BLACK LIQUOR RECOVERY BOILER
ADVISORY COMMITTEE

MINUTES OF MEETING
Crowne Plaza Hotel/Atlanta Airport
Atlanta, Georgia
April 6, 7 & 8, 2009

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:	Len Erickson Boise. Inc. P. O. Box 990050 Boise, ID 83799-0050	Tel: 208-384-7933 Fax: 208-384-7637 Cell: 208-841-4246 **lenerickson@boiseinc.com**
Vice-Chairman:	Scott Moyer Georgia-Pacific Corporation Florida County Road 216-S (shipping) P. O. Box 919 (mail) Palatka, FL 32178-0919	Tel: 386-329-5609 Mobile: 386-227-8991 **scott.moyer@GAPAC.com**
Secretary:	**Mike Polagye** FM Global P. O. Box 9102 Norwood, MA 02062	Tel: 781-255-4730 Fax: 781-762-9375 **michael.polagye@fmglobal.com**
Treasurer:	**Ron Hess** HSB I&I Company 110 Cedar Cove Court Buckhead, GA 30625-3300	Tel: 706-484-1723 Fax: 706-485-5267 **ronald_hess@hsb.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

A company 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

EXECUTIVE COMMITTEE

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BLRBAC SUBCOMMITTEES

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BLRBAC MEETING SCHEDULE

Fall	**October**	**5, 6 & 7**	**--**	**2009**
Spring	**April**	**12, 13 & 14**	**--**	**2010**
Fall	**October**	**4, 5 & 6**	**--**	**2010**
Spring	**April**	**4, 5 & 6**	**--**	**2011**
Fall	**October**	**3, 4 & 5**	**--**	**2011**

"Bring Operator(s). Give them a chance to hear first hand!"

■ Past Chairman Lon Schroeder

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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 Said & Done with appropriate fees before the posted cut-off date.

CROWNE PLAZA HOTEL — Blocked room dates, pricing, address, hotel phone numbers, alternate hotel information, etc.

SCHEDULE — List of Subcommittee activities on Monday & 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
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Below is the current status of the BLRBAC publications. These are available at the **BLRBAC INTERNET ADDRESS**: **www.blrbac.org**

Recommended Practices by BLRBAC

Waste Stream Incineration
(Dated: October 2008)

Fire Protection in Direct Contact Evaporators and Associated Equipment
(Dated: April 2008)

Safe Firing of Black Liquor in Black Liquor Recovery Boilers
(Dated: April 2009)

Personnel Safety & Training
(Dated: October 2007)

Safe Firing of Auxiliary Fuel in Black Liquor Recovery Boilers
(Dated: April 2009)

Emergency Shutdown Procedure (ESP)
(Dated: April 2009)

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

Post ESP Water Level
(Dated: January 2005)

Checklist and Classification Guide for Instruments and Control Systems
(Dated: October 2004)

Post ESP Guidelines
(Dated: October 2002)

Materials & Welding Guidelines (New)
(Dated: April 2009)

If you have any questions, contact:

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‡ = Denotes attendance at meeting April 6, 2009
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Front Row Seated: James Franks, Karl Morency, Mark LeBel, John Phillips, Dave Parrish

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DCE Subcommittee did not meet in spring of 2009

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‡Mark Donahue* Fossil Power Systems, Inc. 10 Mosher Drive Dartmouth, NS B3B 1N5 Tel: 902-468-2743, Ext. 238 Fax: 902-468-2323 Cell: 902-223-3579 donahuem@fossil.ca	**‡Len Erickson** Boise Inc. P. O. Box 50 Boise, ID 83728-0001 Tel: 208-384-4933 Fax: 208-384-7637 lenerickson@boiseinc.com	**Larry Hiner** Babcock & Wilcox P. O. Box 351 Barberton, OH 44203-0351 Tel: 330-860-6525 Fax: 330-860-9295 lahiner@babcock.com
‡Scott Moyer Scott Moyer Georgia-Pacific Corporation Florida County Road 216-S (shipping) P. O. Box 919 (mail) Palatka, FL 32178-0919 Tel: 386-329-5609 Mobile: 386-227-8991 scott.moyer@gapac.com	**Doug Murch** MeadWestvaco 11013 West Broad Street Glen Allen, VA 23060-5937 Tel: 804-327-5245 Cell: 513-288-5750 Fax: 804-201-2192 douglas.murch@meadwestvaco.com	**Sandi Sims** Alabama River Pulp. P. O. Box 100 Perdue Hill, AL 36470 Tel: 251-743-8552 Fax: N/A sandis@ariver.com
‡Rick Young Alstom Power Inc. 1119 Riverfront Parkway Chattanooga, TN 37402 Tel: 423-752-2603 Fax: 423-752-2660 frederick.young@power.alstom.com		

‡ = Denotes attendance at meeting April 6, 2009
*= Denotes a new member

WASTE STREAMS SUBCOMMITTEE

‡John Rickard – Chairman
Jacobs Engineering
P. O. Box 5456
Greenville, SC 29606
Tel: 864-676-6393; Fax: 864-676-6005
john.rickard@jacobs.com

Henry Beder 14150 NE 32nd Place Bellevue, WA 98007 Tel: 425-861-6801 Fax: 425-516-8225 maddmaxx321@comcast.net	**Chris Cahoon** Domtar P. O. Box 747 Highway 149 North Plymouth, NC 27962 Tel: 252-793-8301 Fax: 252-793-8262 chris.cahoon@n.domtar.com	**‡Mark E. Cooper** FM Global Key Center 601 108th Avenue, NE, Ste.1400 Bellevue, WA 98004 Tel: 425-709-5084 Fax: 425-454-7847 mark.cooper@fmglobal.com
‡Wendy Coyle Weyerhaeuser Postal Bag 1020 Grande Prairie, Alberta Canada T8V 3A9 Tel: 780-539-8183 Fax: 780-539-8344 wendy.coyle@weyerhaeuser.com	**Arnie Iwanick** Harris Group, Inc. 1750 NW Naito Parkway Portland, OR 97209-2530 Tel: 503-345-4516 Fax: 503-228-0422 arnie.iwanick@harrisgroup.com	**‡Olie Kujanpaa** Andritz 10745 Westside Parkway Alpharetta, GA 30004 Tel: 770-640-2571 Fax: 770-640-2455 olli.kujanpaa@andritz.com
‡John Lewis Fluor Daniel Forest Products 100 Fluor Daniel Drive Greenville, SC 29607-2762 Tel: 864-517-1683 Fax: 864-517-1322 john.lewis@fluor.com	**‡Mathias Lindstrom** MeadWestvaco 1021 Main Campus Drive Raleigh, NC 27606 Tel: 919-334-3998 Fax: 919-334-3312 mathias.lindstrom@mwv.com	**‡Steven Osborne*** Babcock & Wilcox Power Generation Group 20 S. Van Buren Avenue Barberton, OH 44203 Tel: 330-860-1686 Fax: 330-860-9023 slosborne@babcock.com

‡ = Denotes attendance at meeting April 6, 2009
*= Denotes a new member

WASTE STREAMS SUBCOMMITTEE (Cont.)

Winston "Jerry" Pate Georgia Pacific P. O. Box 709 Brewton, AL 36427 Tel: 251-867-8371 Fax: 251-867-1153 **winston.pate@gapac.com**	‡**Ann Plank** A.H. Lundberg Associates Inc. P. O. Box 597 Bellevue, WA 98009 Tel: 425-283-5070 Fax: 425-283-5081 **ann.schlegel @lundbergassociates.com**	‡**Paul Seefeld*** A.H. Lundberg Associates Inc. 6174 Kissengen Springs Ct. Jacksonville, FL 32258 Tel: 904-614-6492 Fax: N/A **paul.seefeld @lundbergassociates.com**
‡**H. Bentley Sherlock** Babcock & Wilcox 2302 Parklake Drive. N.E. Ste. 300 Atlanta, GA 30345 Tel: 770-621-3947 Fax: 770-621-3922 **hbsherlock@babcock.com**	‡**Michael D. Sides** GE GAP Services 1360 Olympia Park Circle Ocoee, FL 34761 Tel: 407-656-4275 Mobile: 407-462-4622 Fax: 888-964-7348 **michael.sides@xlgroup.com**	‡**Arie Verloop** Jansen Combustion and Boiler Technologies 12025 115th Avenue N.E., Suite 250 Kirkland, WA 98034-6935 Tel: 425-952-2825 Fax: 425-825-1131 **arie.verloop@ansenboiler.com**
Marla Weinberg International Paper Corporate Technology Center 6285 Tri-Ridge Blvd. Loveland, OH 45140 Tel: 513-248-6789 Fax: 901-214-0894 **marla.weinberg@ipaper.com**		

‡ = Denotes attendance at meeting April 6, 2009

*= Denotes a new member

WATER TREATMENT SUBCOMMITTEE

‡**Tom Madersky**
Power Specialists Assoc. Inc.
531 Main Street
Somers, CT 06071
Tel: 860-763-3241; Fax: 860-763-3608
tom.madersky@psaengineering.com

‡**Craig Aderman** Sappi 1329 Waterville Road Skowhegan, ME Tel: 207-238-3000 Fax: N/A **craig.aderman@sappi.com**	**Kari Cahoon** Domtar Paper Company Highway 149 North Plymouth, NC 27962 Tel: 252-793-8059 Fax: 252-793-8262 **kari.cahoon@n.domtar.com**	‡**Clark Conley** Metso 2900 Courtyards Drive Norcorss, GA 30071 Tel: 770-263-7863 Fax: N/A **clark.conley@metso.com**
‡**Buck Dunton** ChemTreat 4301 Dominion Blvd. Glen Allen, VA 23060 Tel: 804-935-2000 Fax: N/A **buckd@chemtreat.com**	‡**Frank Gabrielli** Alstom Power 2000 Day Hill Road Windsor, CT 06095 Tel: 860-688-1911 Fax: N/A **frank.gabrielli @power.alstom.com**	‡**John Gray** Rayonier 4470 Savannah Highway Jesup, GA Tel: 912-427-5221 Fax: N/A **john.p.gray@rayonier.com**
‡**Ken Hansen** Babcock & Wilcox 20 South Van Buren Avenue Barberton, OH 44203 Tel: 330-860-1186 Fax: N/A **kehansen@babcock.com**	‡**Norris Johnston** Ashland, Inc. 37 Hough Road Lacey's Spring, AL 35754 New York, NY Tel: 256-650-0049 Mobile: 256-520-1011 **nnjohnston@ashland.com**	‡**Sam Lewis** Delta Training 4020 Oleander Drive Wilmington, NC Tel: 910-790-1988 Fax: N/A **slewis@deltatraining.com**

‡ = Denotes attendance at meeting April 6, 2009
* =Denotes new subcommittee member

WATER TREATMENT SUBCOMMITTEE (Cont.)

‡**Mitch Morgan** Nalco 1601 W. Diehl Road Naperville, IL 60563-1198 Tel: 630-305-1000 Fax: N/A **jmorgan@nalco.com**	‡**Rick Morgan** FM Global Granite Parkway Plano, TX 75024 Tel: 972-731-1656 Fax: N/A **rick.morgan@fmglobal.com**	‡**Kurt Parks** SAPPI Fine Paper NA 2201 Avenue B Cloquet.MN 55720 Tel: 218-878-4378 Fax: 218-879-0648 **kurt.parks@sappi.com**
‡**Tom Przbylski** Boise Int'l. Falls, MN 56649-2327 Tel: 218-285-5011 Fax: N/A **tomprzybylski@boisepaper.com**	‡**Jim Robinson** GE (infra, water) 4636 Somerton Road Trevose, PA 19053 Tel: 215-355-3300 Fax: N/A **james.robinson@ge.com**	‡**Alarick Tavares** Georgia Pacific 133 Peachtree Street Atlanta, GA 30303 Tel: 404-652-4000 Fax: N/A **ajtavare@gapac.com**
‡**Alvaro Timotheo** Andritz 1115 N. Meadow Parkway Roswell, GA 30076-3857 Tel: 770-640-2500 Fax: N/A **alvaro.timotheo@andritz.com**		

‡ = Denotes attendance at meeting April 6, 2009

* =Denotes new subcommittee member

Registered for the meeting were:

A.H. Lungberg Associates
Plank, Ann, Bellevue, WA
Seefeld, Paul, Jacksonville, FL

AbitibiBowater
Allen, Bryan, Coosa Pines, AL
Maxwell, Don , Coosa Pines, AL
Morris, Jim, Coosa Pines, AL
Patton, Brigitte, Coosa Pines, AL

Airtek Construction
Bringman, Lewis, Linthicum, MD

Alabama River Pulp
Browning, John, Perdue Hill, AL

Alstom Power
Bush, Joe, Chattanooga, TN
Gabrielli, Frank, Windsor, CT
Kistka, Gerry, Jacksonville, FL
LeBel, Mark, Windsor, CT
Leontyuk, Iryna, Windsor, CT
Miolen, Mary, Chattanooga, TN
Semyanko, Ivan, Windsor, CT
Young, Frederick, Chattanooga, TN

AMEC
Wilson, Steve, Tucker, GA

American Forest & Paper Assoc.
Grant, Thomas, Yonkers, NY

Andritz
Collins, Peter, Roswell, GA
Frykmo, Christer, Palmetto, FL
Kujanpaa, Olli, Roswell, GA
Martin, James, Roswell, GA
Phillips, John, Roswell, GA
Soderlund, Harri, Roswell, GA
Timotheo, Alvaro, Roswell, GA

Ashland, Inc.
Durham, Virginia, Media, PA
Knowles, Garth, Carp, ON

Austrian Energy and Environment
Merriman, Nick, Graz, Austria

AXA Corporate Solutions
Abel, Fred, Lyon, France

Babcock & Wilcox
Burkhardt, John, Atlanta, GA
Dickinson, Jim, Barberton, OH
Hansen, Ken, Atlanta, GA
Hicks, Tim, Barberton, OH
Hovinga, Mark, Barberton, OH
Kittel, David, Atlanta, GA
Kornaker, Greg, Barberton, OH
Krekeler, Daniel, Cincinnati, OH
Kulig, John, Barberton, OH
Lance, Gail, Barberton, OH
Osborne, Steve, Barberton, OH
Pon, Ronald, Napa, CA
Sherlock, H. Bentley, Atlanta, GA
Yash, John, Atlanta, GA

BE&K Construction
Clayton, Shawn, Birmingham, AL
Cotten, Kelly, Birmingham, AL
Darnall, Bill, Birmingham, AL
Dean, Jerry, Birmingham, AL
Ivey, Roger, Birmingham, AL
Moss, Ed, Birmingham, AL

Boise, Inc.
Bethune, Larry, Jackson, AL
Blaylock, Tommy, Jackson, AL
Davis, Matt, Jackson, AL
Erickson, Leonard, Boise, ID
Przybylski, Tom, International Falls, MN

Registered for the meeting were:

Buckeye Technologies
Streit, David, Perry, FL

Buckman Laboratories
Fairchild, William, Sylacauga, AL
Graham, Jim, Collierville, TN
Hoffman, Ron, Clintonville, WI

CNA Risk Control
Walker, Billy, Apex, NC

Charles Higginbotham, PE, LLC
Higginbotham, Charles, St. Simons Island, GA

ChemTreat
Dunton, Buck, Richmond Hill, GA

Clearwater Paper Corp.
Dave Bliss, McGehee, AR
Holloway, Scott, McGehee, AR

Clement Consulting
Clement, Jack, Copley, OH

CORR System, Inc.
Ruiz de Molina, Eladio, Birmingham, AL

Delta National Kraft
Spencer, Daryl, Pine Bluff, AR

Delta Training Partners
Lewis, Sam, Wilmington, NC

Diamond Power
Edwards, Tom, Columbia, SC
Kaminski, Bob, Lancaster, OH
Mangelli, Louis, Baton Rouge, LA
McAllister, Phil, Lancaster, OH

Domtar Paper Company
Avery, David, Bennettsville, SC
Buster, Mark, Ashdown, AR
Gore, Chris, Bennettsville, SC
Worsham, Jesse, Bennettsville, SC

Evergreen Packaging/Blue Ridge
Bragg, Scott, Canton, NC
Yarbrough, Kyle, Canton, NC

Extra Hand Plant Support Services
Phelps, Robert, Chester, VA

Fluor
Lewis, John, Greenville, SC

FM Global
Barefoot, David, Four Oaks, NC
Beaulieu, Andre, Montreal, Que. Canada
Chambers, Jeff, Fairhope, AL
Cooke, Craig, Plano, TX
Cooper, Mark, Stockholm, Sweden
Crysel, Scott, Plano, TX
Judge, Chris, Manchester, UK
Labonte, Guy, Montreal, Que. Canada
Lang, Dave, Plano, TX
Morgan, Rick, Plano, TX
Onstead, Jimmy, Plano, TX
Parrish, David, Norwood, MA
Polagye, Mike, Norwood, MA
Tavener, Brian, Prosper, TX

Fossil Power Systems
Donahue, Mark, Dartmouth, NS, Canada

FPInnovations
Singbeil, Douglas, Vancouver, BC, Canada

GA Dept. of Labor
Welch, Paul, Atlanta, GA

Registered for the meeting were:

GE Water & Process Technologies
Robinson, James, Trevose, PA

George H. Bodman, Inc.
Bayse, Michael, Kingwood, TX
Bodman, George, Kingwood, TX
Steinberg, Robert, Kingwood, TX

Georgia-Pacific
Flach, Don, Palatka, FL
Harrod, Chad, Brunswick, GA
Holm, Ralf, Atlanta, GA
Jackson, Robert, Brunswick, GA
Lane, Terry, Brunswick, GA
Morency, Karl, Atlanta, GA
Moyer, Scott, Palatka, FL
Tavares, Alarick, Atlanta, GA

Glatfelter Co.
Gentzler, William, Spring Grove, PA

Global Risk Consultants
Jackson, Christopher, Beaverton, OR
Smith, Andy, Atlanta, GA

GommiTech
Gommi, Julius, Maple Valley, WA

Graphic Packaging International
Hutchison, Frank "Hutch", Macon, GA

Houghton Cascade
Leary, Ray, Tacoma, WA

Howe Sound Pulp & Paper
Casey, Sherman, Port Mellon, BC

HSB I&I Co.
Hess, Ron, Buckhead, GA

HSB Professional Loss Control
Tessier, Henry, Hartford, CT

International Paper
Clay, Dean, Loveland, OH
Coyle, Wendy, Springfield, OR
Dunn, Tony, Franklin, VA
Fuhrmann, Dave, Loveland, OH
Gillette, Steve, Franklin, VA
Growe, Zachary, Franklin, VA
King, Ed, Selma, AL
Kiper, Mike, Loveland, OH
Lanier, Dustin, Franklin, VA
MacIntire, Wayne, Loveland, OH
Petrie, Leslie, Franklin, VA
Sargent, Mark, Loveland, OH
Stallings, Steve, Franklin, VA

Interstate Paper
Christian, Phillip, Riceboro, GA
Nixon, Joshua, Riceboro, GA
Smith, Joe, Riceboro, GA
Stapleton, David, Riceboro, GA

Jacobs Engineering
Rickard, John, Greenville, SC

Jansen Comb. & Boiler Tech.
Dye, Ned, Kirkland, WA
Verloop, Arie, Kirkland, WA

John E. Cover
Cover, John, Birmingham, AL

K-Patents, Inc.
Gronowski, Eric, Naperville, IL
Miller, Adam, Naperville, IL
Pyorala, Keijo, Naperville, IL

LENRO Inc.
Olavessen, Len, Millington, TN

Lincoln Paper & Tissue
Davis, Tim, Lincoln, ME
LaFlamme, Alan, Lincoln, ME

Registered for the meeting were:

