

SUPERHEATER

FALL 2019-13	
Classification:	Noncritical
Co, Mill, Location:	**International Paper, Prattville Mill**
Unit Data:	RB#2,1980, Combustion Engineering, 20278-V2RE, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	3.2 MMlb DS/day, 510000 lb/hr steam, 1500 PSIG, 900ºF, 1720 PSIG Design
Incident Date/Time:	May 1, 2018, Earliest Indication: 5/1/2018 at 12 am
Downtime hrs, leak/total:	0
ESP?	NO
Leak/Incident Loc:	Superheater, Pinhole Leak Front PSH Outlet Panel 9 Tube 2 from rear side, inside crown seal
How discovered:	Other, Discovered during water fill for temperature prior to acid clean
Wash adjacent tube:	NO
Root cause:	Stress Assisted Corrosion (SAC), Cold side corrosion, loss of refractory in the crown seal
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Apr-18
Sequence of events:	During 2018 Spring Annual outage, post inspection and repairs, boiler was filled with water in preparation for acid cleaning. Operations decided to do a visual inspection from boiler openings to ensure there were no obvious leaks before the acid clean began. Water was identified near superheater tube penetration through the roof tubes. Used camera and dropped level in the boiler to help us determine that leak was a superheater leak and not a roof tube leak. Acid cleaned boiler and then prepared boiler for entry for removal of crown seal and repair.
Repair procedure:	All four tubes in crown seal were cut out and replaced
Future prevention:	Mill will be inspecting additional tubes at crown seal in 2019, will use inspection results to determine timing of superheater section replacement.

SUPERHEATER

FALL 2019-14	
Classification:	Critical #914
Co, Mill, Location:	**Verso Co, Androscoggin, Jay, Maine**
Unit Data:	RB#2,1976, B&W, PR-182, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	3.0 MMlb DS/day, 365,000 lb/hr steam, 900 PSIG, 810ºF, 1050 PSIG Design
Incident Date/Time:	January 18, 2019, Earliest Indication: 1/18/2019 at 0039
Downtime hrs, leak/total:	134.5
ESP?	YES
Leak/Incident Loc:	Superheater, Secondary superheater just below roof; 2 Furnace screen leaks found on hydro.
How discovered:	Control Room, Excessive differential detected and confirmed by operator
Wash adjacent	NO

tube:	
Root cause:	Fatigue, Metal fatigue
Leak detection:	YES
Bed cooling enhanc	YES
Last full inspection:	Aug-18
Sequence of events:	At 0039 control room operator got a low drum level alarm, they were unable to increase drum level. Thought that the issue may have been for lack of available feedwater, the operators then opened the crossover valve to the other feedwater system. At 0045 the control room operator called the shift supervisor and power plant operator to inform them of the situation. The shift supervisor boiler operator went to the 9th floor to look and listen and the power plant operator went to the ground floor to check drain temps. At this point it was noticed that there was approximately 50 kpph of steam/feedwater differential. At 0055 shift supervisor called to shut the sootblower steam PCV and put sootblowers in hold. Once sootblower steamflow went to 0 kpph a superheater inspection door was opened and shift supervisor and operator heard what they determined was a large leak and immediately called for an ESP at 0103. A headcount of all personnel was performed. All functions of the ESP worked as designed and were double check in a field verification checklist after the 4 hour wait period. The boiler was inspected top to bottom and no immediate indication of a failed boiler component. There were several areas of the bed that had piling and were probed and liquid CO2 was injected. All areas of bed were below 500 Deg F after 16 hours. A hydro was performed to identify the failed component. A failed secondary superheater tube was identified. The failed secondary superheater tube was located on platen 13 tube 7 approximately 6" from roof tubes. A 4' Dutchman was installed below the failure and above in the penthouse. Other tubes in the area were NDE'ed and nothing was found. In addition to the superheater tube visible indications of water were found on the horizontal sections 2 screen tube platens during the identification hydro. Staging was built from the furnace floor to inspect/repair indications. Leaks were on screen tube platens 8 and 11 both on tube 1, indications at the toe of the membrane weld propagated into the tube. A similar indication was found on tube 1 of platen 12. All other areas were NDE'ed and it was decided to do five 3' Dutchman on platens 5 & 7 both tube 1 for further testing, platen 12 tube 1 for similar indication and platens 8 & 11 both tube 1 for leaks
Repair procedure:	Superheater dutchman
Future prevention:	Lower sootblower pressures in superheaters

SUPERHEATER

FALL 2019-15	
Classification:	Noncritical
Co, Mill, Location:	**Verso Co, Androscoggin, Jay, Maine**
Unit Data:	RB#RB2,1976, B&W, PR-182, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	3.0 MMlb DS/day, 365,000 lb/hr steam, 900 PSIG, 810ºF, 1050 PSIG Design
Incident Date/Time:	February 19, 2019, Earliest Indication: 2/19/2019 at 0530
Downtime hrs, leak/total:	74
ESP?	YES
Leak/Incident Loc:	Superheater, Secondary superheater just below roof
How discovered:	Control Room, Excessive differential detected and confirmed by operator
Wash adjacent tube:	NO
Root cause:	Fatigue, Metal fatigue

Leak detection:	YES
Bed cooling enhanc	YES
Last full inspection:	Aug-18
Sequence of events:	At 1730 the control room operator noticed that the boiler had elevated steam to feedwater differential 40-45 mpph. Operators looked in to whether the differential was caused by the recent increase in continuous blowdown flow. Supervisor decided to pull liquor and do a thorough walkdown to confirm or deny suspicions. The CBD was reduced to 13 gpm from 32 gpm and still the boiler had elevated differential. Liquor was out by 1854 with 4 natural gas auxiliary burners in. Operations crew started the walkdown and heard what was thought to be a significant leak coming from the penthouse, they immediately called for an ESP. ESP was initiated at 1927. A headcount of all personnel was performed. All functions of the ESP worked as designed and were double checked in a field verification checklist after the 4 hour wait period. The boiler was inspected top to bottom and no immediate indication of a failed boiler component. There were several areas of the bed that had piling and were probed and liquid CO2 was injected. All areas of bed were below 500 Deg F after 8 hours. A hydro was performed to identify the failed component. A failed secondary superheater tube was identified. The failed secondary superheater tube was located on platen 13 tube 8 approximately 3" above roof tubes. A 4' Dutchman was installed below the failure and above in the penthouse. Other tubes in the area were NDE'ed and nothing was found. In addition to the superheater tube a leak was found on the secondary SH header drain approximately 2" from header. A weld repair was made per our policy. Another hydro 850 psi was performed and no other leaks were found.
Repair procedure:	Superheater dutchman
Future prevention:	Lower sootblower pressures in superheaters and changed nozzle type

SUPERHEATER

FALL 2019-16	
Classification:	Noncritical
Co, Mill, Location:	**Evergreen Packaging, Pine Bluff, AR**
Unit Data:	RB#3,1959, Babcock & Wilcox, PR-60, Drums - 2, DCE - Cyclone, Floor - Sloped to Front
Unit Size:	1.4 MMlb DS/day, 205,000 lb/hr steam, 1250 PSIG, 850ºF, 1275 PSIG Design
Incident Date/Time:	July 20, 2019, Earliest Indication: 7/20/2019 at 6:00 pm
Downtime hrs, leak/total:	68
ESP?	YES
Leak/Incident Loc:	Superheater, secondary outlet
How discovered:	Boiler Trip, High furnace pressure & low drum level
Wash adjacent tube:	NO
Root cause:	Overheat, Plugging and channeling of flue gas
Leak detection:	NO
Bed cooling enhanc	YES
Last full inspection:	Jan-19
Sequence of events:	At approximately 6:00 PM on July 20th, Recovery Boiler #3 (RB3) tripped on high furnace pressure. After walking the boiler down after RB3 tripped, a loud noise could be heard near the wall of the Secondary Superheater section of the boiler. At that time, the decision was made to initiate the ESP. The failure was due to overheating of the tube. The liquor flow (99 gpm) was being picked up on the boiler throughout the day. As the fuel was being added, the superheater loop temperatures were increasing. The operator was increasing the de-superheating water for temperature control when the tube ruptured. This particular superheater tube was in an area that was well above the 941 degree upper limit alarm as the flue gas was channeling through this area due to plugging in the adjacent sections.
Repair procedure:	Dutchman was installed
Future prevention:	Reviewed SOP w/ operator, Superheater replacement – November 2020