Liquid Solids Control
Sweeney, Michael, Upton, MA

LIXI (Low Intensity Xray Imaging)
Kovarik, Jim LIXI, Huntley, IL

Longview Fibre
Andrews, Mark, Longview, WA
Mansker, Tim, Longview, WA
Wilson, Cliff, Longview, WA

M&M Engineering Assoc.
Moskal, Max, Indian Head Pk., IL

Matrix Risk Consultants
Eaves, Dennis, Berkeley Lake, GA

MeadWestvaco
Andrews, John, Charleston, SC
Lindstrom, Mathias, Raleigh, NC

Metso Power
Abrams, Larry, Charlotte, NC
Blackard, Vernon, Charlotte, NC
Borduas, Pierre, Charlotte, NC
Conley, Clark, Charlotte, NC
Desso, John, Charlotte, NC
Gantt, Melissa, Charlotte, NC
Langstine, Bob, Charlotte, NC
Morgan, Preston, Charlotte, NC
Morris, Richard, Charlotte, NC
Nichols, Jody, Charlotte, NC
Nika, Kent, Charlotte, NC
Skoog, Mikael, Charlotte, NC
Wasson, Eric, Charlotte, NC
Weikmann, John, Charlotte, NC

Nalco
Brulotte, Richard, Naperville, IL
Morgan, Mitch, Naperville, IL

NewPage Corp.
Hollern, Michael, Luke, MD

Packaging Corp. of America
Grefe, Bob, Tomahawk, WI
Stelling, John, Tomahawk, WI

Power Specialists Assoc. Inc.
Haraga, Rudy, Somers, CT
Madersky, Tom, Somers, CT
Zawistowski, Bob, Somers, CT

Process Barron
Ray, Allen, Pelham, AL

Propal S.A.
Castillo, Moises, Cali, Colombia
Esquivel, Hector Fabio, Cali, Colombia

Proterra-Power
Proterra, Joe, Gainesville, GA

Rayonier
Dean, Sam, Jessup, GA
Gray, John, Jesup, GA
Kicklighter, Thomas, Jessup, GA

SAPPI
Aderman, Craig, Westbrook, ME
Anderson, Todd, Skowhegan, ME
Dorko, Bob, Skowhegan, ME
Parks, Kurt, Cloquet, MN

Savcor Consulting
Duda, Yurij, Vancouver, BC

Sharp Consultant
Sharp, Sandy, N/A

SIS
Sherrod, Hank, Irving TX

Registered for the meeting were:

Smurfit Kappa Carton de Colombia
Cubillos, Jairo, Cali, Colombia
Franco, Daniel, Cali, Colombia

Smurfit-Stone
Dunn, Johnathan, Florence, SC
Jones, Robert, Stevenson, AL

Snell Group, The
Cooper, Mike, Akron, OH

Southern Environmental
Harris, Don, Pensacola, FL

Starr Technical Risks Agency
Jacobsen, Phil, Jackson, MI

Temple-Inland
Cox, Stephen, Orange, TX
Taveney, Dwayne, Orange, TX

Thilmany LLC
Glasheen, Mike, Kaukauna, WI
Lamers, Randy, Kaukauna, WI

Thompson Industrial Services
Harry, Todd, Sumter, SC
Hobday, Jeff, Sumter, SC

WESCO - Welding Engineering Services
Phillips, Dan, Tualatin, OR

Weyerhaeuser
Dudani, Sushil, Port Wentworth, GA
Hinman, James (Jim), Federal Way, WA
Phillips, David, Vanceboro, NC
Slagel, David, Port Wentworth, GA

XL GAPS
Franks, James, Somerville, TN
Goddard, Robert, Tupelo, MS
Rawls, Lynn, Perkinston, MS
Sides, Michael, Ocoee, FL

INTRODUCTION

BLRBAC Chairman, Len Erickson, called the meeting to order at 8:00 a.m. on Wednesday, April 8, 2009.

CHAIRMAN: Good morning. I'd like to welcome everyone to the business meeting of spring 2009 BLRBAC session. This is the first time I've seen snow in Atlanta in April. It was 75 degrees in Boise, Idaho, yesterday. Now I'm down here in Atlanta where it's 40-some degrees. What's wrong with this picture?

I do request, out of courtesy to others, that you please take a second to make sure your cell phones are turned off. I checked mine first!

As with all of our meetings, this meeting will be held in compliance with the BLRBAC Anti-Trust Policy. Discussions involving prices, pricing policy, or any restraint on competition are not allowed.

Before we get started with the main business meeting, we have a gentleman with us who has been attending BLRBAC since essentially when BLRBAC started in the 1960s. He had a forty-year career with Babcock & Wilcox and when he retired in 1996, he continued his career as a consultant. Throughout the whole time he has held up the standard and pushed forward for recovery boiler safety in operations, design, and maintenance. Following his retirement from B&W, he served within BLRBAC as the Chairman of the Waste Steams Subcommittee; then went on to join the ESP Subcommittee and was Secretary of the ESP Subcommittee until 2007. During this time he also supported the AF&PA, and as recently as two weeks ago I was getting a TIP update from him and reviewing some TIPS on economizer design. Jack Clement, we appreciate the work that you have done within BLRBAC and industry in promoting the safe maintenance, operation, and design of recovery boilers. For that, we have a plaque that we hope you will add to your collection! Thank you very much for your service. Good luck in your retirement. (Applause.)

Presentation of Retirement Plaque to Jack Clement by Len Erickson

OLD BUSINESS

ACCEPTANCE OF THE SPRING 2008 MEETING MINUTES – Len Erickson

I assume everyone has reviewed the meeting minutes from the fall 2008 meeting. Are there any corrections or additions on the fall 2008 Meeting Minutes? If the Meeting Minutes are to be accepted, do I have a motion to accept? Second? All in favor? The fall 2008 Meeting Minutes have been approved as written.

NEW BUSINESS

1. **NEW MEMBERS/REPRESENTTIVE CHANGES REPORT** – Mike Polagye

NEW REGULAR MEMBERSHIP

Clearwater Paper Corporation – a spin off from Potlatch Forest Products Corporation. This occurred this past December. They have mills in McGehee, Arkansas and Lewiston, Idaho.
Dave Bliss is the designated Representative.
David Wren is the designated Alternate Representative.

NEW ASSOCIATE MEMBERSHIPS

AirTek Construction, Inc. – a supplier of air pollution control services.
Eugene Schickling is the designated Associate Representative
Al Johnson is the designated Alternate Associate Representative

CORR Systems, LLC – a provider of consulting and design services in the Power and Recovery area.
Eladio Ruiz de Molina is the designated Associate Representative
John Cover is the designated Alternate Associate Representative

Sheppard T. Powell Associates – a provider of water treatment analysis and consultant services.
Robert Bartholomew is the designated Associate Representative
Emory Hull is the designated Alternate Associate Representative

Jari Consultoria de Automaçãо, Ltda. – Brazil – a new company recently created by Jari Sopanen, following his lay-off from Andritz. Jari has been a long-time employee of Ahlstrom/Andritz with many years of involvement in BLRBAC; particularly in the Instrumentation Subcommittee. We wish Jari well in his new endeavor and look forward to seeing him at future BLRBAC meetings.
Jari Sopanen is the designated Associate Representative
No Alternate Associate Representative – sole proprietorship.

1. **NEW MEMBERS/REPRESENTTIVE CHANGES REPORT** (Cont.)

NEW CORRESPONDING MEMBERSHIPS – None Reported

REGULAR REPRESENTATIVE CHANGES

Alstom Power
Joe Bush replaced Rick Young as the designated Representative.
Mark LeBel remains the designated Alternate Representative.

Andritz, Inc.
John Phillips replaced Ralf Holms as the designated Representative.
Olli Kujanpaa replaced John Phillips as the designated Alternate Representative.

Buckeye Technologies
David Streit remains the designated Representative.
Raul Das replaced Randy Baker as the designated Alternate Representative.

Georgia-Pacific
Karl Morency remains the designated Representative.
Don Flach replaced Rick Durham as the designated Alternate Representative.

Longview Fibre
Mark Andrews replaced Greg Berg as the designated Representative.
Greg Berg replaced Rick Brien as the designated Alternate Representative.

SAPPI Fine Paper
Craig Aderman remains the designated Representative.
Bob Dorko replaced M. Fowlds as the designated Alternate Representative.

Thilmany LLC
Randall Lamers replaced Heath Hoffmann as the designated Representative.
Richard Petersen replaced Keith Morgan as the designated Alternate Representative.

ASSOCIATE REPRESENTATIVE CHANGES

ITT Corporation
Geary Kent remains the designated Associate Representative.
Brian Hoffa replaced Brent Murphy as Alternate Associate Representative.

CORRESPONDING MEMBERSHIP CHANGES – None Reported

1. **NEW MEMBERS/REPRESENTTIVE CHANGES REPORT** (Cont.)

MEMBERSHIP COMPANY NAME CHANGES

Ashland, Inc. (previously d/b/a Ashland Hercules Water Technologies)
Virginia Durham remains the designated Associate Representative.
Norris Johnston remains the designated Alternate Associate Representative.

Fluor (previously d/b/a Fluor Daniel Forest Products)
John Lewis remains the designated Representative.
Keith Medlock remains the designated Alternate Representative.

Georgia-Pacific (acquired Fort James Corporation)

GE Water & Process Technologies (previously d/b/a GE Betz)
James Robinson remains the designated Associate Representative.
Daniel Setaro remains the designated Alternate Associate Representative.

Hartford Steam Boiler Inspection & Insurance Company (previously d/b/a HSB Group)
Ron Hess remains the designated Representative.
Henry Tessier remains the designated Alternate Representative.

SAPPI Fine Paper (previously d/b/a SAPPI Forest Products)
(See **REGULAR REPRESENTATIVE CHANGES)**

*{**Secretary's Note**: The Company Membership List posted on the BLRBAC website is out of date, 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}*

2. **EXECUTIVE COMMITTEE REPORT –** Len Erickson

The Executive Committee met in closed session Tuesday afternoon. In attendance were Mike Polagye as Secretary; Ron Hess as Treasurer; Jimmy Onstead as the Insurance Representative; Mark LeBel as the Boiler Representative; Dave Fuhrmann as the Owner's Representative; Scott Moyer as the Vice Chairman and myself as Chairman.

We covered a number of topics. As a follow-up from the fall meeting, Barbara Holich went through the list of member company voting representatives and alternates and made some updates . It will be posted on-line and it will be on the board outside the registration room when you come in at the fall meeting. There are a number of companies that we have crossed off, as we know they are defunct. Also, some new companies were added and name changes have been made. Please check the list to make sure it is consistent with your organizations' intended representation.

2. **EXECUTIVE COMMITTEE REPORT** (Cont.)

The Materials & Welding draft, the Safe Firing of Black Liquor Revisions and the ESP Procedure document revisions were approved by the Executive Committee to be voted on at this mornings' meeting when the respective chairs of those subcommittees present their reports. This will also be the time to pose any discussions or questions prior to the vote.

Another action, Chris Jackson is resigning as Chairman of Direct Contact Evaporator Subcommittee in order to take a position on the ESP Subcommittee. That, of course, started the dominos! Craig Cooke will take over as chairman of DCE; and that leaves open the News & Publicity seat. What we told Craig is that he will be the chairman of both committees until he finds a suitable replacement.

Dave Streit has resigned as Chairman of the Auxiliary Fuel Subcommittee. Bruce Knowlen will replace Dave in that position.

The BLRBAC Executive Committee has over the years drafted and approved a number of operating procedures. We went over these last fall and we went over them again. They include open meeting guidelines, hospitality suite operation during meetings, records retention policy, dissemination of materials not available to the general public, fees for searching and copying old records, anti-trust statement, conflict of interest statement, guidelines for technical presentations, and under consideration are guidelines for the use of cameras and video recording or taping of the proceedings by members or guests, and guidelines for non-BLRBAC related presentations. It is our intent to add these guidelines, along with some of the others we have documented, as an appendix to the Operating Procedures. They will then be available for all to review. If the membership, especially those that have been coming for a while, know of other procedures that have been passed probably back into the 1980's or prior, please forward them to me or any of us on the Executive Committee; otherwise the "invisible sunset clause" will take over and they won't exist anymore.

The last item we went over was that there was a discussion in which document or documents the startup checklists reside. There has been some discussion between some different committees. Currently the only startup checklist is in Safe Firing of Black Liquor. The Executive Committee has taken it under advisement and is looking at the possible need for a "master" checklist. Are there any questions or comments? (None.)

3. **TREASURER'S REPORT** – Ron Hess

For this particular meeting we had 170 Advance registrations and 41 At-Door; so this put our registration number at 211 and that is approximately where we have been during the last two or three meetings. So we appreciate the attendance and the level of participation. This meeting's attendees are from 27 operating companies; four boiler manufacturers; five insurance companies; 28 Associate members; and five guests.

Our foreign visitors consist of six attendees: four from Colombia; one from France and one from Austria. We appreciate their participating as well as the travel and effort they've made to attend the meeting.

3. **TREASURER'S REPORT** (Cont.)

Thanks to hard work of Barbara and Frank Holich, the registration side of things went very smoothly. A few people thought they had advanced registered and were a little bit surprised at the door. Please remember, you will get an e-mail confirmation from Barbara upon her receipt of your completed registration form and appropriate payment. If you don't get that e-mail from her, it means we have not received your registration materials. If you think you should be registered and you have sent a check in, you may wish to follow that up with a phone call or e-mail to Barbara. This will help avoid some surprises at the registration desk.

On the financial side:

BLRBAC Certificate of Deposit	$14,396.35
BLRBAC Checking Account	$41,185.33
Balance:	$55,581.68

We remain in good shape financially. Taxes for this year have all been filed. We renewed all our documents to maintain our "exempt - not for profit organization" status. The hotel contract comes up for renewal after the October meeting; so if there is any input from anyone about activities here, how they have performed or things you want to see changed, you can either send me an e-mail or see me. We will include your suggestions as part of the negotiations.

I thought "Casino Night" went great last night. We appreciate everyone's participation. There was a big crowd down there and we appreciate you guys taking your time to participate in the event.

Are there any questions on the financial side? (None.)

I have found somebody who stepped forward, Len Olevessen will be helping out and learning the Treasurer's role. So over time the responsibility will be migrating hopefully to Len and you will start seeing more of him. Any questions? (None.)

4. **SECRETARY'S REPORT** – Mike Polagye

I'd like to add my thanks to everybody for attending. I know that for many of you it required some extra effort to get the necessary authorization to come. We really appreciate everybody being here because BLRBAC needs your participation and input to provide the best advice for safe operation of recovery boilers.

When registering for meetings please take the time to fill out the brief registration form completely before you send it in along with your check or money order. That makes Barbara's job a lot easier. There are always a few incomplete forms submitted to her and she must then track down necessary information, such as, where is your plant or office located, what is the correct name of your organization, etc. Make it as clear as you can for her so that it makes her job easier. The registration form is one of the most important documents Barbara uses to confirm company affiliations and working e-mail addresses when trying to maintain the BLRBAC membership list and address database.

Also, just a reminder, all BLRBAC correspondence with its membership and attendees is through e-mail. So if your e-mail address changes, please take the time to notify Barbara. It will help reduce the number of "undeliverable" e-mail notices that she receives back each time she sends out a mailing. All BLRBAC information is posted on the website. So if you don't get an e-mail announcing that the Meeting Minutes have been posted or that there are documents out there that are up for membership review and comment or the next Meeting Notice for October, go to the website. Take a look to see what's there. Everything is posted there as soon as we can get it ready. The Meeting Registration Notice comes out in mid-January for the spring meeting and in mid-July for the fall meeting. Meeting Minutes of the prior meeting get posted about the same time.

Today, as Len mentioned, we will be voting on accepting one new document and two revisions to existing documents. As a result of work done by the subcommittees at this meeting, there will be other materials posted for review, comment, and voting on at the fall meeting. I encourage everyone to take the time to look at what's posted. We really don't want people being surprised when somebody comes up to them and says, "See what's in the document?" or "What are you doing about this?" Be aware of what's going on so that you are not broadsided with something that you are not expecting. All Subcommittees need your input. There are a limited number of people who can attend at each meeting, but we need the input from everybody to make the recommendations in our Recommended Practices as practical and as useful as we can for the safe operation of recovery boilers.

Does anyone have any questions? (None.)

SECRETARIAL SERVICES REPORT – Barbara Holich

It is required that each regular member company (boiler insurers, boiler operators and boiler manufacturers – voting members) keep me advised of names and e-mail addresses of their designated Representative and designated Alternate Representative. Preferably they will be someone who regularly attends BLRBAC. It is the member company's responsibility to keep me informed of any changes in representation by e-mailing me. **A "Representative Change Form" is posted on the BLRBAC website to make it easier for management to submit the changes in responsibility and/or any e-mail address changes.**

Anyone who wishes to be added or deleted from the BLRBAC e-mail list, please e-mail me (fhholich@aol.com) your intentions. Include your name, company and your e-mail address.

Someone is needed to take the initiative (in the best case scenario, this should be the designated Representative or Associate Representative) to keep me advised of any member company name changes, mergers, etc. so that the BLRBAC database can be properly maintained.

No changes are made to the database until written (letter, fax, or e-mail are acceptable) notification is received. I keep a file folder for each member company that includes correspondence naming the Representative and Alternate for each organization. These letters usually contain the e-mail addresses I must have in order to maintain the BLRBAC database.

Therefore, be sure that I have your current working e-mail address. BLRBAC notice of meetings and meeting minutes will only be sent via e-mail. If an e-mailed notice is returned to me as "undeliverable," that e-mail address will be deleted from the BLRBAC database after a second attempt has been made.

4. **SECRETARIAL SERVICE'S REPORT** (Cont.)

This second attempt is made in case someone's mailbox is full or there was a system problem at the time of the first mailing.

If you are a designated Representative or Alternate Representative for your organization and something happens wherein you will no longer be functioning in this capacity, such as, retirement, occupational change, downsizing, etc., please let me know (fhholich@aol.com) and supply me with the name and e-mail address of whomever will fill your vacated position within BLRBAC.

Per BLRBAC's policy, BLRBAC's Secretarial Services will verify receipt of meeting registrations and checks via e-mail when appropriate e-mail addresses are given on the registration form. Be advised that faxed registration forms are of no use to me until the appropriate fees are paid. Therefore please,

DO NOT FAX REGISTRATION FORMS!

5. **SUBCOMMITTEE REPORTS**

5.1 **AUXILIARY FUEL REPORT –** Dave Streit

The Auxiliary Fuel Subcommittee met in open session on Monday afternoon in the Hepburn Room. Business was conducted under the BLRBAC antitrust policy. There were six members/alternates and 14 guests present at the meeting. One of the guests, Mr. Joe Proterra with Proterra-Power, LLC, requested, and was accepted to become a member of the subcommittee. Two previous members that are no longer associated with the industry were removed from the membership list.

There was no meeting conducted during the fall 2008 session, and there was no "old business" from the spring 2008 meeting on our agenda. Therefore, new business items were addressed.

Mr. Streit shared with the members and guests present an e-mail addressed to the Auxiliary Fuel Subcommittee regarding a possible conflict between NFBA 85 and BLRBAC for boiler purge requirements. NFPA requires a minimum of five-minutes or at least 5 volume changes of the boiler enclosure with an airflow through the burners of 25% MCR or greater. BLRBAC requires a minimum of five minutes of purge time with an airflow of 30% MCR or greater, with the airflow entering the boiler below the liquor gun elevation. In addition, BLRBAC require operator verification that oxygen levels and CO/combustibles levels are adequate. The concern expressed was that a five-minute purge might not provide five volume with the larger furnaces common in today's recovery boilers.

Mr. Streit discussed with the group how the question of purge requirement was reviewed by the subcommittee approximately 10 years ago when the document was re-written. At that time, a conscious decision was made by the subcommittee to keep the purge requirement of a minimum five minutes and 30% airflow below the liquor guns. The decision was made based on our historical experience that indicated that there had never been issues when these purge guidelines have been used. In addition, the subcommittee added an operator function to verify oxygen and CO/combustibles levels are acceptable for burner light-off following the purge. The operator function was considered a backup to ensure a successful purge.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.1 **AUXILIARY FUEL REPORT** (Cont.)

There were significant discussions regarding the current NFPA definition of boiler enclosure (physical boundary for all boiler pressure parts and for the combustion process), air change (a quantity of air, provided through a fuel burner, equal to the volume of the furnace and gas passages), volume changes, etc. There was some confusion how these definitions would apply to recovery boilers and the impact they would have on purge time and/or design requirements.

Based on the discussions, it was decided by those present, that the current BLRBAC purge requirement, with the operator verification of oxygen and CO/combustibles, should provide for a proper purge. It is believed that changes to the document are not needed. It was also pointed out that owner/operators can increase purge airflow and/or the purge time requirement for their boiler if they think additional time or airflow is needed.

Mr. Scott Moyer represented the Safe Firing of Black Liquor Subcommittee and reviewed proposed changes to the safe firing of black liquor document.

He discussed all the proposed changes, although proposed interlocks to include proof of dissolving tank level and smelt spout cooling water flow (and the appropriate changes to the explanation charts) prior to initiating a boiler purge were the primary changes that would affect the safe firing of auxiliary fuel document.

There was significant discussion of the proposed changes with some in favor of the changes and some opposed. It was determined that the proposed changes did not impact safe firing of auxiliary fuel, therefore action was not required by the Auxiliary Fuel Subcommittee, even though changes would made to common block logic and explanation charts located in our document. The decision to accept or reject the proposed changes should be made by the general membership.

The executive committee requested the auxiliary fuel subcommittee to develop a generic boiler start-up check sheet for the membership to use as a guide to develop detailed check sheets for their boilers. There were questions regarding the scope and boundary of what was to be included, and how to coordinate with existing check sheets included in other documents. The subcommittee is willing to work on the check sheet development, but believed more definition is required before work can begin. The subcommittee brought this issue to the executive committee for more guidance.

Mr. Streit informed the group that this is his last auxiliary fuel subcommittee meeting as chairman of the subcommittee. A potential replacement has been identified and recommended, and as Len noted in the Executive Committee report, our recommendation has been accepted and Bruce Knowlen will be the new subcommittee chairman.

The time and place of the next meeting was deferred and will be determined by Bruce.

CHAIRMAN: Thanks Dave for your report and for your many years of service as Subcommittee Chairman..

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.2 **BLACK LIQUOR REPORT** – Mark Sargent

Open Meeting, April 6, 2009 at 8:30 AM Crawford Room with seven members and approx. 35 guests and Open Meeting 1:00 PM Crawford Room with six members and approximately 15 guests.

AGENDA:
Opened the meeting.

Reviewed BLRBAC Anti Trust statement

Reviewed and approve the Fall 2008 meeting minutes.

We reviewed the AF&PA funded final report by IPST regarding calculations of green liquor density vs. TTA as a function of composition. This study was conducted by Nikolai DeMartini formerly of IPST and now employed by Abo Akademi University – Finland. Nikolai was teleconferenced in by phone to discuss the findings of the study and are highlighted below:

- Controlling the concentration of green liquor in the dissolving tank is an important safety measure. If the concentration reaches the solubility limit, smelt pooling can occur and there is risk of a dissolving tank explosion.

- The study found that density (baume) increased linearly with TTA provided temperature, sulfidity and Cl/Na ratios do not change

- For mills that have widely varying sulfidity (such as batch make-up of NaOH), then TTA testing would be the test method of choice

- For mills that have varying reduction efficiency (varying loads and fired solids), then baume would be the test method of choice

- From a safety perspective, the most important question to arise from the calculations is whether safety guidelines should be prescribed based on the solubility limit of pirssonite or sodium carbonate/burkeite. Because sodium carbonate and burkeite are so much more soluble than pirssonite it is probable that a dissolving tank can operate safely above the pirssonite solubility limit, at least for short periods.

- It is unknown how the smelt solubility rate is affected once the dissolving tank rises above the pirssonite solubility limits.

- The final report with calculations will be available to AF&PA member companies to determine critical TTA and density limits as it pertains to the pirssonite and sodium carbonate/burkeite dissolution limits.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.2 **BLACK LIQUOR REPORT** (Cont.)

- It is recommended that kinetic dissolution studies be carried out to determine the rate of dissolution at different green liquor concentrations to establish safe upper limit for green liquor concentration in the smelt-dissolving tank. We will follow up with AF&PA to determine a path forward on the dissolution studies.

We are having ongoing discussion in the SFBL subcommittee regarding Figure 5, Black Liquor tripping logic. Once case has been brought forward that has potentially shown a weakness in our logic sequence. In the particular case brought to us a solenoid on a 3-way black liquor header/divert valve failed to the divert position. Because the flow meter on the firing header was before the header/divert valve the liquor flow did not drop below the 30% trip level and steam flow did not drop below 30%. There were no auxiliary fuel hearth burners in service. The operators were able to figure out what the problem was and were able to reset the header/divert valve and resume liquor firing without purging the black liquor header or experiencing either a MFT or BLT. We are reviewing our document and logic sequences to be able to prevent these issues from arising again.

We reviewed all of the changes to the SFBL document that will be up for vote at the conclusion of this report. One change we are withdrawing for consideration for vote is the language for black liquor permissive starting logic sequence for "establishing stable firing". We have decided to enhance this language and hope to have ready for membership review and comment and vote in the Fall 2009 meeting.

One new comment/discussion point from the membership at large since the Fall 2008 meeting:

- Question from a member company regarding an insurance carrier requirement for tripping the primary FD fan and closing back on secondary air on a low drum level trip

We had a lively discussion but reached the decision that this issue should be resolved between member companies and their insurance carrier. We do not know of any loss or damage history resulting in leaving combustion air flows as is on a low drum level trip event that would cause us to take action in our recommended practices.

Will work with Personnel Safety subcommittee to determine if there is the need for developing an emergency procedure for known or suspected live smelt in the dissolving tank.

We will review Figure 4, Black Liquor Tripping Logic, and determine if we need to clarify that the logic needs to specifically state "no auxiliary hearth burners in service" vs. the present logic statement, "No Auxiliary Burners in Service" that leads to the "Loss of All Flame" condition and results in an MFT.

For any comments or questions please contact Mark Sargent @ mark.sargent@ipaper.com or by phone at (513) 248-6086.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.2 **BLACK LIQUOR REPORT** (Cont.)

ADERMAN: Excuse me, Mark. One question. You've added language around assuring you have adequate spout openings when firing black liquor. Did you consider adding that criteria for auxiliary fuel firing as well?

SARGENT: Craig, it was added for auxiliary fuel firing. The permissives included in Figure 1 are common to both auxiliary fuel and black liquor. In both documents it will show that after the purge is complete and before moving on to aux fuel firing, there is an operator initiated box that says, "Sufficient Spouts Open."

ADERMAN: I guess my question really is around after the permissive has been met and auxiliary fuel is firing, was there any discussion about assuring spout openings remain open for continued operation?

SARGENT: Not on auxiliary fuel firing.

CLEMENT: Mark, did I understand that you have to have a lighter with a burner. I'm working on a small project. We have four lighters in there that give us all the steam flow we need for start up burners and we just want to put lighters in, but I get the impression from what you said that you have to have a lighter and a burner to meet the BLRBAC requirement.

SARGENT: That is correct. What we are trying to avoid is the pyrolysis gas explosions. We feel that if you were in a position where either your steam flow or your black liquor flow are less than 30%, there is a potential black-out condition where pyrolysis gases could be building and developing in the lower furnace. In that particular case an igniter will not maintain your purge credit. We want a main burner in service.

ADERMAN: But I think the clarification, Mark, in that application is the size of the lighter because of the size of the unit is sufficient to be called a burner. I think this is a semantics issue and I think that is where the clarification is made. In your case and the project you are going on, Jack, would be because you just need those four lighters, what would be sold in the industry on a big boiler as a lighter, on that boiler would really be considered a starting burner.

CLEMENT: Craig, we meet the 30% with the four lighters.

ADERMAN: Correct! That's fine.

SARGENT: Yes. That's not an igniter then.

CHAIRMAN: Do I have other comments and discussions from the floor on the proposed changes from the membership?

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.2 **BLACK LIQUOR REPORT** (Cont.)

STREIT: I have a number of questions on your 10.4 for the dissolving tank flow. The dissolving tank flow is a function of the firing rate on the boiler, so where do you set your alarm? Really you are worried about density. So, for instance, we don't even measure the flow because it's of no value to us and it's a highly scaling location to even try and maintain a flow meter. You know, you have a recommendation to do something, where really, where do you set it at to keep avoiding nuisance alarms or having something that adds value to the safety of the operation where your real intent is to avoid getting high-density conditions. So density, amperage alarms on agitators and things like that are related to high density. That is one question I have. The other question is around 70% black liquor firing target and changing a trip point to 65% solids. If the objective is to make sure you don't put dilute liquor in the boiler with a potential of a smelt water explosion due to dilute liquor, whatever is safe is safe, irregardless of your target solids. Now I did note that you changed the testing frequency between the two conditions where you test once per shift verses every two hours. So if you just say it's okay to test less frequently and change your margin in your trip point, that's one thing, but to me I don't see how it's related to the target firing solids. So I have some question with that approach. Also, on the interlocks for dissolving tank and spout cooling water, we really don't have any kind of history of dissolving tank explosions because we didn't have level in the dissolving tanks when we started auxiliary fuel. So there is some question on adding complexity and potential failure where you couldn't put a fire in the boiler with that interlock. So the question is on complexity of potential failure, how would people react to failures, its additional testing and to have that interlock? So what's the value to get? Does the increase in value justify the potential for additional operating conditions? These are some of the points brought up in our subcommittee meeting also. I just wanted to put out some of my thoughts in those areas.

CHAIRMAN: Thank you, Dave. Do we have other comments from the member companies? If there are no other questions or comments on the proposed revisions to the Safe Firing document, we will proceed to having a vote. Would the voting representative of each Regular member company, which is signified by a red ribbon, please stand? Those in favor of the proposed changes, please raise your hand? Those opposed? Proposed revision as amended by the committee was passed with two opposed.

MORENCY: I think Dave has some valid points there and I probably should have said something before we voted, but I think the Safe Firing of Black Liquor ought to take those comments into consideration. I mean overall I agree with the changes that were proposed, but I think there are some valid points there that need further consideration.

5.3 **ESP SUBCOMMITTEE REPORT** – John Andrews

The ESP Subcommittee met in closed session on Monday April 6th with 13 members represented. Chris Jackson was selected by the committee to fill the seat that was opened by Jack Clement's retirement from the Subcommittee. The Subcommittee met in open session on Tuesday morning April 7th with 13 members represented and about 180 guests.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.3 **ESP SUBCOMMITTEE REPORT** (Cont.)

During the open session, the Subcommittee reviewed 24 incident reports from North America and three international incidents. Of the 24 North American incidents, there was one dissolving tank explosion, seven (7) of the leaks were classified as critical incidents and 16 were non-critical incidents. An ESP was performed in 6 of the incidents including 3 of the critical incidents representing 50% of the critical incidents that should have been ESP'd. One incident that was classified as critical was discovered during a hydro and no ESP was needed.

The Executive Committee reestablished the basic definitions of Explosions, Critical Incidents and Non-Critical Incidents 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 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. This new definition will result in more entries for the Critical Incident list.

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

Some explosions reported before 1999 occurred with no discernable damage or injury, but were reported to be an explosion. Before 1999, the term Critical Exposure was used rather than Critical Incident. A Critical Exposure required the presence of smelt that could be contacted by the water. If there was a leak found and there was a clean furnace, it was considered a Non-critical Exposure. The 1999 change had the effect of increasing the cases classified as Critical Incidents from this standpoint.

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

Incident Locations

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 marks are the non-critical incidents with the yellow mark outside the boiler indicating the leak in the feedwater coil air heater. The red marks indicate the locations of the critical incidents.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.3 **ESP SUBCOMMITTEE REPORT** (Cont.)

The leaks locations are summarized as follows:

- 9 – Economizer
- 5 – Superheater
- 2 – Furnace Screen
- 3 – Boiler Bank
- 3 – Wall Tubes
- 1 – Leak in Feedwater Coil Air Heater
- 1 – Dissolving Tank Explosion

Root Cause

The determination of the root cause is somewhat of a subjective determination by the Subcommittee based on information in the reports. The breakdown is listed below:

- 10 – Fatigue
- 1 – Mechanical Damage
- 3 – Thinning
- 5 – Weld Failure
- 4 – Stress Assisted Corrosion or Corrosion Fatigue.

How Discovered

Operator observations during boiler walkdowns continue to be the prevalent method of detecting leaks and accounted for identification of 16 of the leaks (70%). Two (2) of the leaks were identified by control room indications and two (2) leaks were initially indicated by leak detections systems. Three of the leaks were discovered by a hydrostatic test during an outage.

Leak detection systems were installed on units in 10 of the incidents (42%), which is on par from past meetings. In two of the incidents, the leak detection systems were credited with providing the initial indication of the leak. Three of the economizer leaks were on boilers that had leak detection systems installed and one of the economizer leaks was initially indicated by the leak detection system.

The Subcommittee has been looking at the time between the initial indication of the leak and the initiation of the ESP. The incidents reviewed showed that for those incidents that provided detailed information on timing, the time between initial indication of the leak and the initiation of the ESP ranged from about fifteen minutes to 13 hours. The median time between the first indication of a leak and the initiation of the ESP for the incidents that provided a time line ESP was 30 minutes which indicates there is still room for improvement in making the decision to ESP.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.3 **ESP SUBCOMMITTEE REPORT** (Cont.)

There was one report where the ESP was initiated from information available in the control room and the operators did not delay the ESP by taking the time to visually verify that a leak was present. Those operators should be commended for their prompt action.

The fact that there are usually so few reports of an ESP with no leak probably shows that operators are generally requiring too much confirmation that a leak is actually present before initiating an ESP. The danger of looking for leaks after low drum level trips with high furnace pressure should continue to be emphasized in training.

Incident Review

We are receiving most of the reports electronically and the Subcommittee has initiated a procedure to acknowledge the receipt of all Incident Reports that are received in order to make sure no reports are lost in "cyberspace". Often the reports become large files when pictures and diagrams are attached so there have been some issues with getting through the e-mail system. Whenever you submit an Incident Report, you should receive a confirmation within a week. If not, please contact the ESP Secretary, Jules Gommi, to see what happened to the report. We are aware of at least two reports that had problems getting through to Jules e-mail. If you submitted a report since the Fall Meeting last year that is not reported here, please contact Jules to see what might have happened.

Figure 2 shows the critical incidents reported each year. Since this is the Spring meeting, the bar for 2009 represents only ½ of the year but even if you double the number, it indicates that the critical incidents are decreasing from the recent years. Figure 3 shows that even though there has been nothing reported so far this year, the string of years without an explosion has been broken with the Aux Fuel explosion at Vicksburg in 2008.

Figure 4 shows the five-year rolling average of reported boiler explosions is now up to 0.2 after finally getting to zero. It will be several years for it to get back down to zero – assuming we don't have another boiler explosion during that time.

Figure 5 shows the history of dissolving tank explosions and there was one reported this meeting so it looks like dissolving tank explosions continue to be a problem.

AF&PA has released their report of Dissolving Tank Explosions and several recommendations from that report are being considered by the Safe Firing of Black Liquor Subcommittee to be added into their document.

Figure 6 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 is continuing to trend down over time and is down to just above 0.5 explosions per 100 boiler operating years, but the total explosions, which includes all boiler explosions and dissolving tank explosions, continues to hold steady at just under 0.9 explosions per 100 boiler years because of the dissolving tank explosion reported during this meeting.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.3 **ESP SUBCOMMITTEE REPORT** (Cont.)

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 all need to continue the making the efforts to try to keep that trending down. Effort should be focused on developing better procedures to handle heavy smelt runs and plugged spouts.

Learnings

There were several items from the discussions of the incidents that may be of benefit to other recovery operations.

It is a good idea to monitor or confirm the status of the rapid drain valves prior to start up to assure that the ESP system has power and the rapid drain valves are in automatic.

Mills need to be mindful that changes in boiler combustion air systems my cause unintended problems such as deposit buildups such as lumps at the roof corners. These lumps can fall and cause significant tube damage. Installation of "breaker bars" on top of the leading screen tube may protect the tubes from some of this fallen material.

Start-up curves may need to be extended if boilers are experiencing tubes pulling out from the sidewalls, especially in the corners and also if there are problems with superheater leaks due to not sufficiently clearing the condensate out of the superheater loops before coming on line.

Riser tubes in the boiler penthouse that go from the upper sidewall headers to the steam drum are prone to Stress Assisted Corrosion (SAC), especially those with tight radius bends and short runs between the header and the drum so periodic inspection is recommended.

It is recommended that the recovery boiler not be run with a known leak in the economizer section. Even though the potential for water entering the furnace is low, a small leak can wash adjacent tubes and result in a major leak that can create other problems.

Sootblower pressures should be checked periodically to make sure they are not above the recommended operating pressure, especially for sootblowers with the high efficiency nozzles, to prevent accelerated thinning and the possibility for fatigue cracks in tubes. Mills should also review their stuck sootblower procedures to make sure that sootblowers do not stay in the boilers and damage tubes.

Operating procedures for the condition of "All Spouts Plugged" should include taking the fire out of the boiler to minimize the potential of building up a large pool of smelt behind the spouts. There have been several incidents where boiler deposits have melted into the smelt pool and resulted in a heavy smelt run when a spout is eventually opened.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.3 **ESP SUBCOMMITTEE REPORT** (Cont.)

It is known that low level in the dissolving tank is a problem, but there was a report this meeting of a high level in the tank that contributed to a smelt reaction. Several years ago, there was another dissolving tank explosion when the overflow plugged and the tank level got just below the end of the spouts.

Testing of ESP System

The following draft language to be added to Section 2.2 – "Routine Operator Checks" of the ESP guidelines was approved by the Executive Committee and posted on the BLRBAC website for membership review and comment following the October 2008 meeting. It recommends an annual check be made to verify the operability of whatever alternate system is used to actuate the ESP functions. The test can be accomplished by conducting either a continuity check or a functional test:

> At least annually, also verify the "alternate means" to actuate individual ESP elements and any "remote" means to initiate the ESP or actuate individual ESP elements will transmit a signal to the intended ESP element. Actuation of the ESP device is not necessary; only verification that a signal is transmitted to the device.

If no one has any questions, I would like to submit the change for approval.

CHAIRMAN: I'd like to open the floor for discussion to the members on the proposed changes. Are there any comments from the membership? Since there are no comments, would the voting members please stand? Those in favor of the proposed changes please raise your hand. Opposed? The proposed changes are approved unanimously.

Clarification of "Dedicated Stand –Alone"

The Subcommittee is continuing to work on the appropriate language for a clarification of "Dedicated Stand-Alone" as it refers to the ESP system architecture. The following suggested language has been developed for further discussion:

Recommended Change to second sentence of Chapter 1:

> Upon initiation of the Emergency Shutdown Procedure, ~~a dedicated, stand-alone~~ the system shall perform the following automated actions:

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.3 **ESP SUBCOMMITTEE REPORT** (Cont.)

Add paragraph to the after bulleted items on Page 4

> The Emergency Shutdown Procedure functions must be activated and controlled either by means of relay technology and hard-wiring or other dedicated system as defined in Chapter 2 of the *Instrumentation Checklist and Classification Guide*. In the latter case, it must not be possible to carry out reprogramming during operation or in error. See also Chapter 4 of the *Instrumentation Checklist and Classification Guide*. Whatever technology is utilized, the BMS or DCS systems can be used to monitor operation of the functions. Any time modifications are made to the system, the system shall be functionally tested prior to putting the unit back on line.