ROOF

FALL 2019-17	
Classification:	Critical #915
Co, Mill, Location:	WestRock Hopewell, VA
Unit Data:	RB#, B&W, PR-196, Drums - 2, DCE - No, Floor - Sloped Bottom.
Unit Size:	3.2 MMlb DS/day, 496 lb/hr steam, 1250 PSIG, 900 ºF, 1475 PSIG Design
Incident Date/Time:	March 27, 2019 Earliest Indication: 3/27/19 at 2 PM.
Downtime hrs, leak/total:	120.5 hours between water wash and successful leak repair.
ESP?	No
Leak/Incident Loc:	Roof tube in penthouse, inside steam drum tube hole.
How discovered:	Hydro of boiler after water wash.
Wash adjacent tube:	No.
Root cause:	Exterior stress corrosion cracking.

Leak detection:	No.
Bed cooling enhanc	No.
Last full inspection:	April 2018.
Sequence of events:	A Nalco representative started to notice a discrepancy between the combination and recovery boiler cycle readings. Mill personnel was notified on 3/23/19 at 8 PM, and multiple walk downs of the boiler occurred to look for leaks. The cycles continued to be monitored and routine walkdowns of the boiler occurred until the Recovery Boiler was taken down for a water wash on 3/25/19 at 4:30 AM. Prior to start-up, the boiler was hydro'd (3/27/19 at 2 PM) and first indication of a leak occurred in the penthouse at 150 psi. The damaged section of the roof tube was cut out and the tube stub was replaced. The weld repair was X-rayed before putting the boiler back online. At the time the leak was discovered, the boiler was offline with no smelt bed present.
Repair procedure:	Tube stub replacement.
Future prevention:	Inspection of area on annual outage.

UPPER FURNACE

FALL 2019-18	
Classification:	Noncritical
Co, Mill, Location:	**7530 Hwy 114, Pennington, AL 36916**
Unit Data:	RB# 4, 1993, B&W, PR-220, Drums - 1, DCE - No, Floor – B&W Sloped.
Unit Size:	5.4 MMlb DS/day, 883,000 lb/hr steam, 1300 PSIG, 905^{o}F, 1625 PSIG Design
Incident Date/Time:	9/4/19 6:30 AM Earliest Indication: 9/4/19 at 6:30 AM
Downtime hrs, leak/total:	26 hours
ESP?	**No**
Leak/Incident Loc:	Cold side leak on 1st tube RS wall steam enclosure panel.
How discovered:	Operator basic care (OBC) route on recovery boiler
Wash adjacent tube:	No
Root cause:	Stress in tube wall where weld was not wrapped around membrane from original boiler construction
Leak detection:	Nalco
Bed cooling enhanc	No
Last full inspection:	May 2019
Sequence of events:	The boiler had been in normal operation since a scheduled ring header wash on 8/27/19. The first indication of the leak was approximately 6:30 AM on Wednesday, 9/4/19. An operator performing his basic care route identified the leak audibly. Additional recovery staff were contacted to investigate at which time lagging and insulation were removed to visibly identify the leak at approximately 7:30 AM and confirm it was a steam leak on the cold side on the RS wall steam enclosure panel. The decision was made to proceed with an orderly shutdown of the boiler and the boiler was offline at 10:45 AM. From this point, B&W was contacted to confirm metallurgy, boiler pressure parts were locked out, a weld repair plan was developed, and the repair was made with assistance an NDE contractor followed by a successful hydro. The overall shutdown duration was 26 hours.
Repair procedure:	The base metal was restored on this tube followed by a hydro that revealed no leaks.
Future prevention:	The weld repair also included cutting the membrane back and wrapping the weld around

	the end of the membrane.

LOWER FURNACE, BELOW HIGHEST AIR ENTRY

FALL 2019-19	
Classification:	Noncritical
Co, Mill, Location:	**Canfor Pulp Limited, Northwood RB5, Prince George, BC**
Unit Data:	RB#5,Started 1982, CE, CA79120, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	3.45 MMlb DS/day, 558,800 lb/hr steam, 652 PSIG, 752ºF, 800 PSIG Design
Incident Date/Time:	April 14, 2019, Earliest Indication: 4/14/2019 at 2310
Downtime hrs, leak/total:	193 hours
ESP?	NO
Leak/Incident Loc:	Lower Furnace, below highest air entry, Cold side attachment weld leak on Rear Wall Tube 23, 2'-6" below 3rd floor LH side, near nozzle port "A". Exterior to boiler, orderly shutdown initiated, no ESP completed.
How discovered:	Walkdown,
Wash adjacent tube:	NO
Root cause:	Weld Failure, Cold side tack weld to tube, rear wall LH Upper Secondary Airport seal box vertical attachment.
Leak detection:	NO
Bed cooling enhanced:	NO
Last full inspection:	Nov-18
Sequence of events:	External tube leak observed rear left side of boiler 3rd floor 11pm. Wisp of steam noticed by Shift engineer "A" nozzle port 3rd floor (north west side of boiler) 11pm. Further inspection revealed water dripping between cladding and boiler. No chemical residual changes indicating tube leak, phosphate stable, pH stable, silica rising, alkalinity stable. No bed blackout or feed water to steam mass flow imbalance. Gathered small sample of leaking water – checked for boiler feed phosphate and was positive. 1st liquor nozzle out 11:10pm, all liquor out 11:25pm. Visual inspection showing possible external leak only. All gas out of boiler 12:34 am.
Repair procedure:	Weld repair. Also: 5 superheater stitch welds repaired on primary and secondary superheater platens, •Boiler tube RW 95 at the new tube/old tube interface removed to check 2018 chemical cleaning effectiveness and feedwater quality. (Confirmed as excellent on both counts). •Eight, 10 tube panels (2 panels per wall) had PT completed. 2 cracks were found on the FW and were chased out. -The carbon tube portion was filled then stainless steel weld overlay completed over top. -All wall panels checked had a few, very small horizontal indications that were consistent with years of previous inspections (less than 1/4" and fine enough that only dye penetrant identified them).
Future prevention:	

LOWER FURNACE, BELOW HIGHEST AIR ENTRY

FALL 2019-20	
Classification:	Critical #916
Co, Mill, Location:	**Woodland Pulp LLC, Baileyville ME**
Unit Data:	RB#3,1989, Gotaverken, 711220, Drums - 1, DCE - NO, Floor - Sloped to Front
Unit Size:	5.4 MMlb DS/day, 800,000 lb/hr steam, 900 PSIG, 825ºF, 1150 PSIG Design

Incident Date/Time:	October 10, 2018, Earliest Indication: 10/10/2018 at 10:00
Downtime hrs, leak/total:	Extended annual outage by ~ 16 days
ESP?	NO
Leak/Incident Loc:	Lower Furnace, below highest air entry, Left Wall Tube #39 from spouts, 40" above composite cut line in carbon tube
How discovered:	Hydro Test, Annual outage hydro before startup
Wash adjacent tube:	NO
Root cause:	Thinning External, internal deposit / thermal stress and external corrosion per MET analysis
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Oct-17
Sequence of events:	The morning of 10/10/18 a hydro was performed on RB3 prior to startup from annual outage. A leak was discovered at tube 39 on the left hand side wall from the spouts wall, about 40 inches above the composite cut line in carbon tube. This tube is under the bullnose and is typically covered with a thin slag layer on outages as it does not get effectively waterwashed. Once the tube was removed for dutchman repair, it was found to have a thick waterside deposit near the leak on the hotside and to be externally deformed. The tube was sent for MET analysis. The entire sidewalls under the bullnose were hydroblasted and cleaned with a 90° fire nozzle. Two other tubes were then found nearby that appeared deformed; Tube 37 at approximately the same elevation, and Tube 43 about 9 feet above the composite cut line. These were NDE'd, and although they were above flag thickness, they were well below normal readings in the area and were also replaced with dutchmen. Similar localized deposits were found in these tubes, as Tube 39. With the walls totally cleaned, the entire furnace was robotically NDE'd, Xray was performed in the area of the composite line, swages, and floor, and no other issues were found. The OEM also performed non-destructive DWD of the lower furnace and results were 20 – 30 gm/sq ft, especially in the area of the leak, with lower readings closer to the floor. Actual DWD samples of the removed tubes supported this. These results combined with the local heavy deposits prompted the mill to schedule an emergency chemical cleaning of the boiler.
Repair procedure:	Dutchman repair
Future prevention:	Improved sidewall cleaning under bullnose for more complete inspection, new chemical cleaning policy for recovery boiler, increased NDE in this area.

INTERNATIONAL INCIDENTS

FURNACE FLOOR

FALL 2019-x1165	
Classification:	
Co, Mill, Location:	**International Paper, Kwidzyn Poland**
Unit Data:	RB#, 1977, Babcock & Wilcox, BWC 141-7380, Drums - 2, DCE - NO, Floor - Sloped to rear
Unit Size:	4.740 MMlb DS/day, 672,400 lb/hr steam, 940 PSIG, 825^{o}F, 7.76MPag / 1,125 PSIG Design
Incident Date/Time:	May 23, 2019, Earliest Indication: 5/23/2019 at 12:00 pm
Downtime hrs, leak/total:	118hr
ESP?	YES
Leak/Incident Loc:	Furnace Floor, in front of smelt spout # 2
How discovered:	Leak Detection System, Walk down
Wash adjacent tube:	NO
Root cause:	Thermal Fatigue, Crack was found approximately 2" long on tube 58 along the tube side toe of the membrane fillet weld.
Leak detection:	YES
Bed cooling enhanc	YES
Last full inspection:	Apr-18
Sequence of events:	1. On 5/23/2019 at 12:00 pm smelt spout no.2 plugged. 2. On 5/23/2019 Around 2:00 pm No. 2 spout still plugged and primary airport No.10, between # 2, # 3 smelt spout was blacked out. 3. The steam-water balance was checked, the difference was up to 5t / h. 4. On 5/23/2019 at 2:47 ESP"d the boiler. 5. Bed cooling enhancement ended on 5/24/2019 at 7:20 PM. Bed temperature was 695 F. 6. Started water washing the boiler at 8:45 PM on 5/24/2019. Water wash was completed at 10:15 AM on 5/25/2019. 7. Boiler locked out and contractor started working at 11:00 PM on 5/25/2019. 8. Contractor completed work on 5/27/2019 at 1:00 PM. 9. Hydro completed at 12:30 AM on 5/28/2019. 10. First fire in the boiler at 5:20 AM on 5/28/2019 11. Boiler on line at 1:05 PM on 5/28/2019
Repair procedure:	Two floor tubes were replaced, along with knuckle bend in front of smelt spout # 2, about 1m long
Future prevention:	Annual outage June 2019 - Replaced 13 tubes, in the smelt spouts area, all the tubes were tested at a width of about 2 meters (6.56 feet) in the area of the rear wall.

BOILER BANK

FALL 2019-x1169	
Classification:	
Co, Mill, Location:	**International Paper do Brasil, Luiz Antônio**
Unit Data:	RB#1991 /2005,CBC, CBC / Andritz , 19463, Drums - 2, DCE - NO, Floor - Decanting
Unit Size:	3.307 MMlb DS/day, 529,109.04 lb/hr steam, 1109 PSIG, 842°F, 1123 PSIG Design
Incident Date/Time:	April 23, 2019, Earliest Indication: 4/23/2019 at 15:00 (GMT-3)
Downtime hrs, leak/total:	26 h
ESP?	NO
Leak/Incident Loc:	Boiler Bank, 6th floor level
How discovered:	Walkdown, A small noise was identified, after the insulation removal we found external humidity
Wash adjacent tube:	NO
Root cause:	Thermal Fatigue, Improper welding procedure to allow for the tube thermal expansion in a weld attachment caused a crack in the tube to attachment weld area.
Leak detection:	YES
Bed cooling enhanc	NO
Last full inspection:	Jan-18
Sequence of events:	During the Recovery Boiler's field operator walk down inspection a small noise was identified next to the mud drum (6th floor). After removing the Insulation an external humidity was found, with the removal of the casing, we identified a leakage in the side wall tube of the boiler bank. The decision was made to do an ordinary shutdown of the boiler. The leak was a crack propagated from a welded plate between the tube and the 6 inches U-profile of the closing casing. In conjunction with Operation, Maintenance, Reliability and IP CTC we decided to remove the crack and repair by welding, tracking by penetrant Test (PT) and approved by Hydro testing.
Repair procedure:	• Remove the crack and repair by welding, tracking by penetrant Test (PT) and approved by Hydro testing.
Future prevention:	Perform on next Annual Outage NDT Preventive Inspection on elevation +28000 mm (mud drum) and +39150 mm (Steam drum) to ensure no more constrained welding was improperly executed.

APPENDIX II
ESP POWER POINT PRESENTATION
Note: Some of the diagrams below might be reproduced in the ESP report above.

Meeting Attendance

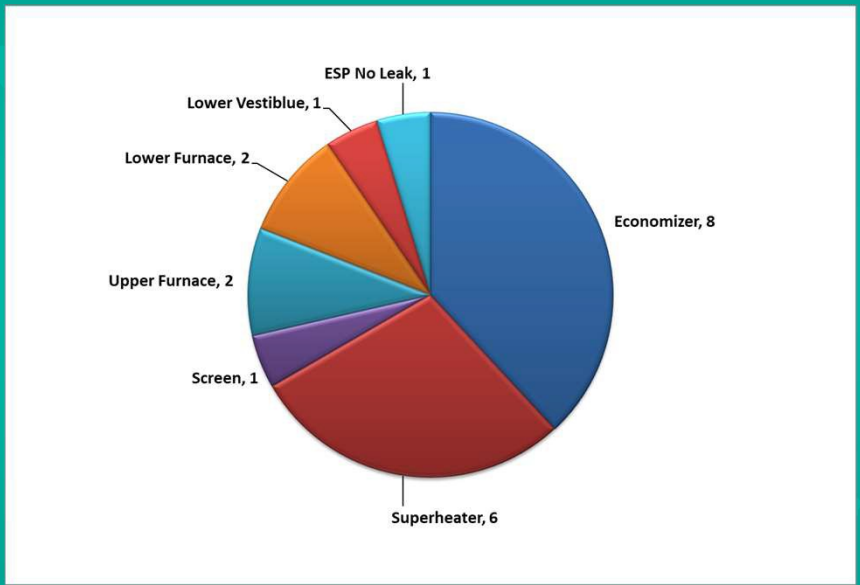
- Closed session Monday Oct 14th
  - 11 members represented
  - Dave Slagel resigned from Subcommittee
- Open session Tuesday Oct 15th
  - 11 members
  - About 190 guests

Incident Questionnaire Review

- 20 North American incidents
  - No Smelt Water or Dissolving Tank Explosion
  - 5 Critical
  - 14 Non-critical
  - 1 ESP w/ No Leak
  - 7 ESP'd
    - 1 Critical
      - 33% of Critical that Should ESP
- 2 International Incident Submitted