The intent of the suggested language is to emphasize that the system that initiates all the functions of the ESP system such as closing the feedwater stop valve and opening the rapid drain valves should be a accomplished by a system that only performs those functions and either a hard wired "ESP Relay" or a dedicated PLC type system can be used. It is emphasized that the system only has to send the signal to the field devices upon initiation by the operator with the only logic being the time delay for the vent valve. The monitoring function of the position feedback from all the field devices can be done with some other system such as the DCS or the Boiler Safety System.

Testing of Rapid Drain Valves

The Subcommittee has approved the following language that provides some clarification to the procedure for testing the rapid drain valves and has submitted it to the Executive Committee for approval:

> **2.2 Routine Operational Checks**
> Only one drain line at a time should be isolated for the monthly motor-operated valve tests; this will allow the remaining drain lines to function as designed if a real ESP is required during the testing period.

If the Executive Committee approves it, it will be posted on the web site for review by the membership and hopefully we will be voting on it next meeting.

This is another addition to routine operational checks and we are clarifying that only one drain line at a time should be isolated for the monthly motor operator valve test. This will allow the remaining drain lines to function as designed if a real ESP is required during the testing period. Most mills are doing this now but there have been a few installations that isolate the entire rapid drain system to run the monthly test and then open all the valves together. Once they complete the test, they have to go around and reopen the manual valves. We are just making it clear that that is not an acceptable way of running the test.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.3 **ESP SUBCOMMITTEE REPORT** (Cont.)

A comment was received from Dave Streit who has a "Cadillac" system on his unit where their system is set up that they don't even have to close the manual valve. They have a double valve system and the logic opens one valve at a time to assure that the other valve is closed. This is above and beyond what we are trying to do here. So we would not be changing that in any way. Again, hopefully, this will go into the website as a proposed change and we will be voting on that at the next meeting.

List of Operating Boilers

The lists of Operating Boilers in the USA and Operating Boilers in Canada are posted on the BLRBAC Website and will be updated by Jules Gommi. Please submit any updated information to Jules, especially for mill ownership changes.

Jack Clement has retired from the committee after many years of serving as the Secretary and recently as a member of the Subcommittee. The Subcommittee is very appreciative of all the effort and dedication that Jack has given to the work of the Subcommittee. We will be in the process of deciding on a replacement and Jack has agreed to work with the Subcommittee until that replacement has been named. Chris Gore has announced that he will be stepping down after many years of service as well. Therefore, we will be in the process of identifying a replacement for Chris on the committee.

Incident Questionnaires

The Subcommittee appreciates the effort that is required to prepare the incident questionnaires since it is important to receive that information in order to help BLRBAC continue to provide guidelines for the industry.

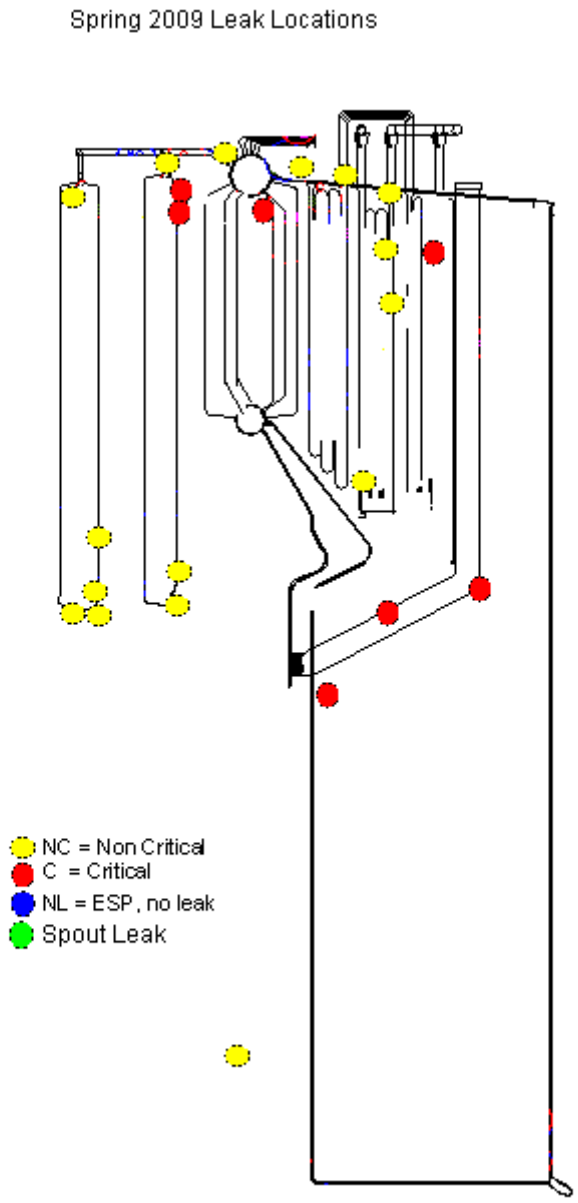
The ESP Questionnaire continues to be updated and mills are requested to obtain the current version from the BLRBAC website if an incident needs to be reported. The completed form should be submitted to Jules Gommi at the e-mail address listed on the form. Please note that Jules' mail box is limited to a file size of 10 MB, so please consider this limit when submitting the report. Jules will send out an e-mail confirmation to the mill any time he receives a questionnaire. If the mill does not receive that confirmation within a couple of weeks of submitting the form, please contact Jules to see if there is a problem.

(See Appendix B for a copy of the slides used during this report at the Main Committee Meeting.)

5.4 **FIRE PROTECTION IN DIRECT CONTACT EVAPORATORS REPORT** – Chris Jackson

No subcommittee meeting was held; therefore there was no report was given at this meeting.

Figure 1


Spring 2009 Leak Locations
NC = Non Critical
C = Critical
NL = ESP, no leak
Spout Leak

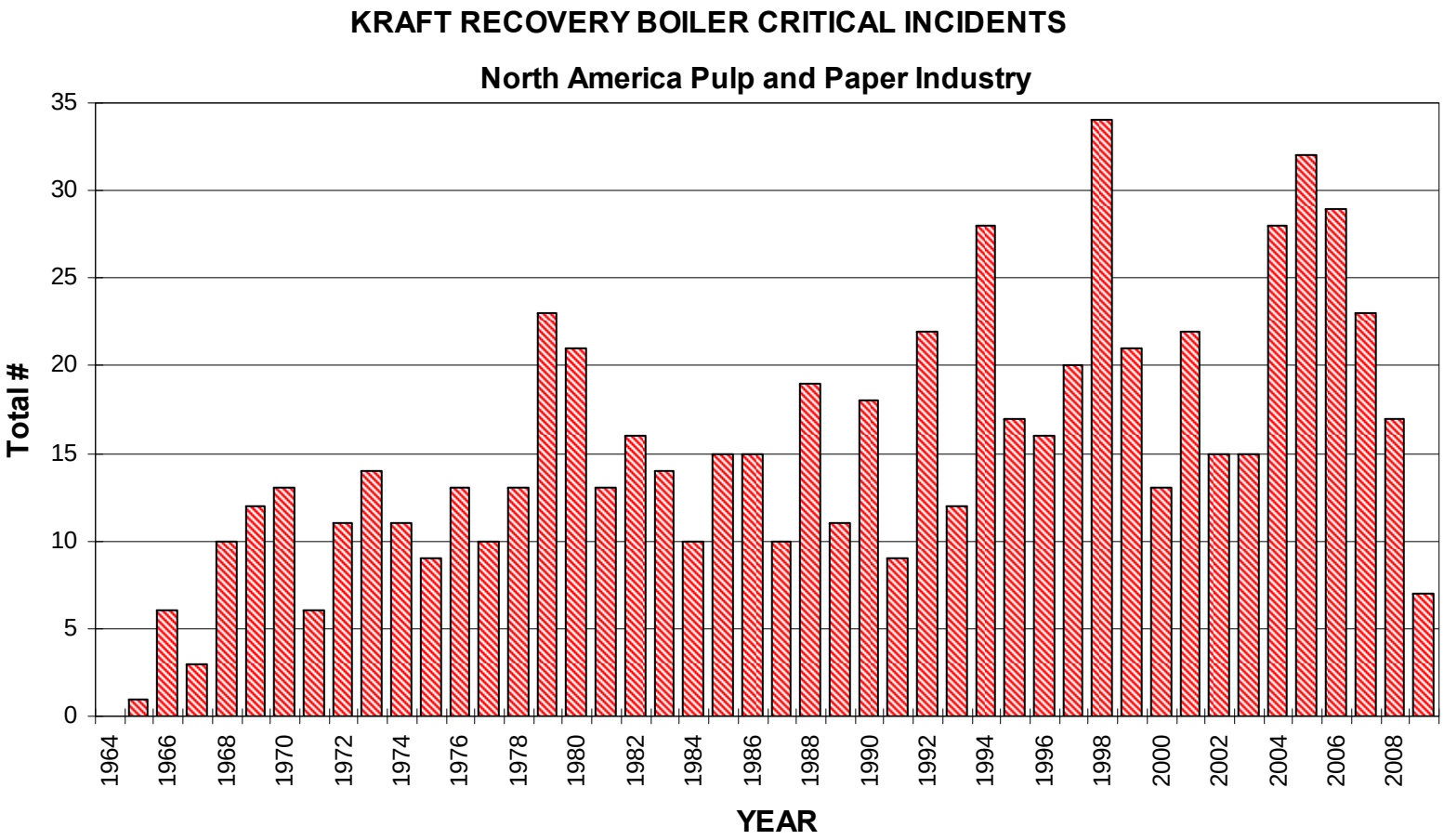


Figure 2

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

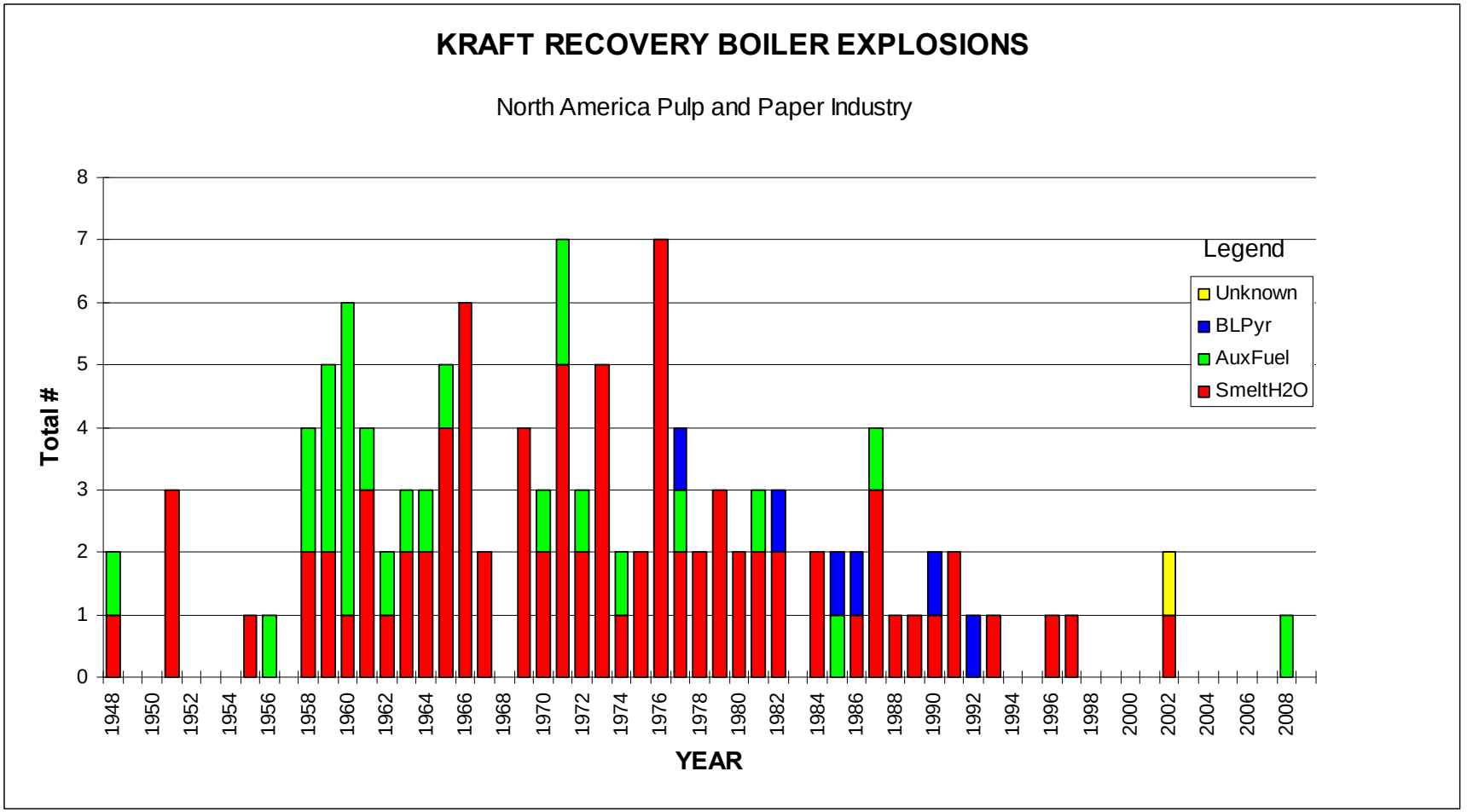

KRAFT RECOVERY BOILER EXPLOSIONS
North America Pulp and Paper Industry
Total #
YEAR
Legend
Unknown
BLPyr
AuxFuel
SmeltH2O
0
1
2
3
4
5
6
7
8
1948
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008

Figure 3

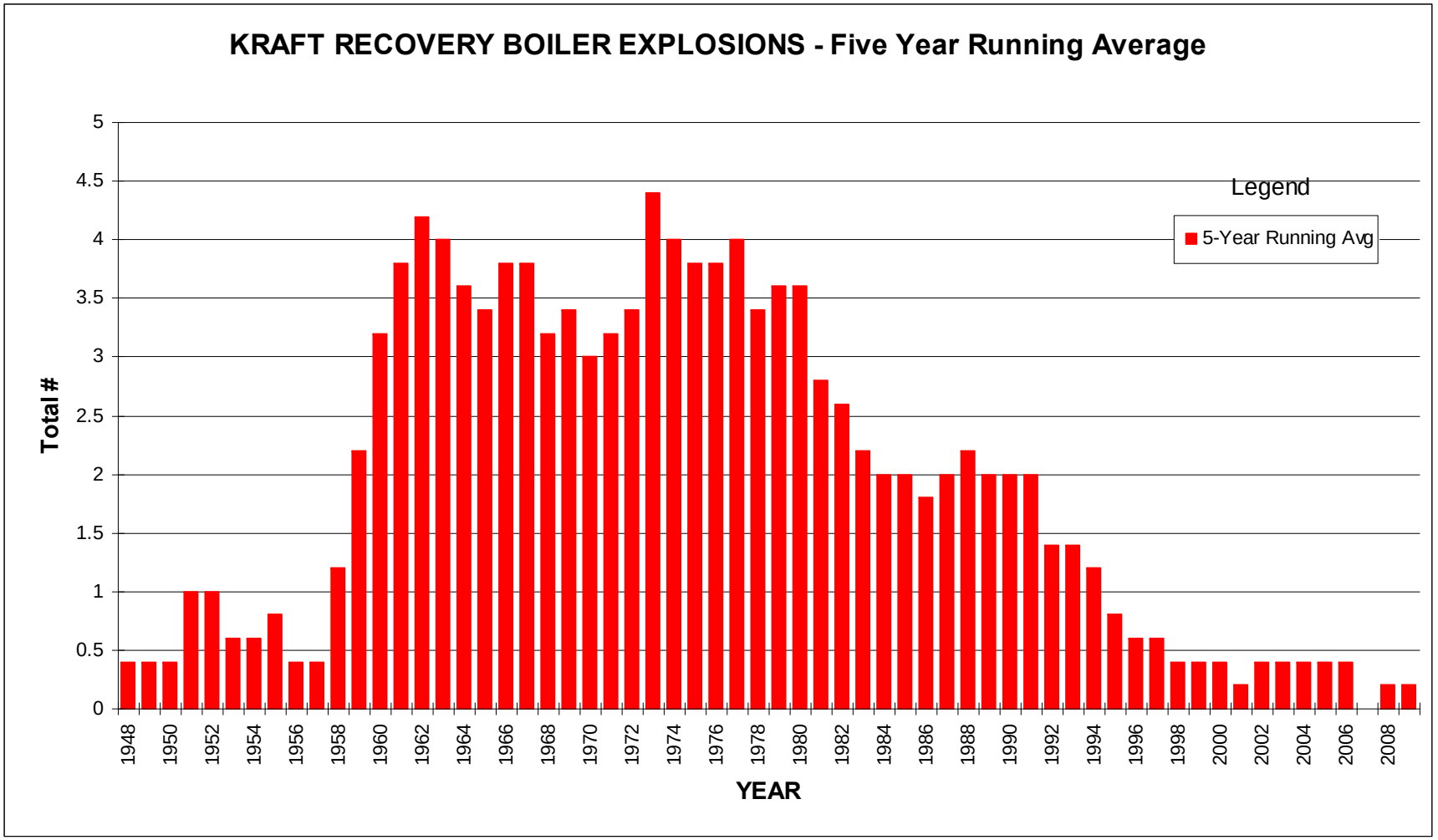

KRAFT RECOVERY BOILER EXPLOSIONS - Five Year Running Average
Total #
YEAR
Legend
5-Year Running Avg
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
1948
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008

Figure 4

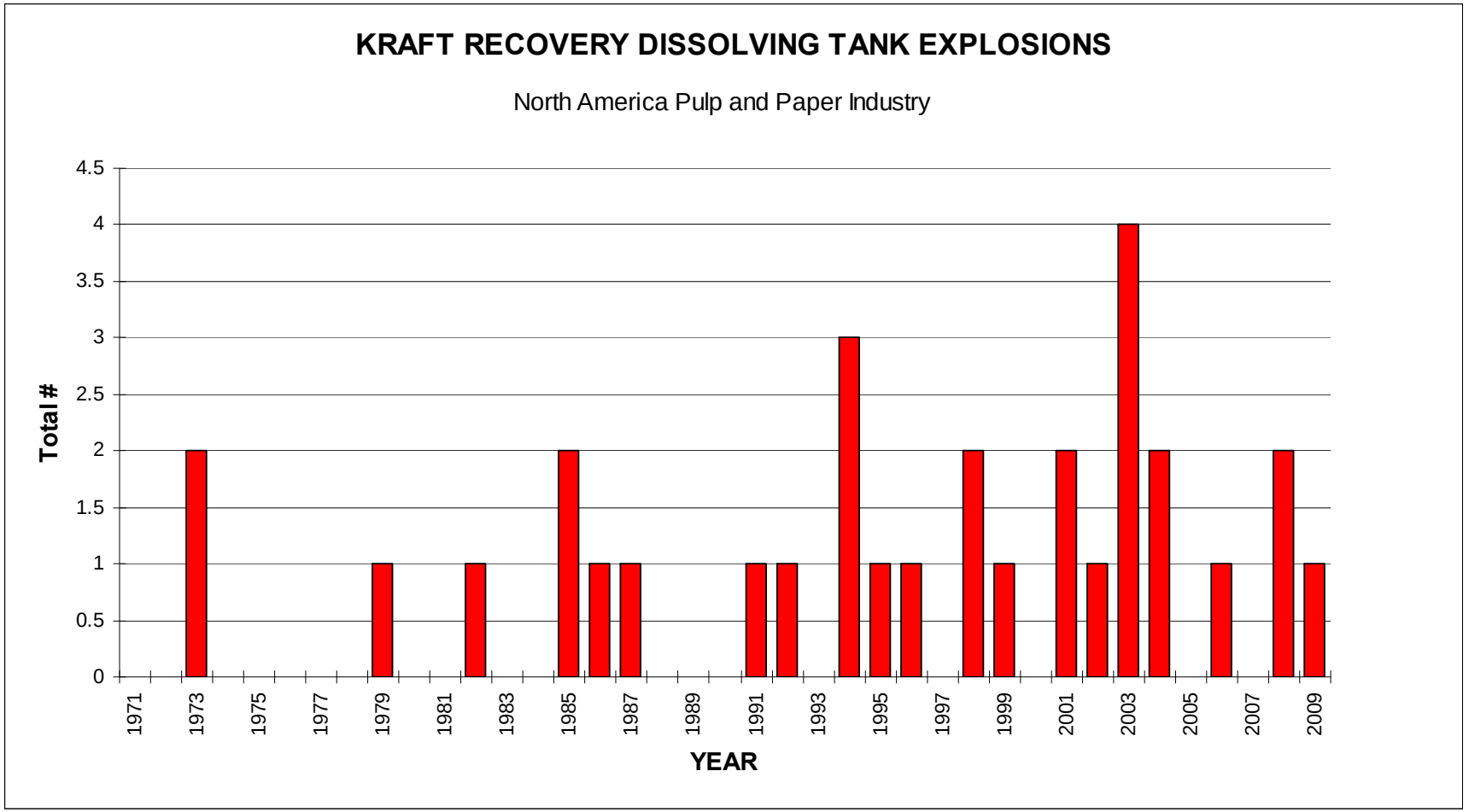

KRAFT RECOVERY DISSOLVING TANK EXPLOSIONS
North America Pulp and Paper Industry
Total #
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
YEAR