3

Incident Locations



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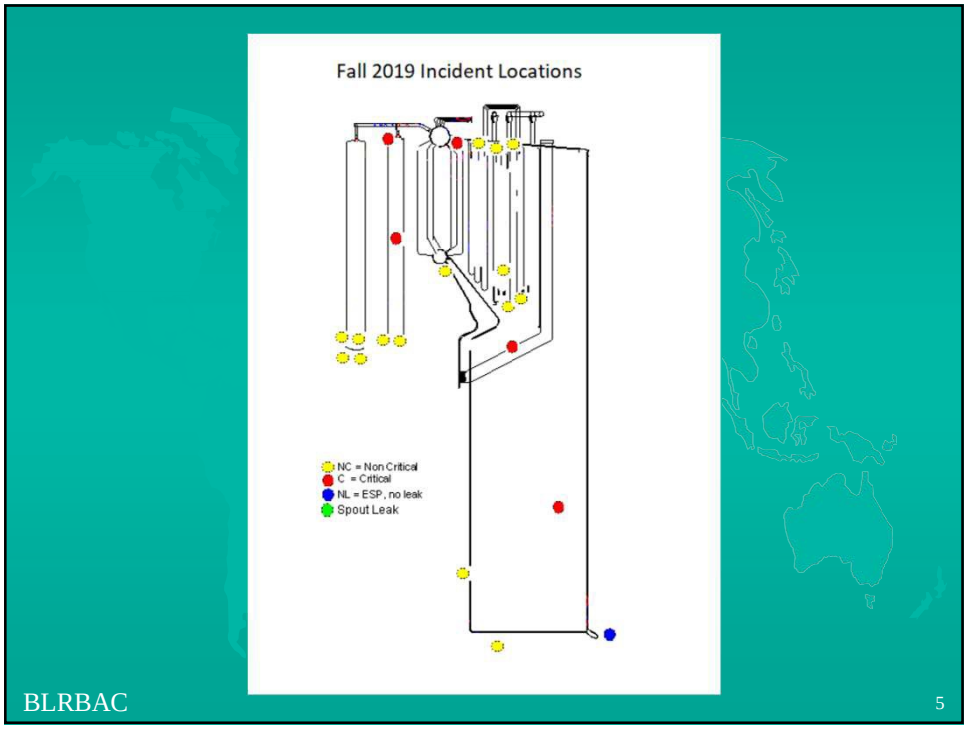
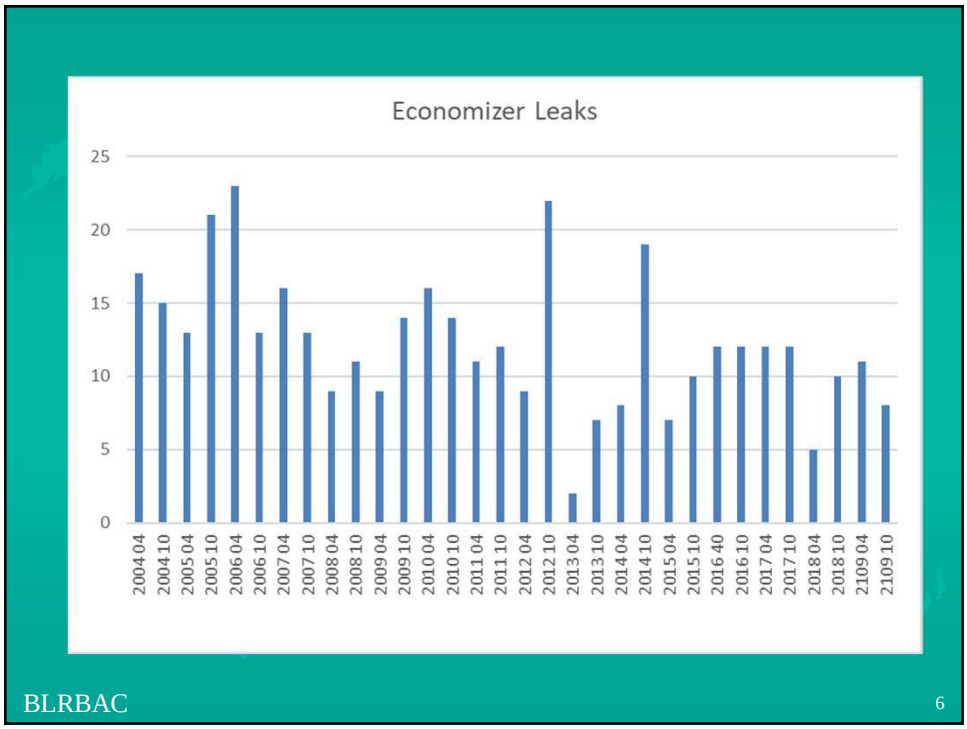

Fall 2019 Incident Locations
NC = Non Critical
C = Critical
NL = ESP, no leak
Spout Leak
BLRBAC
5

5


Economizer Leaks
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20
15
10
5
0
2004 04
2004 10
2005 04
2005 10
2006 04
2006 10
2007 04
2007 10
2008 04
2008 10
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2018 04
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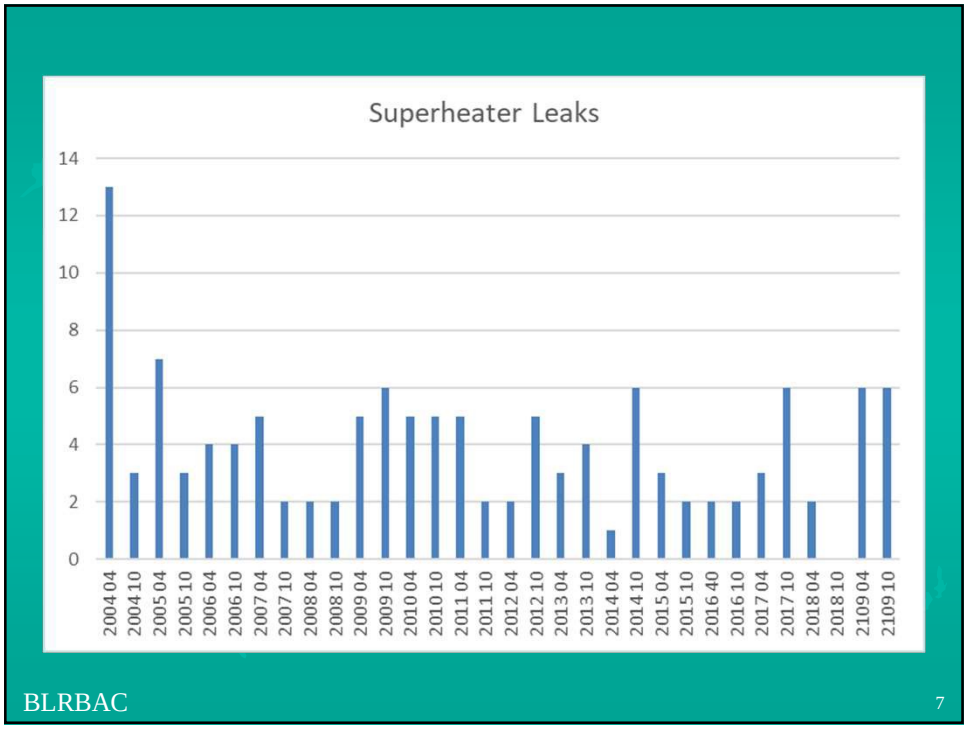
2109 04
2109 10
BLRBAC
6

6


Superheater Leaks
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12
10
8
6
4
2
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2004 04
2004 10
2005 04
2005 10
2006 04
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2007 04
2007 10
2008 04
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BLRBAC
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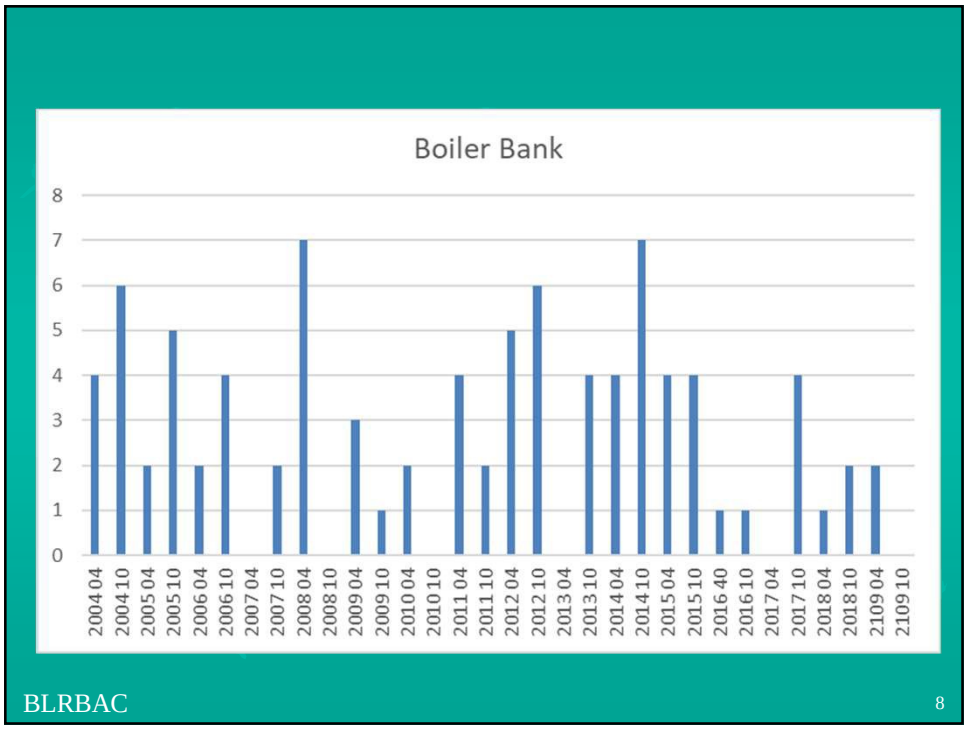
7


Boiler Bank
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7
6
5
4
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1
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2004 10
2005 04
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2006 04
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BLRBAC
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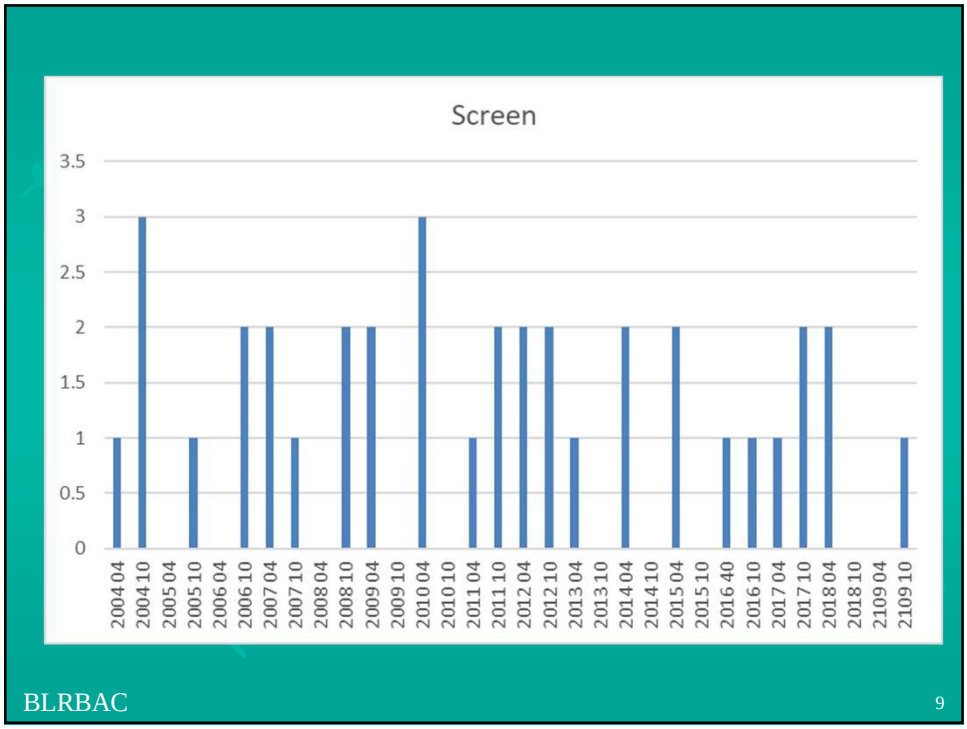
Screen
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3
2.5
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2004 04
2004 10
2005 04
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BLRBAC
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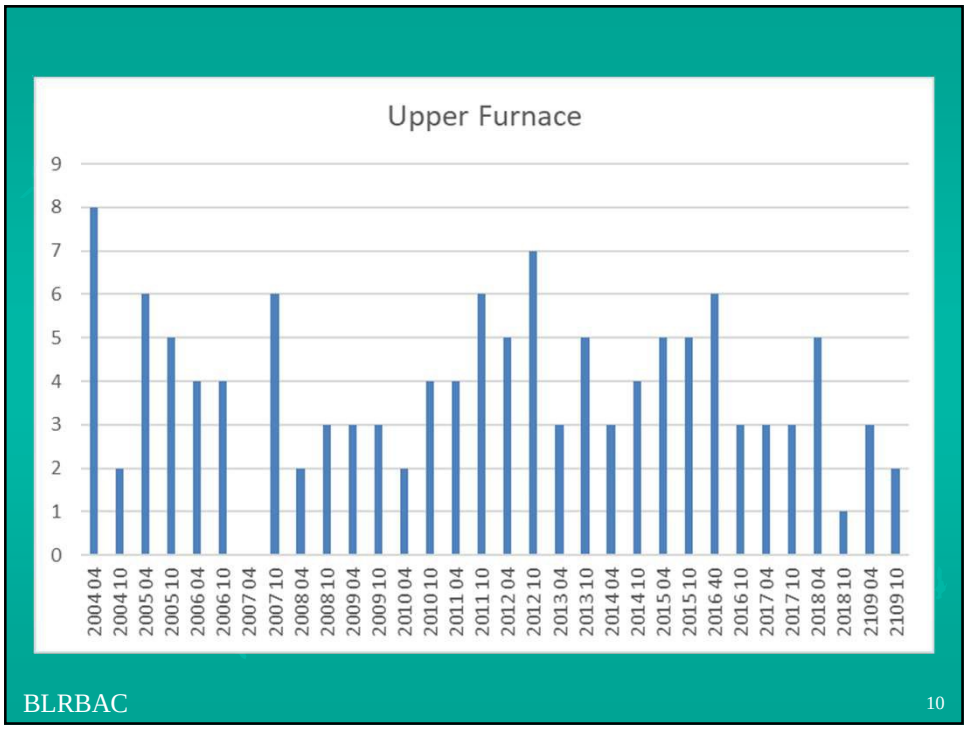
9