Figure 5

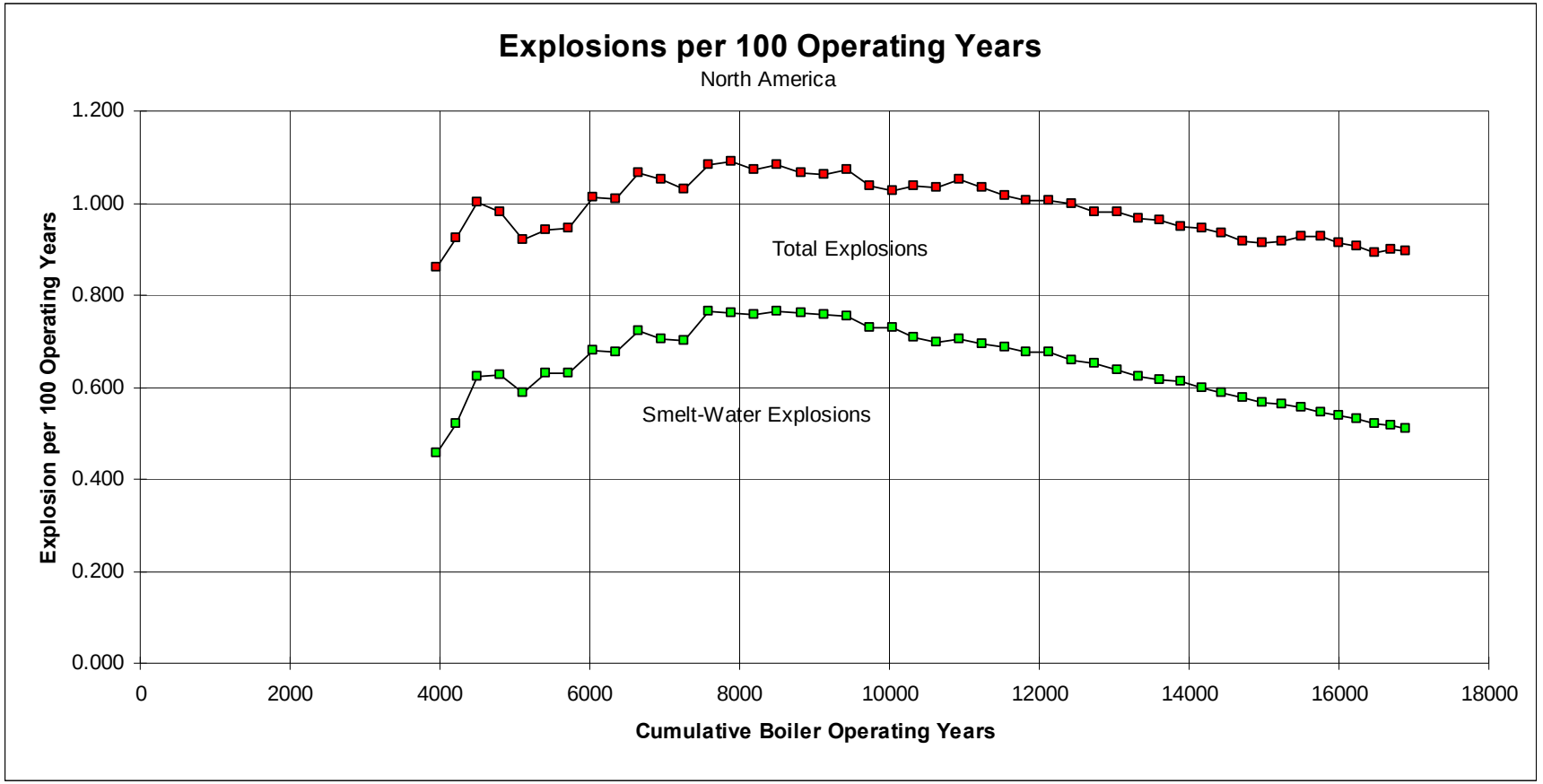

Explosions per 100 Operating Years
North America
Explosion per 100 Operating Years
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Total Explosions
Smelt-Water Explosions
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Cumulative Boiler Operating Years

Figure 6

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.5 **INSTRUMENTATION REPORT** – Dave Avery

The Instrumentation Subcommittee met in open session on Monday morning with 6 out of fourteen members and 5 guests. Our session began with introductions of members and guest. We continued on with a review of last October's minutes and they were accepted. Under new business we accepted a membership change for our Andritz representative changing from Jari Sopanen to Harri Soderlund. It was also noted that our secretary, Dick Pothier, plans to step-down in the fall, so we have begun a replacement search.

As a safety note, we briefly discussed changes in NFPA 70E 2009 verses the 2008 version; 2009 requires an additional electrical verification of the power isolation of an opened breaker. This is in addition to the existing checks/ procedure already in place. An E&I person, properly dressed out, will have to physically check each breaker with a meter that is being locked out. Other verification tools may exist that could lessen the additional time requirements. This will impact our shut schedules and available manpower for scheduled maintenance.

Moving forward we looked at our progress on our update of the instrument checklist and have an agreed checklist format for our common endeavors. The format contains current information plus new supplemental information; i.e., cross references and any approved additions from the other recommended practices. A revision date was added to keep track of which parts have been updated. The sub-committee members will work between meetings to update the list and we expect to have it ready for presentation by the spring '11 meeting. To make this happen we will send monthly updates between members and are planning on several Sunday meetings starting this fall.

The subcommittee has agreed to a replacement term and definition for the currently used term SIS (Safety Instrumented System). The new term, Recovery Boiler Safety System (RBSS) will be inserted in place of our existing SIS references.

> Our definition for Recovery Boiler Safety System (RBSS) is: A system composed of sensors, logic solvers, and final control elements for the purpose of taking the process to a safe state when predetermined conditions are violated. Included in this system are Emergency Shutdown Procedure/System (ESP), Safety Shutdown System (SSD), Safety Interlock System and Flame Safety Supervisory System (FSSS).

In the afternoon session, six members and four guests were present. We began our work on terms and definitions to support and coordinate with the ESP Subcommittee's work on the Stand-Alone wording. The work is on going and there will be a coordinated release that will bring this subject to resolution. The fall session will continue our fast track on this subject as well as the checklist update.

Finally, your visits to our sessions are a value to us and we encourage you come by. Remember most of the time most of you would like us to be transparent to the mill's operation, however when you need us you know we are there. This means, like it or not, were always on your mind, so help us make good sensible decisions by participating with us.

5. **SUBCOMMITTEE REPORTS** (Cont.)

CHAIRMAN: Thank you Dave. Any questions?

ADERMAN: Just one question or comment for you, Dave. In going through some of our auditing protocols, etc., I know you are working to try to incorporate recent changes to Safe Firing of Black Liquor into the Instrument Checklist. One of the items where we still think there might be some help you could offer would be in that checklist where you have checks, for instance, for interlock, there is not much description as to what the actual interlock function is to provide. From our case it would be seen as a benefit if you could include that.

AVERY: Under the "Comments" we are defining it by putting more verbiage in there to clarify that and to help us all out. Also, we are adding a section "J" to the checklist that would include Waste Streams. So we are trying to make it more encompassing.

5.6 **MATERIALS & WELDING REPORT** – Dave Fuhrmann

Review BLRBAC Anti Trust Statement -- "This meeting, as are all BLRBAC meetings, is being held in accordance with BLRBAC Anti-Trust Guidelines"

Attendance

- The Materials and Welding Subcommittee met in morning session on April 6, 2009 with 10 of 18 members represented and one guest.

- Membership attendance was reviewed. Mark Hovinga replaced Steve Osborne of Babcock and Wilcox. Michael Hollern of New Page was accepted as a new member.

Old Business

- The chairman advised the group of the Executive Committee's comments after review of the document submitted to them for review. The Executive Committee advised that focus should be placed on completing references for material. Assignments were made to provide listings from various reference documents:

  - ASME – Dave Lang (Preview of draft document ASME PCC Summary)
  - NACE – Billy Walker / Michael Lykins (several documents that may apply)
  - NBIC – to be assigned
  - B&W Plant Services Bulletins – Steve Osborne - Complete (8 Bulletins)
  - TAPPI TIPs – Michael Lykins (in progress; 2 listed)
  - AF&PA – Dave Fuhrmann – Complete
  - Alstom Power Bulletins – Dennis Hollenbach
  - Welding Manual – Jesse Worsham
  - Copper contamination of welds – Henry Tessier (8 articles for review next session)

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.6 **MATERIALS & WELDING REPORT** (Cont.)

New Business:

- Documents were presented for consideration as references for the Stress Assisted Corrosion Bulletin. 6 were approved for use as references:

  - Sharp, W.B.A., *The Strength of Recovery Boiler Tubes Containing Stress-Assisted Corrosion*, 2004 International Chemical Recovery Conference
  - Sharp, W.B.A., "*An Overview of Stress-Assisted Corrosion in the Pulp and Paper Industry*," NACE Paper #04513, 2004.
  - Moskal, M.D, "*Waterside Stress-Assisted Corrosion Cracking*," AF&PA-BLRBAC Corrosion Seminar, Atlanta, April 1996.
  - Port, Robert D., "*The Nalco Guide to Boiler Failure Analysis"*, p. 173, McGraw-Hill, Inc., 1991.
  - M.J. Esmacher, "*Stress Enhanced Corrosion of Boiler Tubing,"* Materials Performance Volume 26, No. 5, pp 17–20, 1987.
  - Stress Assisted Corrosion: Boiler Waterside, Babcock and Wilcox, Plant Service Bulletin PSB29, 1987.

- Comments received on the M&W draft document posted for member review were discussed. The comments to be addressed by the subcommittee after document approval were:

  - Editorial Comments, mostly directed at inconsistent use of Guidelines, recommendations, and best practices. The Subcommittee decided to use the term Guidelines. This wording would be used in the edited document before posting if the draft is approved by the membership.

  - A lack of detail in Bulletin *1.4 Corrosion Resistant Weld Overlay Applications on Tubes* regarding the impact of dilution of base material. The use of approved weld procedures should consider weld technique to minimize penetration and potential compromise of base material Minimum Wall Thickness.

  - The misleading direction on the use of PT for corrosion protection to evaluation for base material exposure in Bulletin *1.3 Repair of Pressure Boundary Materials in Tubes*. This is only useful for detection of cracks; copper sulfate must be used to detect base material exposure.

- Task Team Assignments were reviewed and drafts were requested so that the subcommittee could continue reviews during sessions.

  - Future work would be on section documents to be inserted into the overall document when fully approved.

- Dave Lang made a presentation on the ASME Post Construction Committee work that listed many references in its draft document.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.6 **MATERIALS & WELDING REPORT** (Cont.)

- Follow up assignments:

  a. Check with Metso and Andritz for their versions of Plant Service Bulletins that may be available for reference – Dave Fuhrmann
  b. Review and provide guidance on reference citations – Billy Walker
  c. Provide final ASME Post Construction Committee document to subcommittee members – Dave Lang

Afternoon Session:

The afternoon session met in an open meeting with 11 members and 27 guests.

- Call to order and review of the BLRBAC Anti Trust statement.
- Guest registration was completed with a solicitation for new members.
  - Terry Lane – GP Cellulose agreed to join the subcommittee
- Presentations (available with the meeting minutes) by Dr. Sandy Sharp, Sharp Consultants, on:
  - **THE STRENGTH OF RECOVERY BOILER TUBES CONTAINING STRESS-ASSISTED CORROSION** (Appendix C)
  - **INSPECTION OF RECOVERY BOILERS** (Appendix D)
- Review of Closed Meeting Activities

Plans for the next meeting may include:

- Review welding and material references
- Update status on Individual and Task Team assignments
  - Corrosion resistant weld overlay application on tubes – Fabian (3 submitted)
- Continue draft reviews and get subcommittee approval.
- Consideration was given to development of a glossary to better define specific terms. Jesse Worsham will develop a draft to present to the group next session.
- Develop Technical Bulletins for Materials –
  - Chemical Cleaning – George Bodman, Mike Garfield, Max Moskal
    - Transfer to Water Treatment Subcommittee??
  - Refractory Installation (sloped floor) – Lynn Barrett, Mike Hovinga
  - Refractory Installation (decanting Hearth) – John Heffernan, Dennis Hollenbach
  - Tube coatings (fireside) - Dave Fuhrmann, Fabian Henriques
  - Tube coatings (cold side) – Ron McCarty, Dan Phillips
- Additional Technical Bulletins and Procedures will be developed, approved and inserted into the document as completed.
- Presentations of experiences that may be of interest to this group.
  - Refractories
  - Welding Research Council

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.6 **MATERIALS & WELDING REPORT** (Cont.)

CHAIRMAN: I'd like to open the floor for comments and questions on the Materials & Welding Guideline document. It has been posted on the WEB for quite a while through the revisions as we thought the information was important enough to get out to the membership for use right away. Therefore, it has been posted in a draft form I think for several years now. Are there any comments, questions or clarifications from the floor? There has been a lot of work done on this. I believe this committee started in 1999. If there are no comments or questions from the floor, would the voting members please stand. Those in favor of accepting and approving the proposed document as the new document for Materials & Welding, raise your hand. Those opposed? The draft as proposed is approved unanimously.

FUHRMANN: Now that we have that approved, we've got our work cut out to start changing it!

5.7 **PERSONNEL SAFETY REPORT** – Robert Zawistowski

The Personnel Safety Subcommittee met in an "open" session on Monday, April 7, 2008. There were nine members (out of 19) and 11 guests in attendance during the meeting.

The BLRBAC anti-trust statement was reviewed. The minutes of the last meeting were read and accepted.

Representation at our meeting by regular members and guests included original equipment manufacturers Babcock & Wilcox, Diamond Power and Metso Power. Representation from insurance and insurance service companies included AXA Corporate Solutions, FM-Global, HSBI & I Company and XL GAPS. And Operating companies represented at this meeting included International Paper, Packaging Corporation of America, Rayonier, Sappi, Thilmany LLC, and Weyerhaeuser. Consultant representation included Lenro and Power Specialists Associates, Inc.

It had been suggested by the Executive Committee to add references to the SOP/ESOP list in our document. In subcommittee discussion we agreed we would try using a format similar to one used in Safe Firing of Black Liquor; using three columns where we list the procedure, its purpose, and reference. After discussing this with the Executive Committee, it was agreed we will also add references to other BLRBAC documents where applicable.

Occasionally we still have questions to our recommendation for the direction of door opening to protected areas. The problem is BLRBAC wants the doors to open into the recovery area, the direction opposite that required by building codes in most jurisdictions. One mill developed a generic letter that has been used successfully to obtain the necessary variances so the doors can be installed as BLRBAC recommends. In discussion with the subcommittee we agreed to add language to our document referencing this letter and including it as an appendix to our document. The language change and generic letter will be submitted to the Executive Committee for review and if accepted posted on the website for review.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.7 **PERSONNEL SAFETY REPORT** (Cont.)

With regard to doors into and out of protective areas, it was noted several meetings ago that it could be difficult to open doors in the event of an explosion, especially where round doorknobs are used. One operator who was in a building during a utility boiler explosion suggested the door handle should be large enough that you can get your arm through the handle to pull the door open. During this meeting one of the committee members refreshed our memory of this suggestion. He had larger door handles installed on his recovery boiler area doors that close against door frames and swing open into the boiler area. This was reported as a low cost modification that certainly could improve the ease of leaving an area in the event of an explosion.

Between the October 2008 and April 2009 meeting there were two inquiries. One asked if there were any written procedures for dissolving tanks in the Personnel Safety document. At this point in time we do not have any procedures for this system.

The second inquiry was asking if there have been any reports of operators complaining of "carpel tunnel" syndrome from using rods to clear primary air ports and rodding in general. The subcommittee and guests were not aware of this particular issue surfacing. We had a brief discussion on rod shape, construction and weight. One person suggested the possible use of padded gloves to minimize shock when rodding.

One "Near miss" was discussed. On a recovery boiler that fires heavy oil in the start up burners it was discovered some operators would open the atomizing steam valve at the gun, while the gun was disconnected, to blow condensate out of the line. As this is done, hot steam and condensate blow out of the gun connection creating a potential to burn the operator. The system is properly piped with a block and bleed valve so condensate can be drained from the line at ground level. Though no operator has been injured by this action the mill made sure the operators know how to properly drain the condensate to the floor.

Following the fall BLRBAC meeting I received information about a US based source of material for fabricating protective garments for use in the smelt spout area. This material was suggested by one of the off-shore users. Following are specifications and contact information for the company supplying this material. As always we suggest that each mill evaluate whether or not this material is fit for the purpose intended and to define how it is to be used. In the Personnel Safety Subcommittee we are always interested in receiving feedback, positive or negative, on your experiences with this or any other materials used to protect personnel:

FREESTYLE 600 FABRIC - TECHNICAL INFORMATION

FABRIC WIDTH
60" inches

TYPE OF FINISH
Dyed Fabric

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.7 **PERSONNEL SAFETY REPORT** (Cont.)

WEIGHT PER SQ METER
5.4864 oz per sq meter

WEIGHT PER SQ YARD
6 oz per sq yard

Type of Knit

WEFT, WARP, THICKNESS
NOMEX fiber TYPE 462

YARN SIZE 30/2 NOMEX Tipo # 462

FABRIC COMPOSITION

93% NOMEX,
5% KEVLAR,
2% CARBON FIBER

FOR MORE INFORMATION CONTACT SOUTHERN MILLS
AT 1-770-969-1000 AND ASK FOR HARRIET.

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

5.8 **PUBLICITY & NEWS REPORT** – Craig Cooke

Good morning! I am presently the chair of a rather exclusive subcommittee, News & Publicity. In this position I basically distribute a summary of BLRBAC activities and future meeting dates to multiple technical journals and newsletters. As you are aware, Chris Jackson's move to the ESP Subcommittee has allowed me to slip from vice-chair to chairman of Fire Protection in Direct Contact Evaporators. First, thanks to Chris Jackson for all his hard work and leadership on that committee. Big shoes to fill! This opens up a very exciting opportunity for one of you to become chair of the News & Publicity Subcommittee. I know there is really no need to sell you on this outstanding opportunity to contribute your skills. Nonetheless, I will try to sell you on this.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.8 **PUBLICITY & NEWS REPORT** (Cont.)