Upper Furnace
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7
6
5
4
3
2
1
0
2004 04
2004 10
2005 04
2005 10
2006 04
2006 10
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2007 10
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BLRBAC
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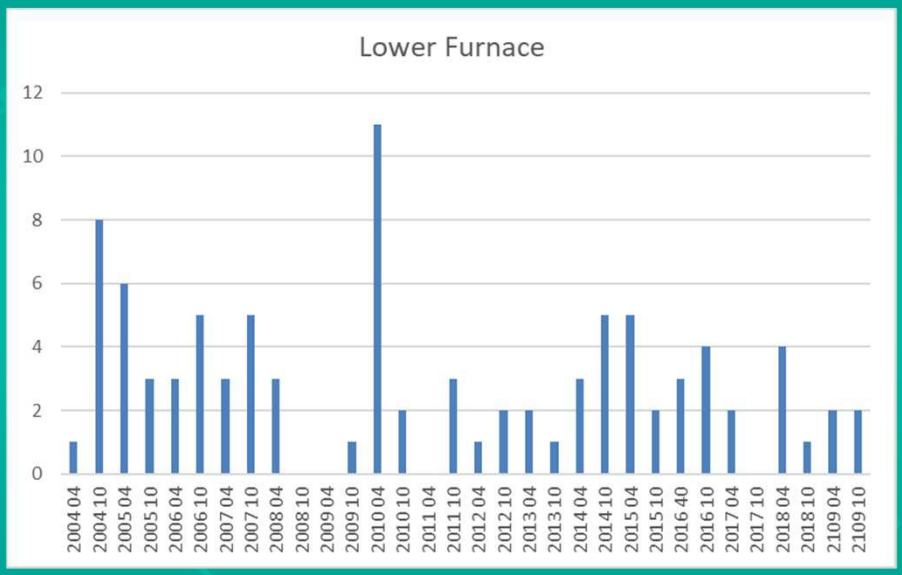


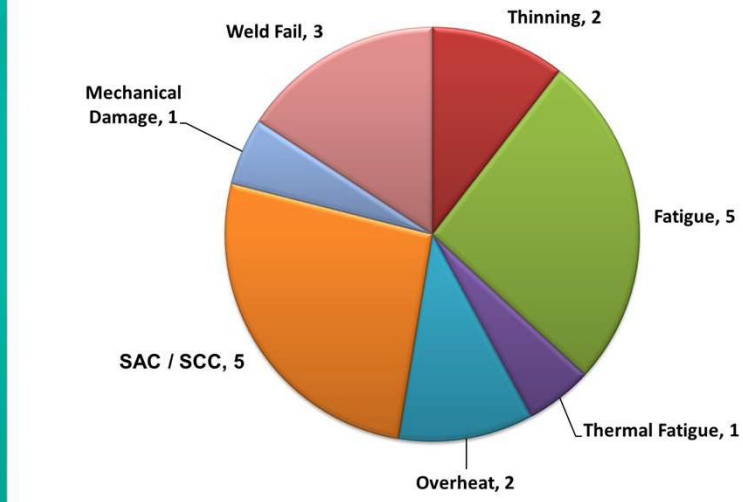
11

Incidents By Boiler Type

- Drums
  - 1 - 2
  - 2 - 18
  - 3 - 0
- Back End
  - Large Economizer - 13
  - Cascade - 5
  - Cyclone - 2