Imagine now that I'm David Letterman with his top ten reasons for you to be the next News & Publicity Chair:

10. Your boss will be forced to send you to every BLRBAC meeting.
9. Minimal qualifications required for this position as evidenced by yours truly.
8. You can meet wherever you want.
7. You can meet whenever you want.
6. The Subcommittee Report is guaranteed to be one of the shortest.
5. And because it's shore, the Subcommittee Report is guaranteed to be one of the most popular.
4. Robert's Rules of Order are totally optional for your meetings.
3. There should be few, if any, conflicts with your committee as you'll be the only one on the committee.
2. An intense training program will be included to assure a smooth transition of responsibilities and it's likely to be held at Spondivitz.
1. And, the number one reason for you to be the next News & Publicity chairman is this very cool ribbon you get. Actually this is the wrong ribbon, yours will be, I think, "WHITE!" That is always good for impressing fellow members and anyone you might meet in the bar.

In all seriousness, News & Publicity is very important. BLRBAC is an excellent organization. We need to encourage people to come to the meetings. As the News & Publicity chair, it is important to get those meeting dates out there and everybody should be encouraged to attend this marvelous organization.

Going forward, you can contact me and probably copy Len Erickson on your interest. I expect to have my inbox totally full of applicants. Any questions?

POLAGYE: Craig, did you say a sense of humor was part of the requirements for that subcommittee?

COOKE: It will be taken into consideration!

CHAIRMAN: It also has one of the higher compensation rates of all the subcommittees because if you divide the compensation by the hours worked…….(applause). Thanks, Craig.

5.9 **WASTE STREAMS REPORT** – John Rickard

On April 6, 2009, the Waste Streams Subcommittee met in closed session at 9:00 AM with 12 members present and in open session at 1 PM with 11 members and 14 visitors present. At the start of both sessions the BLRBAC antitrust statement was reviewed.

Last meeting's minutes were reviewed and approved by a unanimous vote.

Steve Osborne with B&W has joined the subcommittee in place of B&W's Bentley Sherlock.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.9 **WASTE STREAMS REPORT** (Cont.)

The waste stream incineration survey that is available on the BLRBAC website has produced three replies. As an alternate means to learn the extent of waste stream incineration in recovery boilers, the subcommittee will compile a list of installations from systems suppliers. This list can be used to request more information from mills on the list. Ann Plank will create the composite list. John Rickard will get a list from Metso.

The subcommittee had planned to make a waste streams incident questionnaire available to provide learnings from problems with waste stream incineration. Based on initial responses to the previously mentioned survey, an incident questionnaire may be unproductive. As an alternate plan, John Rickard will keep a record of waste stream incidents when such information is available. Those incidents can be reviewed during subcommittee meetings.

There have been a number of questions and comments concerning the Waste Streams Guidelines since the last meeting. They were divided into two categories: questions that concerned the intent of the guidelines, and questions and comments that may result in improvements to the guidelines. The first category of questions covered topics such as:

- What is adequate DNCG conditioning before blending that stream with combustion air? (The resulting mixture's relative humidity should be below 50%.)

- How is a liquid waste stream intended for a dedicated burner determined to be Class A or Class B? (The burner designer must review the waste stream analysis and comment on its qualifications as a fuel.)

- Do permissives from CNCG/SOG guidelines apply to a dedicated waste stream burner? (No, Safe Firing of Auxiliary Fuels guidelines are the source of permissives for a dedicated burner.)

The other category of questions was added to a composite list of comments for further consideration. Review of that list was started during the October 2008 meeting (see meeting minutes for earlier revisions) and the review was continued as the next item on the agenda. Listed below are this meeting's proposed revisions for the Waste Streams Guidelines.

- John Lewis provided a new Chapter 1, Introduction, that is a combination of the Foreword and Chapter 1. The Foreword is eliminated. At the end of Chapter 1 is a paragraph that contains a somewhat contradictory sentence stating that ".. BLRBAC does not encourage this practice." This paragraph is deleted. Chapter 1 was accepted by a unanimous vote of the subcommittee.

- Chapter 3, General Considerations, has been updated by Wendy Coyle and Mark Cooper. It was reviewed with minor changes and accepted by subcommittee members by vote.
  - The Executive Committee has agreed that the Waste Stream guidelines should include a statement that "waste streams be properly conditioned". This performance requirement will be added to Chapter 3, Major Considerations, by Mark Cooper.

4. **SUBCOMMITTEE REPORTS** (Cont.)
   5.9 **WASTE STREAMS REPORT** (Cont.)

- Chapter 4, DNCG
  - Paul Seefeld will improve the discussion pertaining to the value of cleaning DNCG ducts.
  - Text will be revised to state that flow or pressure should be monitored and alarmed.
  - The Logic Explanation Chart for Figure 3 will list the Hazard Protected from "Temperature of chip bin gases after cooler not low" to be "Excursion above LEL".

- Chapter 5, CNCG/SOG:
  - Deleted reference to future dedicated burner
  - Added comment on inspecting CNCG lines and/or cleaning on a regular basis due to the potential for organic deposit build up
  - Deleted from the Logic Explanation Chart a requirement the CNCG line be connected.
  - On figure 5, the label "LP Steam" will be changed to "Purge Steam".
  - Electric heat tracing will be allowed. Text presently calls out "steam tracing".
  - An explanation to not combine CNCG and SOG will be added.
  - The flow diagrams for CNCG and SOG will be revised by changing the atmospheric vents depiction so that they are connected at the top of the transport line and the condensate drain lines will be simplified.

- Chapter 6
  - Methanol – Revised wording concerning isolating methanol to automatically closing one valve and shutting off the pump. Added ability to blend methanol into a system that continuously recirculates a portion of black liquor if the tank is vented to an enclosed collection system.

  - Added a section for blending turpentine or red oil with black liquor. Turpentine or red oil flow will be limited to 0.5% of the black liquor flow. Mathias Lindstrom will investigate the effect that turpentine and red oil has on refractometers for addition in the guidelines.

All of these comments will be submitted to the Executive Committee for review. Upon approval, they will be posted on the BLRBAC website for review by everyone.

Using Waste Stream Guidelines to safely blend diesel fuel with black liquor. At the start of the open afternoon session, the subcommittee discussed using the Waste Stream Guidelines to safely blend a small amount diesel fuel with black liquor on a continuous basis. Diesel fuel is not a pulp mill waste stream, so it is not covered by the Waste Streams Guidelines. However the subcommittee was willing to discuss how these guidelines can be used for this modification.

Input from guests was very valuable during this discussion. Both the soap blending guidelines and the methanol blending guidelines have been used for blending of diesel fuel. When using either of these guidelines, there are some adaptations that can be made for diesel fuel. The subcommittee agreed that the minimum firing rate for diesel blending can be 50% MCR as stated in the guidelines or it can be based on stable operation as defined in Safe Firing of Black Liquor. Diesel fuel can be blended into liquor systems that continuously recirculate a portion of the liquor stream; however it is preferable that this recirculated stream goes to a tank that is vented to a closed collection system.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.9 **WASTE STREAMS REPORT** (Cont.)

The subcommittee has requested that the BLRBAC secretary notify all BLRBAC operating companies of this diesel fuel blending discussion.

The subcommittee meeting was adjourned at 4 PM after a good day's work. Does anyone have any questions?

ZAWISTOWSKI: I though I remember hearing you saying during the meeting, and I just didn't hear you cover it here, was that the diesel fuel issue is not going to result in a change to the waste stream guidelines. Is that correct?

RICKARD: Yes, that is correct. I appreciate your reminding me of that. We are not making any guideline change to address diesel fuel. This is simply a statement of how our guidelines can be used for the diesel fuel injection. Also, that reminds me, we have asked the secretary to send out a statement to all the members so that everybody can see the results of today's meeting if they weren't present. Rather than getting it out with the Minutes, which takes a little bit of time, we might do it a little quicker than that so everybody knows what our findings were.

5.10 **WATER TREATMENT REPORT** – Tom Madersky

The water treatment sub-committee met Monday morning in open session.

Eighteen (18) subcommittee members attended the open session meeting; the subcommittee membership profile is as follows:

- Five (5) OEM's
- Five (5) Mill Representatives
- One FM Global Representative
- Seven (7) BLRBAC Associate Members (4 of the 7 in attendance represent water treatment companies.

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There were an additional 18 guests.

Norris Johnston and I would, again, like to thank all the subcommittee members and guests for their participation and valued contributions.

The Agenda for the spring meeting was as follows:

- Review of the BLRBAC Antitrust Policy
- Update the Membership Information
- Summarize the Fall 2008 Subcommittee Meeting Minutes
- Discuss Subcommittee Representation Guidelines
- Restate the Subcommittee Objectives

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.10 **WATER TREATMENT REPORT** (Cont.)

- Discuss the transfer of responsibility for the development of boiler chemical cleaning guidelines from the Materials and Welding Subcommittee to the water treatment subcommittee.
- Review/edit of the 1st Draft Outline of Subordination
- Discuss Content Development Strategy
- Confirm Path Forward

The following is a line item summary of the topics that were addressed:

Discussion regarding Subcommittee Representation Guidelines

- A motion was set forth that any number of folks could serve on the water treatment subcommittee but there would be only one vote per company. The motion was seconded and carried.

Restatement of the Subcommittee Objectives

- The subcommittee concurred that all resources developed by the subcommittee would align with two primary objectives:
  - Protection of the health and safety of personnel in the recovery area
  - Protection of the recovery boiler and its ancillary steam/water support systems to ensure the ability to process black liquor

Discussion regarding the transfer of responsibility for the development of boiler chemical cleaning guidelines

- Prior to establishing a resource development critical path, the subcommittee members suggested that the water treatment chairperson discuss the scope of work and deliverables with Dave Furmann, the chairperson of the Materials and Welding subcommittee.
- That discussion was held Monday afternoon during executive session. It was agreed upon that any resources that had been developed YTD by the Materials and Welding group would be forwarded to the water subcommittee chairperson.
- Part and parcel to that discussion, the Executive Committee restated the basis for the transfer of responsibilities

Review/edit of the 1st Draft Outline of Subordination

Edits of the entire draft outline were reviewed and many of the suggested changes to the outline were voted upon and accepted by the subcommittee. Those changes will be incorporated into the draft outline and the first revision will be reissued to the membership for a final edit. To hasten the development of content, the chairperson committed to turning around the first revision to the draft within thirty days.

5. **SUBCOMMITTEE REPORTS** (Cont.)
   5.10 **WATER TREATMENT REPORT** (Cont.)

Discuss Content Development Strategy

The Water Treatment outline of subordination is subcategorized into three disciplines; all three focus upon the Recovery Boiler and the Recovery Boiler Water Support Systems. Those disciples are as follows:

- Design and Operating Considerations
- Water Treatment
- Maintenance Practices and Protocols.

A significant amount of time was dedicated to establishing resource development boundaries and suggested constraints to guideline specificity within those three disciplines.

To better define the boundaries, the subcommittee discussed content development of one specific item within each discipline.

As a product of this undertaking, the subcommittee concluded that:

- A Recovery Boiler reliability focused overview should precede any set of guidelines assigned to any particular topic or component system. That overview would serve to define what concerns or issues prompted the development of the subsequent guidelines.
- The guidelines would serve to direct the end user to what mill generated documentation(s) would best serve to address the concerns and/or issues set forth in the overview.
- Where deemed appropriate and essential, specific prescriptive directives will be set forth in the guidelines. The specificity employed to address those prescriptive directives would reside with each individual mill location.
- Water Treatment Guidelines, previously developed by other organizations and societies (ASME, etc.) would be brought into the BLRBAC document. These guidelines will be reviewed by the subcommittee and then updated where deemed necessary. The guidelines, if revised, will incorporate the appropriate verbiage to address the basis for any changes made.

Path Forward

- The Subcommittees will be divided into three teams based on area of expertise.
- Each team will draft some basic content for a designated subcomponent.
- The content will undergo an edit during the fall 2009 meeting.

In closing we are looking for more mill volunteers to serve on our subcommittee. If you are interested in participating please respond to my e-mail address:

Tom.Madersky@PSAengineering.com.

6. **AMERICAN FOREST & PAPER ASOCIATION RECOVERY BOILER REPORT** – Tom Grant

The AF&PA Recovery Boiler Program is continuing in its efforts to produce greater awareness of safe practices and improvement in the operation, maintenance, safety and efficiency of recovery boilers.

Membership

Currently, 31 companies participate in the Program including six non-AF&PA member companies. The Program members represent nearly 95% of the total production of sulphate pulp in the U. S. There are three other companies operating recovery boilers that are not in the Program. We will continue to encourage them to join with the current members in the cooperative efforts for the safe operation and research to improve the reliability of the recovery boilers. All companies operating recovery boilers benefit directly from the Program's activities, including the research.

Currently, there are 110 mills operating 173 recovery boilers in the U. S. They produce about 40% of the total energy used in the U. S. pulp and paper industry. The average age of the boilers is about 29 years. Over 67% of the boilers were installed prior to 1979.

Operational Safety Seminars

AF&PA is continuing to sponsor three Operational Safety Seminars each year as it has done since 1985. Over 2,800 superintendents, supervisors, operators and maintenance personnel have attended the seminars. Three seminars were held last year with a total of 163 attendees from 20 companies and 34 mills. This year has been a different story with the economic conditions restricting travel. We scheduled three seminars, but due to the limited registrations the March seminar in Portland OR and the April seminar in Atlanta had to be cancelled. The last seminar for this year is scheduled for May 12 – 13th in Atlanta. We are hoping that we will have sufficient registration to hold it. If your mill wishes to send some people to this seminar, please let me know as soon as possible.

Dr. Grace and Ron McCarty announced that this would be their last year to monitor the seminars. They will be missed to say the least. Jules Gommi and Bob Phelps were selected to replace them for next year's seminars.

Recovery Boiler Reference Manuals

The Operation and Maintenance Subcommittee is reviewing the AF&PA Recovery Boiler Reference Manuals to include any possible new information. Plans are to make any necessary revisions and to put the manuals onto CDs to make them more available at the mills.

Non-Destructive Technologies for Detecting Water-Side Deposits

The final report for the Non-Destructive Technologies for Detecting Water-Side Deposits was completed last year. The study did not reach its goal in testing the several different technologies, although some showed some promise, it was not what we had hoped. The Advisory Group has been in contact with another vendor (Aptech) to determine the prospect of its instrument for future study.

6. **AMERICAN FOREST & PAPER ASOCIATION RECOVERY BOILER REPORT** (Cont.)

Including Economizer Tube Failure Study Recommendations and Guidelines into AF&PA Guidelines and Checklist Document

The Operation and Maintenance Subcommittee is reviewing the recommendations and guidelines developed in the Economizer Tube Failure Study. These are being processed so that the AF&PA Guidelines and Checklist document maybe updated to include these recommendations.

Study on Smelt Dissolving Tank Explosions

Last year, Dr. De Martini of IPST/Georgia Tech. completed a study sponsored by AF&PA. The study was on dissolving tank explosion incidents. The BLRBAC Safe Firing of Black Liquor in Recovery Boilers Subcommittee discussed the results of this study. From the outcome of these discussions, AF&PA sponsored a study on the calculations of green liquor density vs. TTA as a function of composition. The Safe Firing Subcommittee is studying the results of this latest study to help make a decision for the preferred test methods for this situation. Currently, there are no guidelines for this. Thus, this study will aid to guide in reducing dissolving tank explosions.

Updating "Kraft Recovery Boilers" Blue Book

The R & D Subcommittee contracted Dr. Tran and other known recovery boiler researchers to update the "Kraft Recovery Boilers" textbook. There have been enough commercial advances and research activities documented to warrant a new edition. Dr. Tran will spearhead this effort with the authors for publication at the end of 2011. Copies of the current edition are available for purchase from TAPPI.

TAPPI TIP Sheets

The TAPPI Subcommittee is reviewing drafts of the TIP sheet for economizers based on the study AF&PA sponsored on Economizer Leaks. The possibility of TIP sheets for industry use from the other AF&PA sponsored studies on Behavior of Furnace Corners in Explosions; Superheater Study and Floor Tubes is also being discussed by TAPPI.

Other Research Projects Under Review

The Committee is considering several studies related to recovery boiler safety.

Annual Meetings and Conference

AF&PA's annual Recovery Boiler meetings and Conference were held in Atlanta in January this year. Although attendance was slightly down from last year, participation was very good. As usual, it is open to all operating companies, insurers, vendors and manufacturers. The presentations included reports on the projects currently sponsored by the AF&PA Recovery Boiler Program and subcommittee reports on their accomplishments, as well as other research being done related to recovery boilers. The object of the Conference is to keep not only the members advised, but also the remainder of the recovery boiler community, as well. We hope that many of you will plan to attend next year's Conference, which will be held in Atlanta next February.

7. **NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS REPORT**

   No report given at this time.

8. **TAPPI RECOVERY BOILER SUBCOMMITTEE OF STEAM & POWER REPORT** – Jim Dickinson

   The TAPPI Steam & Power/Energy Management Committee hasn't met since BLRBAC last time, so I don't have any updates to the presentation that I gave last October. We will be meeting this afternoon at 1:00 p.m. downstairs where the Casino Night was. I believe it is the Hepburn Room. I invite everybody to please come on down. We like guests and value your input.

   The main fall meetings will be about a week after BLRBAC in mid-October in Memphis. I will provide another update in the fall.

MORENCY: I have a question for Jim. It appears to me that the NBIC is getting into the front-end design business and ASME is getting into the post-design business. Is this effort coordinated or are we seeing, I guess, a turf battle here between the two agencies?

ERICKSON: I think that is a good question, Karl. We will follow up with Dave Parrish of FM Global because I think he has both ASME and NBIC contacts. I noticed that in the last NBIC revision they removed, or at least I can't find it, the reference to recovery boilers they once had.

POLAGYE: That's still in there.

{Secretary's Note: The material on recovery boilers is in Part 2, Inspection, Section 2, Item 2.2.12.2, Kraft or Sulfate Black Liquor Recovery Boilers}

9. **WESTERN CANADA BLRBAC REPORT** – Shawn Casey

   The 2008 fall meeting was held in Vancouver, British Columbia. A total of 65 people attended, which included mill representation and boiler manufacturers. There were no incidents reported. All incidents submitted to BLRBAC for the Spring 2008 meeting were discussed.

   There were three presentations from boiler manufacturers of updates on what is new. The operation and trouble shooting session continues to be a success.

   The next meeting is in Richmond, British Columbia and is scheduled for April 21 and 22, 2009.

   In closing I'd like to than everyone for the warm hospitality I received again at this meeting and excellent learnings that I can take back to our membership. There is an open invite for anyone who can attend any of our meetings. We do have the Winter Olympics next year!

10. **ACTIVITIES OUTSIDE NORTH AMERICA REPORTS**

    No reports were given at this time.

11. **OPERATING PROBLEMS SESSION REPORT** – Scott Moyer

Good morning. Wow, it looks like we need to extend the room back so more people can sit in the back. We had a good Operating Problems Session. It started with a quiz, which was back by popular demand, and I'm happy to report that everybody, but Tom Grant, got 100%. Tom has to stay after school!

It is estimated that about 150 guests attended. After the quiz we talked about a number of issues from salt cake falls to dissolving tank issues, side streams, including diesel mixing. We had an excellent participation. By far this was the greatest amount of questions that have ever been submitted. So I appreciate the participation. That session is for all of you to learn and share. Again I appreciate everybody's help making that a success.

Immediately following this morning's session we have two Technical Presentations. The first is on "Digital Radiography." Some new technology that looks very interesting to us. The second is on "Stress-Assisted Corrosion." So I think they are both pretty good material and I encourage you to attend if you can.

NEXT MEETING: October 5, 6 & 7, 2009, at the Crowne Plaza Hotel, Atlanta GA.

CHAIRMAN: Are there any other new business items from the members that you would like to bring forward? If not, can I have a motion to adjourn the meeting? Second? All in favor? The spring meeting of the 2009 BLRBAC is now closed. Everyone have a safe trip home!

APPENDIX A – SUMMARY OF INCIDENTS

ECONOMIZER

SPRING 2009 - 01	
Classification:	**Non-Critical**
Location:	**International Paper, Valliant, OK**
Unit:	#2 RB 2004 Andritz Contract 400084, 1-Drum Large Econ
Unit Size:	6.3 MM lb ds/day, 943,000 lb/hr steam at 1250 psig, 925°F, 1500 psig design
Incident Date:	September 25, 2008
Downtime hrs, leak/total:	34
ESP?	**No**
Leak/Incident Loc:	¼" crack at toe of attachment weld at seal plate attachment approximately 4 feet from lower economizer bottle headers
How discovered:	Walk down. Saw water in economizer hopper
Wash adjacent tube:	No
Root cause:	Fatigue at high stress point with possible weld undercut at L-shaped seal plate weld to tube – should only be welded to fin.
Leak detection:	Yes. Boiler blow-down indicator – confirmed leak
Bed cooling enhanc	No
Last full inspection:	May 2008
Sequence of events:	During rounds the recovery operator found water in the economizer one hopper. The boiler was taken off liquor, cooled down and locked out.
Repair procedure:	Removed the seal plate attachment weld from the tube, ground out the indication and pad welded (SMAW). The plate was not reattached to the tube.
Future prevention:	At next outage, all sites of that type will be inspected. Any welds onto tube will be removed

ECONOMIZER

SPRING 2009 - 02	
Classification:	**Non-Critical**
Location:	**International Paper, Courtland, AL**
Unit:	#2 RB 1979 B&W Contract PR-180, 2-Drum DCE Cyclone
Unit Size:	4.2 MM lb ds/day, 500,000 lb/hr steam at 450 psig, 550°F, 550 psig design
Incident Date:	October 9, 2008
Downtime hrs, leak/total:	41
ESP?	**No**
Leak/Incident Loc:	Small ¼ - ½ " tears in 3 tubes (35, 37, 38) at tube shield attachment lugs, lowest soot blower elevation, rear lane
How discovered:	Leak Detection Alarm, operating data, and verified by walk down – saw water leaking from cyclone inlet duct
Wash adjacent tube:	No
Root cause:	Split nozzle of soot blower lance tube caused it to bow, which impacted tubes. 7 others damaged. Nozzle failure possibly from corrosion from specific blowers out of service period
Leak detection:	**Yes.** Mass balance
Bed cooling enhanc	No
Last full inspection:	September 19, 2008
Sequence of events:	Liquor solids dropped 1%; cyclone dilution dropped to 0, Level 1 leak detection alarm triggered at 4 am. Walk down found nothing. Level 2 alarm at 5:40 am. Level 3 alarm at 6:15 am. All parameters reviewed by new shift. Indicated economizer leak. 6:30 Water discovered leaking out of the north cyclone inlet ductwork. Started orderly shutdown, pulling liquor 6:54. Low drum boiler trip. Visible economizer leak confirmed in non-critical area. Restored fire and continued orderly bed burnout and shutdown.
Repair procedure:	Shields were removed on all 10 tubes, NDE performed, tubes were pad welded. NDE was performed on the repairs. The shields were reinstalled.
Future prevention:	Inspected nozzles including 2 for met. exam. Checked for bowed lances. Trimmed support lugs. Set up tube leak trend analysis procedure.

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

ECONOMIZER and others

SPRING 2009 - 03	
Classification:	**Non-Critical**
Location:	**International Paper, Ticonderoga, NY**
Unit:	#1 RU, 1969B&W Contract PR-131, 2-Drum Large Econ, 1981 B&W Econ
Unit Size:	2.01 MM lb ds/day, 300,000 lb/hr steam at 875 psig, 825°F, 975 psig design
Incident Date:	October 24, 2008
Downtime hrs, leak/total:	0 / 125
ESP?	**No**
Leak/Incident Loc:	1. Crack in tube 3, row 29, header 4, 1" below econ header 2. Cracks in D-links of Secondary SH 3. Thermocouple well of steam outlet 4. Riser tube, south mid wall header, crack 1" from header
How discovered:	1. Walk down. Saw salt stalagmites at inlet of ID Fan; opened drain, saw water 2&3 During hydro 4 Walk down. During start-up, saw steam blowing from header.
Wash adjacent tube:	No
Root cause:	Econ: SAC and thermal cycling [D-links bottomed out and-weld pulled out; Riser: fatique and/or corrosion
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	Econ lower bends in 2008, 2007, 2006
Sequence of events:	24Oct am Saw water and ash icicle at fan. Did orderly shut down. Hydro found econ leak 26Oct am, and 2 SH D-link leaks. Repairs done 27Oct am. Hydro found TC well leak. Start-up pm. Possible water, so 2 hydros Oct 28 but found nothing. Leak found in header riser in pm. Repaired, Oct 29 back on line.
Repair procedure:	Econ: removed tube and plugged at headers. SH D-links: Ground out cracks and welded. TC Well: seal-welded a coupling onto fitting. Riser tube: Ground out cracks and welded.
Future prevention:	Econ: Plan to thoroughly clean sides of economizer on next outage. Modify bottom casing around bottom headers to assure headers are not restricted from expansion/contraction. Plug all tubes in the first two rows from ends of the each header. Start plan to possibly replace economizer SH D-links: Replace with T&G Links Riser: Test all riser tubes for cracks and replace as necessary

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

ECONOMIZER

SPRING 2009 - 04	
Classification:	**Critical Incident #710**
Location:	**International Paper, Ticonderoga, NY**
Unit:	#1 RU, 1969B&W Contract PR-131, 2-Drum Large Econ, 1981 B&W Econ
Unit Size:	2.01 MM lb ds/day, 300,000 lb/hr steam at 875 psig, 825°F, 975 psig design
Incident Date:	December 22, 2008
Downtime hrs, leak/total:	0 / 55.5
ESP?	**No**
Leak/Incident Loc:	Tube crack 1" from top header of hot economizer module
How discovered:	**Walk down**. Saw water dripping from buckstay on 3d floor
Wash adjacent tube:	No
Root cause:	Possibly stress-assisted corrosion and thermal cycling. Salt cake build-up at sides, but no major metal loss. Some minor pitting inside tube.
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	2008 – lower econ bends
Sequence of events:	22Dec 2:15am: Walk down saw water dripping from 3d floor buckstay. Traced back to 5th floor of economizer. Pulled liquor. Opened door and verified leak at upper econ header. 10:45am–9:00pm: Orderly shut down. 9:45 pm Started repair. 23Dec 4:45am: Repair complete. 5:45-8:00am hydro complete. 5:20pm: First fire. 24Dec 00:45am: on line. 3:30am: First liquor.
Repair procedure:	Removed tube and plugged at both headers
Future prevention:	Clean economizer sides. Relieve any lower casing restrictions. Plug all tubes in 1st two rows at each end of header. Evaluate replacement.

ECONOMIZER

SPRING 2009 - 05	
Classification:	**Non-Critical**
Location:	**Weyerhaeuser Flint River, Oglethorpe, GA**
Unit:	#1 RU, 1980 B&W Contract PR-198, 2-drum, 5-pass large Econ
Unit Size:	5.2 MM lb ds/day, 800,000 lb/hr steam at 900 psig, 825°F, 1175 psig design
Incident Date:	December 5, 2008
Downtime hrs, leak/total:	32
ESP?	**No**
Leak/Incident Loc:	1/2x1/16" stress crack in tube about ¾ inch above lower economizer tube-to-header weld
How discovered:	**Walk down**. Wet ash and water found in west economizer hopper
Wash adjacent tube:	No
Root cause:	**Fatigue stress for unconfirmed reasons (age?).**
Leak detection:	Yes
Bed cooling enhanc	No
Last full inspection:	Sept 2008
Sequence of events:	Dec 5, 21:50 Found wet salt cake and water in hopper. Leak detection didn't see steam-water differential. 22:15 Began orderly shutdown. 23:25 Off liquor, burning oil to burn out bed.Dec 6 00:30 Visual confirmation water spraying from lower econ tube. 03:10 Fire out. After cooled, scaffolded, repaired leak, hydroed, and turned over to operations Dec 7, 03:10 Back on line. 07:25 Liquor in.
Repair procedure:	Ground out; TIG weld repair; weld testing done.
Future prevention:	Jan 20, 2009 Economizer inspected – no further evidence found.

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

ECONOMIZER

SPRING 2009 - 06	
Classification:	**Non-Critical**
Location:	**Weyerhaeuser Flint River, Oglethorpe, GA**
Unit:	#1 RU, 1980 B&W Contract PR-198, 2-drum, 5-pass large Econ
Unit Size:	5.2 MM lb ds/day, 800,000 lb/hr steam at 900 psig, 825°F, 1175 psig design
Incident Date:	December 27, 2008
Downtime hrs, leak/total:	33
ESP?	**No**
Leak/Incident Loc:	1" stress crack in tube just above lower economizer tube-to-header weld
How discovered:	**Walk down**. Wet ash and water found in west economizer hopper while clearing rotary feeder
Wash adjacent tube:	No
Root cause:	**Fatigue stress from excess vibration of tube (up to 2") due to missing baffle plate**
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	Sept 2008
Sequence of events:	Dec 26, 11:00 steam-water differential noticeable. Dec 27 00:15 Found wet salt cake and water in hopper while clearing rotary feeder. 00:20 Began orderly shutdown. 02:40 Off liquor, burning oil to burn out bed. 03:00 Visual confirmation water spraying from lower econ tube. 06:30 Fire out. After cooled, scaffolded, repaired leak, hydroed, and turned over to operations Dec 28, 00:30 Fired in unit. 07:00 On line. 09:25 Liquor in.
Repair procedure:	Ground out; TIG weld repair; weld testing done.
Future prevention:	Secured tube and baffles. Jan 20, 2009 Outage: Fixed baffles and secured tubes as required.

ECONOMIZER HAND HOLE CAP

SPRING 2009 - 07	
Classification:	**Non-Critical**
Location:	**International Paper, Texarkana, TX**
Unit:	#1 RU 1972 B&W Contract PR-144, 2-Drum Large Econ, 1985 B&W Econ
Unit Size:	2.6 MM lb ds/day, 408,000 lb/hr steam at 650 psig, 750°F, 775 psig design
Incident Date:	December 30, 2008
Downtime hrs, leak/total:	0 (during outage)
ESP?	**No**
Leak/Incident Loc:	Crack in outlet header hand hole cap weld, primary econ, elev. 128'
How discovered:	**Walk down. Saw steam coming from under insulation.**
Wash adjacent tube:	No
Root cause:	Porosity at start-stop area
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	May 2008
Sequence of events:	During walk down, saw steam coming from under top of economizer section. Removed insulation and found leak.
Repair procedure:	Gouge old, repair seat, weld new cap.
Future prevention:	n/a

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

ECONOMIZER

SPRING 2009 - 08	
Classification:	**Non-Critical**
Location:	**International Paper, Courtland, AL**
Unit:	#2RU, 1979 B&W Contract PR-180, 2-Drum DCE Cyclone
Unit Size:	4.2 MM lb ds/day, 500,000 lb/hr steam at 450 psig, 550°F, 550 psig design
Incident Date:	Feb 6, 2009
Downtime hrs, leak/total:	44
ESP?	**No**
Leak/Incident Loc:	Complete circumferential tear of tube 2" above econ inlet header
How discovered:	**Walk down** found excess dust and noise; **Control room** lost drum level, ID Fan sped up; Mass balance **leak detection** also detected it.
Wash adjacent tube:	Possibly yes
Root cause:	A thinned area on the tube ruptured causing the tube to completely tear. Possibly the thinned area was caused by a small hole (pitting) in the same tube washing the adjacent surface (tube is curved at this location)
Leak detection:	Yes
Bed cooling enhanc	No
Last full inspection:	Sept 2008
Sequence of events:	Feb 6, 2009, 4:49pm Leak detector indicated rupture; Outside operator reported dust-filled building; Control room verified ID Fan increase and drum level dropping. 4:53 Unit tripped on low drum. Tube leak noise evident from lower econ header. Orderly shut down began. Water coming out of ducts below econ. Feb 7, Cooled unit and probed bed. Locked out, scaffolded, 1:00 pm Repaired, completed by 8:00 pm. 11:00 pm Good hydro. 2:00 am First fire. 10:00 am On line. 1:43 pm First liquor.
Repair procedure:	Removed tube; plugged and capped header.
Future prevention:	Examine tube for washed area; Assess water treatment; Do NDE at next outage for pitting

ECONOMIZER

SPRING 2009 - 09	
Classification:	**Critical Incident #711**
Location:	International Paper Riverdale, Selma, AL
Unit:	#2 RU, 1981 CE, Contract 28679, 2-Drum Large Economizer
Unit Size:	2.7 MM lb ds/day, 425,000 lb/hr steam at 1425 psig, 860°F, 1720 psig design
Incident Date:	February 22, 2009
Downtime hrs, leak/total:	46.3/59.5
ESP?	**No**
Leak/Incident Loc:	¼' and 1/8 " holes in two tube welds at top header of hot economizer module
How discovered:	**Walk down**. Water seen at econ bottom door, confirmed by indication of moisture in hopper
Wash adjacent tube:	Yes
Root cause:	One leak likely external corrosion from wet salt cake; Second leak washed from first leak.
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	July 2008
Sequence of events:	**Feb 16** Walk down saw water at econ bottom door, , confirmed by indication of moisture in hopper. Since believed to be at lower econ header hand hole, and no water observed in mud drum hopper, and baffle isolating travel to furnace, chose to wait for orderly shutdown. **Feb 20** Leak worse, with steady wide stream of water in BOTH econ hoppers. **Feb 21** Unit tripped on low steam flow. Refired unit and found leak in upper econ header, and took orderly shutdown. **Feb 23** midnight started repairs. 9:00pm Hydro. 10:00pm Completed repairs Feb 24 2:00am 1st fire.
Repair procedure:	Plugging and capping 6 tubes (2 damaged and 4 cut for access)
Future prevention:	Water wash procedure changed to assure salt cake cleaned from upper econ and roof.

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

SUPERHEATER

SPRING 2009 - 10	
Classification:	**Non-Critical**
Location:	**Canfor Pulp & Paper Northwood Pulp Mill, Prince George, BC**
Unit:	1982 CE CA 79120; 2-drum Large Econ
Unit Size:	3.69 MM lb ds/day, 586,000 lb/hr steam at 635 psig, 750°F, 800 psig design
Incident Date:	April 27, 2008
Downtime hrs, leak/total:	8/ 53-3/4
ESP?	**Yes**
Leak/Incident Loc:	Small pinhole where the crown seal was welded to the superheater tube
How discovered:	During **hydro** following ESP
Wash adjacent tube:	No
Root cause:	Stress from ESP or earlier extreme annual hydro
Leak detection:	Yes
Bed cooling enhanc	No
Last full inspection:	April 2008
Sequence of events:	Operators saw 50 tonne/hour steam water difference with the feed water valve at 100%. Believing it to be a leak, they ESP'd the boiler at 6:03 am. Afterwards, the DCS info showed the leak indication was a result of unstable firing conditions (two earlier flameouts and 3d in progress, while learning new air system). The feedwater valve was closing off and the differential was dropping just around the time the ESP buttons were pushed.
Repair procedure:	Defect was ground out. All crack indications were removed and repair plus overlay weld was done
Future prevention:	

SUPERHEATER & OTHERS

SPRING 2009 - 11	
Classification:	**Non-Critical**
Location:	**Domtar, Ashdown, AR**
Unit:	1979 CE Contract 27477 2-drum Large Econ
Unit Size:	4.2 MM lb ds/day, 600,000 lb/hr steam at 850 psig, 850°F, 1075 psig design
Incident Date:	July 28, 2008
Downtime hrs, leak/total:	132
ESP?	**Yes**
Leak/Incident Loc:	4 circ & long. cracks in SH tube at hinge pin welds (elev. 130'); 1/8" circ crack in primary SH tube at steam-cooled spacer clip (elev. 95"); 5/16 circ crack in north wall tube at membrane weld, exterior in penthouse
How discovered:	Operator observed disruption in smelt bed via **bed camera**
Wash adjacent tube:	No
Root cause:	Weld fatigue crack in all cases
Leak detection:	Yes
Bed cooling enhanc	Yes
Last full inspection:	2004
Sequence of events:	During normal operation, operator saw on bed camera bed disturbance similar to earlier ESP case. Diverted liquor. Saw suspicious bed area. ESP'd 12:45 pm. 6-hr SOP evacuation.
Repair procedure:	Hinges and clips were removed, indications were ground out, and tubes were pad welded
Future prevention:	Visual examination of adjacent tubes was done. Additional NDT will be done October, 2008. These leaks maybe due to ESP stress.

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

SUPERHEATER

SPRING 2009 - 12	
Classification:	**Non-Critical**
Location:	**Domtar, Ashdown, AR**
Unit:	#2 1979 CE Contract 27477 2-drum Large Econ
Unit Size:	4.2 MM lb ds/day, 600,000 lb/hr steam at 850 psig, 850°F, 1075 psig design
Incident Date:	September 25, 2008
Downtime hrs, leak/total:	101/294
ESP?	**Yes**
Leak/Incident Loc:	1. 50% circ cracks in secondary SH tube above roof at bottom of fillet weld at high crown seal (elev. 140'); 2. Pinhole crack in secondary SH tube at stitch weld 3d down from top (elev.120')
How discovered:	**Leak Detection alarm & walkdown.** Operator heard noise in SH when investigating alarm
Wash adjacent tube:	No
Root cause:	Cyclic weld fatigue crack and weld fatigue pinhole
Leak detection:	**Yes** – alarmed leak
Bed cooling enhanc	Yes
Last full inspection:	2004
Sequence of events:	During normal operation, lLeak detect system alarmed steam-water differential. Operator did walkdown and heard steam blowing in upper furnace, with puffs. Noise verified after sootblower system isolation. Unit ESP'd. After 8 hours TC's inserted into bed
Repair procedure:	Dutchmen put in to replace the 2 SH leaks from this ESP and the 4 SH leaks ESP in July
Future prevention:	Additional extensive NDT was performed during the outage. More in depth inspections of these areas needs to be performed on future outages. Historical data will be studied to develop a scope of work to prevent future failure.

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

SUPERHEATER

SPRING 2009 - 13	
Classification:	**Non-Critical**
Location:	**Interstate Paper, Riceboro, GA**
Unit:	1968 B&W PR-099; 2-drum DCE Cyclone
Unit Size:	1.4 MM lb ds/day, 219,000 lb/hr steam at 600? psig, 760°F, 725 psig design
Incident Date:	September 19, 2008
Downtime hrs, leak/total:	48
ESP?	**No**
Leak/Incident Loc:	¼" hole worn into top U-bend SH rubbed by roof refractory & shingle plate, near 6th flr access door
How discovered:	**Walk down**. Operator heard noise
Wash adjacent tube:	No (checked by UT)
Root cause:	Top of SH tube was rubbed, after 40 years of operation. Hanger maybe held loop too close
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	May 2008
Sequence of events:	**Sep 19 Friday evening**: Operator heard noise in generating bank ash hoppers while making rounds, with sootblowers off. No moisture in ash hoppers. Contacted crew leader. Steam/feedwater separation normal. Some puffing, but furnace draft pretty normal. Opened doors to pinpoint location: Suspected superheater tube leak 6th flr. Decision made to pull liquor and burn bed out. **10:15PM** liquor firing stopped. **Sat 9:00 am** No pressure. Small bed present, about 3' high in center. Hydroed boiler at 20 psig. Water seen running down SH tubes near roof. **1:10 PM** washed area with top soot blower. **3:00 PM** scaffolding installed in the area. **5:00 PM** leak identified. **Sunday 5:30 AM** repairs and x-rays were complete**. 7:50 AM** hydro complete. **4:20 PM** boiler on line.
Repair procedure:	Removed hanger. Cut both legs of SH loop ~2 feet from the roof. Removed loop. Pad welded thin area. Checked with Dye penetrant. Welded loop back into SH. X-rayed the two new welds
Future prevention:	40 year old SH has had a number of leaks over the years. Reviewed incident with all crews. Will try to inspect similar bends at 2009 annual outage. This area is very difficult to inspect. SH spacing is tight and some bends are too far from soot blower lanes.