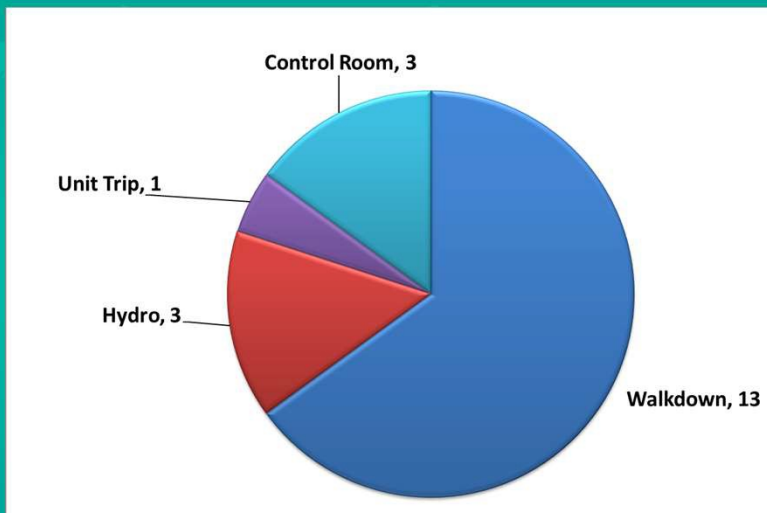
12

Leak Cause



13

How Discovered



14

Leak Detection Systems

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

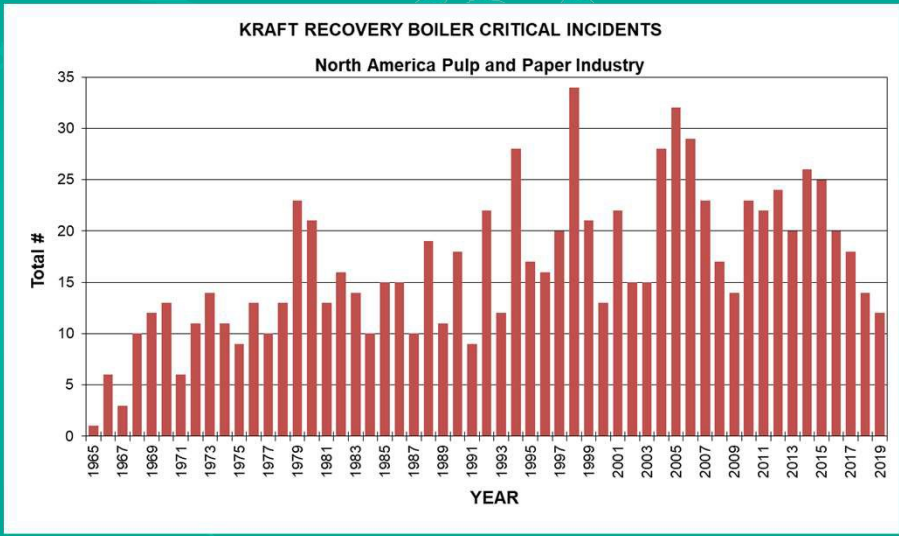
15

Time to ESP from Initial Indication

- Ranged from <1 minute to 2 hours
- Median time was 15 min

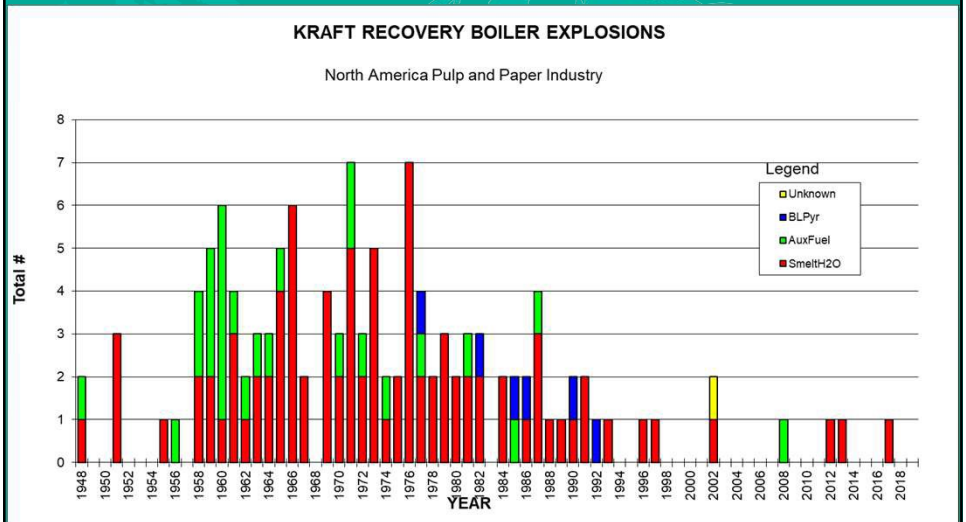
16

Critical Incidents to Date



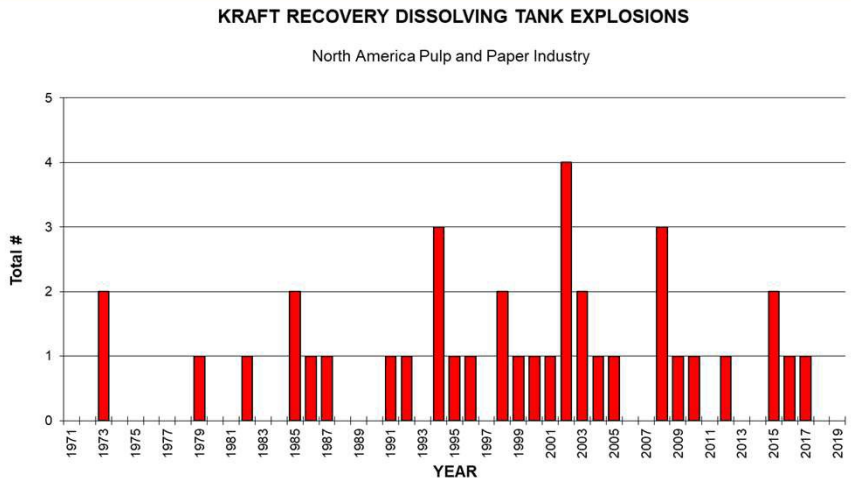
17

Boiler Explosion History



18

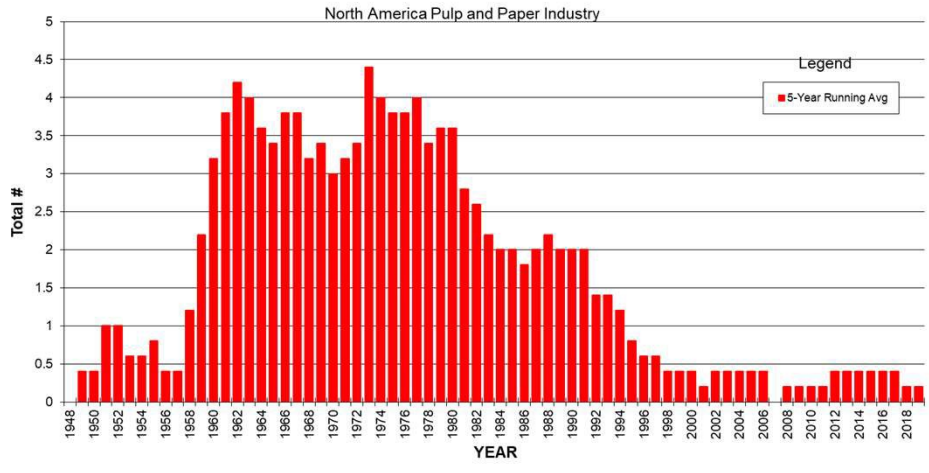
Dissolving Tank Explosions



BLRBAC 19

19

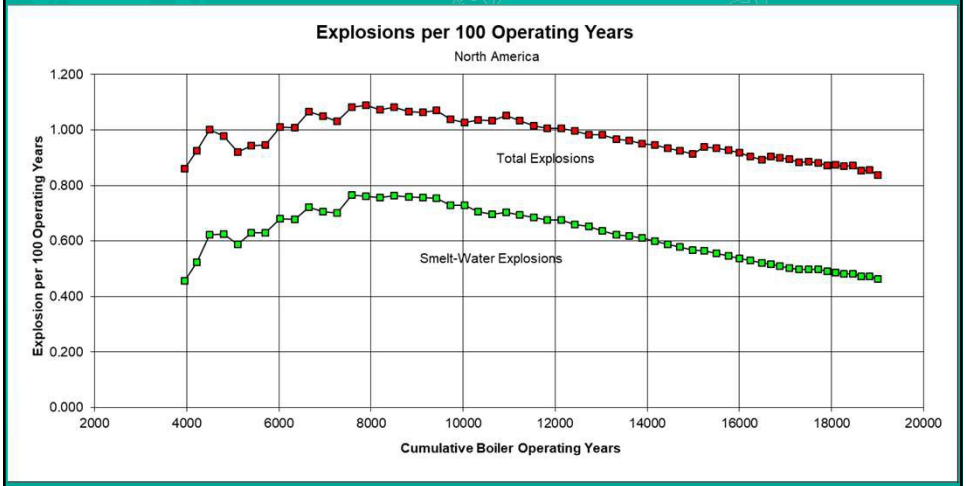
Explosion History - Five Year Avg



BLRBAC 20

20

Explosion History per 100 Oper Yr



21

Boilers in Service

- **North American Total - 182**
-

	US	Canada
– Number	142	40
– Avg Age	40.9	41.3
– Max Age	67	72

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

22

Learnings

- Molten salt cake from boiler deposits has a different appearance than normal smelt and may look clear or light blue rather than the normal red smelt color.
- Shatter jets should remain in service while the boiler is on aux fuel after burning out the bed in case boiler deposits are melted and discharge through the spouts.
- Steam cooled wall panels should be drained of condensate before and during startup to minimize stresses from differential temperatures.
- Extra care is needed to clear superheater tubes after boilers are bottled up for long periods while maintaining pressure.

Learnings

- Mills with hot air dryers or pulp dryers that have copper heating coils should be mindful of possible copper deposits in boilers.
- Deposit Weight Density (DWD) readings are nice but how do you know that you found the worst tube? Deposits tend to be very localized
- Significant changes in boiler loading and firing patterns can alter the high heat transfer zones and cause accelerated corrosion and internal deposition in different areas of the boiler.
- May need to increase the level of protection from composite tubes or stainless overlay.

Learnings

- Flowing liquid smelt on studded carbon steel tubes with no frozen smelt layer may result in accelerated wastage of studs and tubes
- Smelt flowing over refractory and on to tubes may cause localized corrosion – the "waterfall effect" Maintaining a bed is very important.
- "Sootblowers do two things in a recovery boiler – they clean it and destroy it" - Frank Navojosky
  - Repair leaking popet valves
  - Maintain proper condensate drainage
  - Check blower pressures regularly
  - Stay away from angled nozzles

25

Combined ESP and Post ESP Document

- Chapter 1 Purpose
- Chapter 2 Design
- Chapter 3 Post ESP Procedures
- Chapter 4 Re-Entry to Boiler after ESP
- Chapter 5 Procedure for Testing ESP
- Chapter 6 References

26

Discussion Items

- The torque limits, and any other device internal to the actuator, designed to protect the motor or valve, should not be included in the motor control open circuit for the rapid drain valves

Incident Questionnaires

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

APPENDIX III

AF&PA

Slide Presentation

THE AMERICAN FOREST & PAPER ASSOCIATION

RECOVERY BOILER PROGRAM

UPDATE

American Forest & Paper Association

THE AMERICAN FOREST & PAPER ASSOCIATION RECOVERY BOILER PROGRAM UPDATE BY

WAYNE GRILLIOT

October 16, 2019

BLRBAC MEETING ATLANTA, GEORGIA

AF&PA Recovery Boiler Program

The **AF&PA Recovery Boiler Program** was **established in 1974**

- Identify the root cause of recovery boiler critical incidents and explosions
- Assist companies in improving the safety, integrity, and reliability of recovery boiler operations
- Membership is open to all companies that operate recovery boilers
- Activities are funded by member company dues

AF&PA Recovery Boiler Program

- The Recovery Boiler Program is under the direction of a **Steering Committee**
  - **Karl Morency** – Georgia-Pacific
  - **Frank Navojosky** – International Paper
  - **Jeff Wagoner** – International Paper
  - **Wes Hill** – Georgia-Pacific
- The Steering Committee sets the priorities based on:
  - Member Company Input
  - BLRBAC Incidents
  - Industry Needs

AF&PA Recovery Boiler Program

The Recovery Boiler Program provides a forum for companies to develop information to help evaluate:

- **Safe Operating Procedures**
- **Organization and Training**
- **Maintenance Programs**
- **Specifications and Construction**
- **Research & Development Programs**

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
  - **Safety Improvements**
  - **Process Improvements**
- Drive improvements in:
  - **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**
- **Karl Morency** – Georgia-Pacific (Co-Chair)
- **Jeff Wagoner** – International Paper (Co-Chair)
  - **Subcommittee Membership**
- Representatives from the Member Companies

Membership

- In 2018, the Recovery Boiler Program was opened to all Canadian Mills that operate Recovery Boilers
- The AF&PA Recovery Boiler Program
  - **22 Member Companies in North America**
  - **94% of the USA & 30% of Canadian Chemical & Semi-Chemical pulp production**

Operational Safety Seminars

- The **O&M Subcommittee** sponsors the **Recovery Boiler Operational Safety Seminars**
  - Main Objective – Safe Operation of Recovery Boilers
  - Two (2) Safety Seminars were held this year
  - April 23-24 & May 14-15, 2019 - Atlanta Airport Marriott
    - 101 participants representing:
    - 13 companies
    - 29 mills
  - 3rd Seminar (West Coast) - Richmond, BC
    - November 14, 2019 – After WCBLRBAC Meeting
    - River Rock Casino Resort Hotel
- Operators, supervisors, superintendents, maintenance professionals, engineers, and managers attend

Operational Safety Seminars

- Attendees receive valuable information and insight from the dialogue among the attendees and monitors of the seminars
- The tabletop exercises help operators and supervisors make the important decision **when to ESP a Recovery Boiler**
  - The six (6) case studies used are based on actual recent Recovery Boiler Incidents
- Over 3,800 people have attended the seminars since they were started in 1985

Operational Safety Seminars

- As more senior operators and supervisors retire, **training continues to increase in importance**
- Companies are finding these seminars to be an important part of their **safety & training programs**
- We continue to recommend that all companies and mills seriously consider sending people to these valuable seminars

Operational Safety Seminars

2020 Operational Safety Seminars

- **April 21-22, 2020**
- **May 12-13, 2020**
  - **Atlanta Airport Marriott Hotel**
  - **3rd Safety Seminar - Fall 2020 (West Coast)**
    - If enough interest
  - Safety Seminar Monitors
    - **Dean Clay**, Boiler Services & Inspection (BSI)
    - **John Andrews**, Boiler Services & Inspection (BSI)
  - **Only $350** per attendee for member companies
  - Non-member companies - $700 per attendee
  - Attendance is limited – **Register Early!**

Annual Conference & Meetings

2019 AF&PA Recovery Boiler Annual Conference & Committee Meetings

- February 5-6, 2019 @ the Atlanta Airport Marriott Hotel
- Conference Theme – **Dissolving Tank Safety**
- Great attendance, with a good mix of:
  - **Operating Companies**
  - **Manufacturers**
  - **Research Specialists**
  - **Vendors**
  - **Insurers**

Annual Conference & Meetings

- **Objective:** Keep the members and the recovery boiler community informed about:
  - **New developments**
  - **Industry Best Practices**
- The presentations included:
  - **New equipment & process technology**
  - **New research developments**
  - **Industry best practices**
  - **AF&PA Program activities & project updates**
  - **Industry ESP & Incident History**
  - **BLRBAC activity updates**
  - **TAPPI Energy, Recovery & Recaust Committee Report**
  - **Updates from the Canada, Sweden, Norway, and Finland Recovery Boiler Committees**

Annual Conference & Meetings

- **2020 AF&PA Recovery Boiler Annual Conference & Committee Meetings** are scheduled for **February 4-5, 2020**
- Atlanta Airport Marriott Hotel
- 1st Tuesday & Wednesday each February
- The Conference is open to everyone interested in Recovery Boilers
- **We hope to see you there!**

Smelt Dissolving Tank Studies

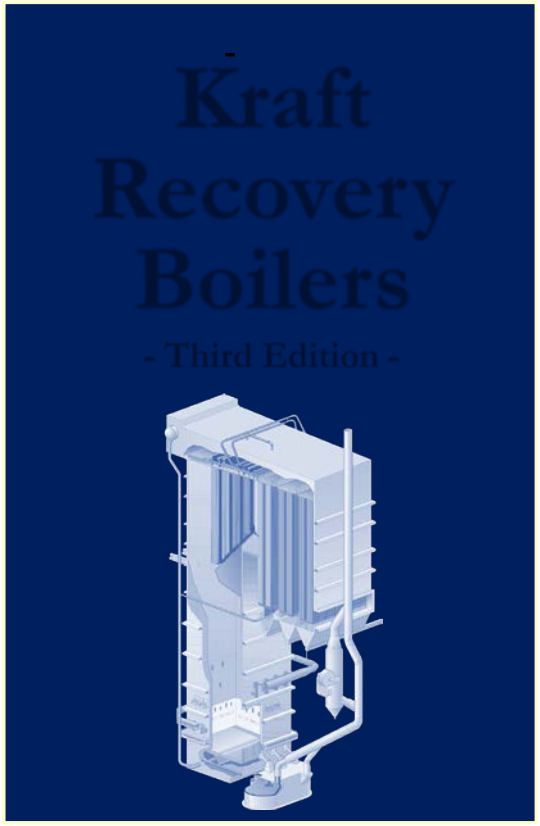
- The **O&M and R&D Subcommittees** are both working to develop best practices around dissolving tank related issues
- The **R&D Subcommittee** is sponsoring some important research projects at the University of Toronto for improved safety and reduced operating risk of Dissolving Tanks
  - The 4 projects focus on:
- **Dissolving Tank key operating conditions**
- **Advanced monitoring techniques**
- The program is building 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** developed the **"Recovery Boiler Functional Checks AF&PA Example Document"**
  - The document is posted on the AF&PA Recovery Boiler Program Website & is available to everyone
  - We encourage all mills to review the document
- The **O&M Subcommittee** is currently working to formalize recommendations from the "Dissolving Tank Survey and BLRBAC Incidents Study" completed by Dr. Tom Grace
  - It will be finalized at the February 4, 2020 meeting
  - Next O&M Sub. Project - The Impact of extended run time on Recovery Boilers: operations, maintenance, risk, areas of concern, & criteria for allowing extensions

“Kraft Recovery Boilers” Blue Book

- **Dr. Honghi Tran** of the University of Toronto is leading the effort to author a new **AF&PA “Kraft Recovery Boilers” Textbook - “Blue Book”**
- Dr. Tran and other well-known recovery boiler experts have completed the 16 chapters of the new book
- AF&PA & TAPPI are working together to publish & sell the new book (sold through TAPPI again)
- The new Kraft Recovery Boilers textbook will be used in **TAPPI’s Kraft Recovery Operations Course**
- The new book will be available in December 2019!!!



Technical Editor: Honghi Tran

Kraft Recovery Boilers

- Third Edition -

by Terry N. Adams
W. James Frederick Thomas M. Grace
Mikko Hupa Andrew K. Jones
W.B.A. Sharp Douglas Singbeil
Honghi Tran

Technical Editor Honghi Tran

American Forest & Paper Association

Protective Clothing

- The **R&D Subcommittee** developed an industry survey on recommended clothing for safe use around recovery boilers. Clothing must be:
  - **Heat resistant**
  - **Resistant to chemical attack**
  - **Provide mobility**
  - **Comfortable**
- We did a limited distribution of the survey in the USA and Canada for testing
- Incorporated the comments and feedback
- Survey will be distributed to all North American mills after the October R&D Subcommittee Mtg.

Recovery Boiler Generating Bank and Screen Tube Studies

- The **R&D Subcommittee** is very interested in doing Generating Bank and Screen tube studies
- 1 in 8 Screen tube leaks reported to BLRBAC resulted in an explosion
- 1 in 25 Generating Bank tube leaks reported to BLRBAC resulted in an explosion
- These studies would build on earlier work by the AF&PA Recovery Boiler Program

Recovery Boiler Program Information

- Available Documents
  - Publications
  - Studies
  - Training Aids
  - Standards
  - General Program Information

- AF&PA Recovery Boiler Program Website:

http://www.afandpa.org/our-industry/recovery-boiler-program

Contact Information

- AF&PA Recovery Boiler Program Website:

http://www.afandpa.org/our-industry/recovery-boiler-program

- AF&PA Website:

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