SUPERHEATER

SPRING 2009 - 14	
Classification:	**Non-Critical**
Location:	**International Paper, Augusta GA**
Unit:	#2 RB, 1965 B&W, Contract PR-89, 2-Drum DCE Cyclone
Unit Size:	1.79 (1.2 design) MM lb ds/day; 185,000 lb/hr steam at 850 psig, 900°F, 875 psig design
Incident Date:	January 2, 209
Downtime hrs, leak/total:	No lost time
ESP?	**No**
Leak/Incident Loc:	1/8" pinhole in 2nd section, 1st stage Superheater, just above arch, 62.5 feet above hearth
How discovered:	Found during boiler hydro following a shutdown and water wash for market down time
Wash adjacent tube:	No
Root cause:	External corrosion likely from high tube temps and high carryover.
Leak detection:	Yes
Bed cooling enhanc	No
Last full inspection:	April 2008
Sequence of events:	Unit down for market slow down. It had been washed and layed up for ten days. The leak found during a hydro preparing for start up
Repair procedure:	Dutchmen installed. Neighboring tubes verified for MWT
Future prevention:	Continue NDT inspections of loops, Evaluate replacement of SH. Try to lower carryover.

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

FEEDWATER AIR HEATER

SPRING 2009 - 15	
Classification:	**Non-Critical**
Location:	**International Paper, Riegelwood, NC**
Unit:	#5 RU 1982 CE Contract 20980 2-Drum Large Econ, 2004 Kvaerner Rebuild
Unit Size:	6.72 MM lb ds/day, 936,000 lb/hr steam at 850 psig, 825°F, 1130 psig design
Incident Date:	August 16, 2008
Downtime hrs, leak/total:	25.2
ESP?	**No**
Leak/Incident Loc:	Pinhole leak in shop weld of elbow to nipple in water cooled air heater
How discovered:	Control panel observation: Air temp dropping; confirmed by water leaking at ducts
Wash adjacent tube:	No
Root cause:	Poor weld: lack of fusion/porosity at termination of circumferential butt weld
Leak detection:	Yes
Bed cooling enhanc	n/a
Last full inspection:	Sept 2007
Sequence of events:	Aug 16 9am: Unit off line. Observed air temp dropping. 10am: Confirmed water leaking from primary duct. Through inspection port, confirmed leak in water coil. Since out of main duct and since no water from drain nor alarm, unit taken down orderly. Repairs made. Unit returned to service.
Repair procedure:	Ground out, weld repaired and PT'd
Future prevention:	Entire set was NDT's by PT

BOILER

SPRING 2009 - 16	
Classification:	**Critical Incident #712**
Location:	International Paper Riverdale, Selma, AL
Unit:	#2 RU, 1981 CE, Contract 28679, 2-Drum Large Economizer
Unit Size:	2.7 MM lb ds/day, 425,000 lb/hr steam at 1425 psig, 860°F, 1720 psig design
Incident Date:	September 29, 2008
Downtime hrs, leak/total:	67.4
ESP?	**Yes**
Leak/Incident Loc:	Sheared boiler tube just under steam drum, hot side, tube 11, row 16
How discovered:	Boiler tripped on high furnace pressure. Found water running outside of boiler at mud drum.
Wash adjacent tube:	Yes (4 additional tubes washed to thinning)
Root cause:	Thinning due to external erosion from failure in 2001 of tube 9, row 16; Possibly from hung soot blower 4 times lately for total of 3 hours, in narrow lane.
Leak detection:	No
Bed cooling enhanc	Yes. Sodium bicarbonate Injection using nitrogen; Austin Fire Equipment; 21.5 hrs; Saved 2 days.
Last full inspection:	July 2008
Sequence of events:	29Sep 1:35pm: Unit tripped on hi furnace pressure. Thought was recent Modicon problem, so began restart purge. Operators switched positions. Drum level gone. 2:05pm Saw water and steam, so ESP'd. 30Sep Midnight:30 Austin Fire began bed cool. 8:00am located sheared tube at upper drum. 1Oct 3am Bed cooled. 11:30am Repair complete 10:50pm Hydro good. 2Oct 2:15am Fired unit. 9:06am On line.
Repair procedure:	Failed tube + 6 more dented removed and plugged at both drums.
Future prevention:	Restress to cut steam to hung soot blower; Expedite simple leak detection system; Automate FW valve closed when get high furnace pressure and low drum within 45 seconds.

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

BOILER

SPRING 2009 - 17	
Classification:	**Non-Critical**
Location:	**Tembec Pulp Group, Skookumchuck, BC**
Unit:	#2 (51841) RB, 1993 ABB Contract CA 91105, 1-Drum Large Economizer
Unit Size:	3.49 MM lb ds/day, 463,000 lb/hr steam at 630 psig, 750°F, 900 psig design
Incident Date:	February 8, 2009
Downtime hrs, leak/total:	41
ESP?	**No**
Leak/Incident Loc:	25% circumferential crack in bottom of boiler bank tube near bottom of assembly on left side, at a tube-to-tube weld near the header weld, behind furnace wall, 102'-6" elev (5th floor)
How discovered:	**Walk down.** Found water and steam coming from lower boiler bank manway door
Wash adjacent tube:	No
Root cause:	Maybe from falling salt cake, since dent found on top of tube
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	May 2008
Sequence of events:	Feb 8 3:30pm Walk down saw water and steam coming from lower boiler bank manway door. Took unit off liquor to check. Confirmed leak at lower boiler bankheader. Controlled shut down, since safe leak spot. Feb 9, 8:15pm: Unit cooled and repair done. Hydro OK. Off liquor 41 hrs
Repair procedure:	Crack was ground out with LP testing, preheat and weld repair., with LP final test
Future prevention:	Inspect area at next outage.

BOILER

SPRING 2009 - 18	
Classification:	**Non-Critical**
Location:	**Clearwater Paper Corp (formerly Potlatch), McGehee, AR**
Unit:	#1 RB, 1977 B&W, Contract PR 184, 1-Drum Large Economizer; 2000 Kvaerner Boiler bank
Unit Size:	2.75 MM lb ds/day, 512,000 lb/hr steam at 850 psig, 825°F, 1050 psig design
Incident Date:	March 3, 2009
Downtime hrs, leak/total:	17.5/27.3
ESP?	**No**
Leak/Incident Loc:	Crack in membrane weld at top of end sidewall boiler tube at econ casing attachment elev 275' 2"
How discovered:	**Walk down**.
Wash adjacent tube:	No
Root cause:	Stress fatigue cracking in membrane, migrated into tube, due to economizer wall load
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	Nov 5, 2008
Sequence of events:	Saw steam from lagging at 10th floor, on top of generating bank. Removed lagging. Found insulation saturated. At first, thought it from rain collected since no side walls. Checked further and found leak in the top of the membrane weld of the end tube of the south generating bank side wall. The economizer side wall is welded to the membrane of the tube with the crack. It was determined that no water was or could enter the furnace. A safe and orderly shutdown was conducted.
Repair procedure:	Membrane ground off. Tube crack dye checked as crack was ground away completely. Approved pad welding repair made. Membrane and roof sheet metal reattached.
Future prevention:	Inspected opposite side - no cracks found. Tapered square edge of membrane to 45o. Fall outage installed Dutchman,

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

SCREEN

SPRING 2009 - 19	
Classification:	**Critical Incident #713**
Location:	**Boise White Paper, Jackson AL**
Unit:	No 2 RU, CE Contract 24272, 2-Drum DCE Cascade
Unit Size:	1.7 MM lb ds/day design, 2.4 Actaul, 300,000 lb/hr steam at 650 psig, 700°F, 760 psig design
Incident Date:	October 13, 2008
Downtime hrs, leak/total:	0 / 204 planned outage
ESP?	**No**
Leak/Incident Loc:	Two ½" cracks at tube-to-tube stitch weld, screen platen 17 tube 2; platen 21, tube 13 from bottom
How discovered:	During **Shutdown inspection** Water seen spraying from screens
Wash adjacent tube:	No
Root cause:	Appears to be stress induced cracking at the termination point of the stitch welds.
Leak detection:	Yes – structure-borne
Bed cooling enhanc	No
Last full inspection:	Oct 2007 and Oct 2008
Sequence of events:	Sept through Oct 12 – three Triple-5 leak alarms, but each fell below alarm ; Inspection found nothing. Oct 12 Shut down for outage. Oct 13 Entered hearth and observed water falling from screen. Scaffolding required to locate.
Repair procedure:	New tubes installed for leaking tubes. Visible and dye pen inspection extended. Several other crack indications in screen tube stitch welds were identified, ground away and replaced with "pac-man" ties.
Future prevention:	Complete dye pen testing scheduled for 2009 outage.

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

SCREEN

SPRING 2009 - 20	
Classification:	**Critical Incident #714**
Location:	**New Page, Wickcliffe, KY**
Unit:	No 1 RB, CE Contract 17467, 2-Drum DCE; Approx 2007 new screen
Unit Size:	3.5 MM lb ds/day, 471,000 lb/hr steam at 575 psig, 750°F, 760 psig design
Incident Date:	December 10, 2008
Downtime hrs, leak/total:	108.2
ESP?	**Yes**
Leak/Incident Loc:	½ inch crack in #8 front screen platen, tube #4, 5, 6 4th floor elev. 440ft;
How discovered:	**PANEL** Feed water-Steam differential, AND **Walkdown**
Wash adjacent tube:	**Yes**
Root cause:	Stress crack from salt cake impact; Chunk fell from roof tube about 40'
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	Nov 07 (Screen Aug 08)
Sequence of events:	**9Dec** 7:30 pm Water-Steam differential suddenly doubled. 8:08pm Shut sootblowers, did walkdown. Any noises unverified. 9:50pm 2nd walkdown still no noise. **10Dec** 7:02 am Walkdown, heard noise 8 am pulled liquor. 8:30 clear leak noise 4th floor. 8:36 ESP'd unit. Upon inspection, Salt cake build-up fell from roof tubes to front screen tubes and crushed first 3 tubes on Screen Platen #8. Tube #5 and #6 were cracked from the impact. Tube #4 had wastage from the leak on tubes #5 or #6 and had a 0.5 inch crack from tube thinning. The #8 Screen Platen tubes were deflected down about 8-12 inches.
Repair procedure:	Screen Platen #8 was capped at the 2 riser in penthouse, 1 down comer in dead air space, and 1 screen header outside the furnace, and then the #8 Platen tubes were removed – Circulation concerns were discussed with Alstom in August 2008 when Screen Platen #4 was removed. Screen Platen #6 – three Dutchmen were installed on tubes #1, 2, and #3 due to ovality. Screen Platen #10 – stitch welds were inspected and repaired on damaged stitch welds In Aug 2008, screen tubes were also crushed
Future prevention:	Build up worse since Nov 2007 air level addition. Air nozzles adjustments and gas flow modeling; Add soot blowers near roof. Leak indication and ESP procedures reviewed

UPPER FURNACE

SPRING 2009 - 21	
Classification:	**Critical Incident #715**
Location:	**International Paper, Augusta GA**
Unit:	#2 RB, 1965 B&W, Contract PR-89, 2-Drum DCE Cyclone
Unit Size:	1.79 (1.2 design) MM lb ds/day; 185,000 lb/hr steam at 850 psig, 900°F, 875 psig design
Incident Date:	November 10, 2008
Downtime hrs, leak/total:	12
ESP?	**No**
Leak/Incident Loc:	½" stress crack at soot blower wall box weld attachment, near front cavity, a few feet below roof, 78 feet above hearth
How discovered:	During routine hydro following fan bearing repair and chill and blow outage
Wash adjacent tube:	No
Root cause:	Stress crack at weld attachment
Leak detection:	Yes
Bed cooling enhanc	No
Last full inspection:	April 2008
Sequence of events:	During routine hydro following fan bearing repair and chill and blow outage, leak was found and repaired, extending outage 12 hours. (Routine Hydros now done due to superheater erosion.
Repair procedure:	Crack ground out and pad welded
Future prevention:	Follow up repairs and evaluation at next outage

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

UPPER FURNACE

SPRING 2009 - 22	
Classification:	**Non-Critical**
Location:	**Boise White Paper, DeRidder, LA**
Unit:	No 1 RB, 1969 B&W Cntrct PR-130, 2-Drum, Large Econ; 1987 B&W Boiler; 2000 B&W furnace
Unit Size:	4.2 MM lb ds/day, 620,000 lb/hr steam at 850 psig, 825°F, 1000 psig design
Incident Date:	January 2, 2009
Downtime hrs, leak/total:	45.75
ESP?	**No**
Leak/Incident Loc:	Pinhole with ¼" tail in right sidewall tube crown where gen bank tube seal plate attaches, 127 ft elev. Also SH tongue & groove attach leak found during hydro
How discovered:	Walk down
Wash adjacent tube:	No
Root cause:	Fatigue weld failure; SH was stress.
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	Feb 08
Sequence of events:	8;00 am During walk down, operator saw steam on side wall near drum Removed Insul & lagging. Saw leak was external to furnace. Orderly shutdown taken. 9:25 pulled liquor. 11:45 off line. Reconfirmed no leaks inside furnace. After repair, hydro on Jan 3 found leak at outlet of secondary superheater, pendant 17 from right wall in the tongue and groove connection of side to side tie to Pendant 16 (Straight tube). Original 40 year old superheater. Scaffolding complete 6:00 am Jan 4. Repaired. 8 pm Jan 3 2nd hydro OK Jan 4 on line 2:50 am, on liquor 4:45 am
Repair procedure:	Both spots PT'd and UT'd. The pin hole was ground out and dye penetrated. SA178, 2 31/32" OD x .180" mw, stick weld. SH repair 2.5" OD x .203" mw SA213 T-22. Wall thickness above code. Ground out, tig weld. PT'ed for cracking Repair made to attachment.
Future prevention:	At next outage, Mar 09, repairs will be replaced with Dutchman. Areas will undergo a visual inspection and NDT scope to prevent help squelch any reoccurrence.

UPPER FURNACE

SPRING 2009 - 23	
Classification:	**Critical Incident #716**
Location:	**New Page, Wickcliffe, KY**
Unit:	No 1 RB, CE Contract 17467, 2-Drum DCE
Unit Size:	3.5 MM lb ds/day, 471,000 lb/hr steam at 575 psig, 750°F, 760 psig design
Incident Date:	February 12, 2009
Downtime hrs, leak/total:	170/170
ESP?	**Yes**
Leak/Incident Loc:	1" Tear in tangential wall tube that pulled away from attachment weld to buckstay, just below screen headers, 4th tube from rear corner, RHSW, elev 410'
How discovered:	Walk down**.** Saw water during start-up.
Wash adjacent tube:	No
Root cause:	Boiler cycled up & down twice due to power failure–wall tube pulled away from attachment weld
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	August 2008
Sequence of events:	During start-up curve on gas on Feb 12 (following power failure trip day before), walk down saw water at 11:15. At 11:45, ESP'd the unit. 8pm smelt cool. Repairs followed. Leak in area of non-membrane tangent tube construction: water could and did enter furnace. In this case, drain valves didn't open because breakers weren't reset after a power planned trip, but next shift crew wasn't aware.
Repair procedure:	Welded in Dutchman to replace damaged section
Future prevention:	Inspect and replace critical tube to buck stay attachments and to add a wall tube pad for the attachment welds. Breaker resets are now on checklist.

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

EXPLOSION DISSOLVING TANK

SPRING 2009 - 24	
Classification:	**Dissolving Tank Explosion #31**
Location:	**International Paper Riverdale, Selma, AL**
Unit:	#1 RU 1966 B&W Contract PR-98, 2-Drum Large Economizer; 1997 B&W/Turner Diss Tank
Unit Size:	1.4 MM lb ds/day, 290,000 lb/hr steam at 650 psig, 700°F, 725 psig design
Incident Date:	November 15, 2008
Downtime hrs, leak/total:	29
ESP?	No
Leak/Incident Loc:	Dissolving tank below sloped hearth unit
How discovered:	**Dissolving tank Explosions** while clearing plugged spouts
Wash adjacent tube:	N/A
Root cause:	Increasing unit load with both spouts plugged and high tank level, with inexperienced operators
Leak detection:	N/A
Bed cooling enhanc	N/A
Last full inspection:	N/A
Sequence of events:	15Nov 5am: Breaker failure tripped mill with #1 RU at 90% load, tripped with full smelt bed; inserted rods to spouts. Noon: Refired unit, 1 spout open with small flow. 3:15pm: Sootblowers dropped lots of saltcake which resealed spout. Worked to open spout for 1 hour; torch inoperable. Smelt pool seen but not excessive. Aux fuel load increasing. Dissolving tank level high. 4:15 Start to back down load, but spout opened high flow overshooting shatter jets; Series of 8-10 moderate explosions damaged shatter jets out of use.
Repair procedure:	Replaced damaged south spout, repaired dissolving tank, and repaired shatter jets
Future prevention:	Keep spout torch operational, with training. Maintain tank level with transfers, not overflow. Specify rods for plugged spout incidents. Recertify operators through training, to include critical scenarios. Revised plugged spout SOP to include pulling fuel, tank level and safety.

EXPLOSION

SPRING 2009 - 1107	**Intl 1107**
Classification:	**(Explosion)**
Location:	**M-real, Alizay, France**
Unit:	1991 Stein 1-Drum Large Econ
Unit Size:	1450 tds/day, 209 t/h steam at 60 bar, 450C , 74 bar design
Incident Date:	October 14, 2007
Downtime hrs, leak/total:	30 days
ESP?	**No**
Leak/Incident Loc:	
How discovered:	Explosion
Wash adjacent tube:	
Root cause:	Possible aux fuel (natural gas), but indications of low solids liquor or even liquor pyrolysis
Leak detection:	
Bed cooling enhanc	
Last full inspection:	
Sequence of events:	Damage minor to moderate; max wall deflection 10”, corners didn’t open, no hearth deflection
Repair procedure:	
Future prevention:	

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

EXPLOSION DISSOLVING TANK

SPRING 2009 - 1108	**Intl 1108**
Classification:	**(Explosion – Dissolving Tank)**
Location:	**SAPPI Usutu, Swaziland**
Unit:	#**1** RB, SB 10035 1961 ICAL Contract 38634,
Unit Size:	640 t ds/day, 74.5 t/hr steam at 42 bar, 400 °C, 48 bar design, 2-drum DCE Decanting
Incident Date:	October 28, 2008
Downtime hrs, leak/total:	23.25 hr
ESP?	No
Leak/Incident Loc:	n/a
How discovered:	Explosions
Wash adjacent tube:	n/a
Root cause:	High tank level and intermittent pump outages with no alignment of density meter
Leak detection:	n/a
Bed cooling enhanc	n/a
Last full inspection:	
Sequence of events:	Green liquor pumps were failing after 10 – 15 minutes, requiring 5 -6 pump change-outs, but no alignment of density meters. Tank level rising. Unit was at low load. Experienced small and large bangs at the tank. Weak white liquor dilution stopped due to high level. Could actually see smelt solidified in tank. Agitator tripped on hi amps. **Explosion.** Moderate damage. No injury. Smelt tank roof top welds cracked and separated, thus leaking. LHS smelt spout box and cover slightly distorted
Repair procedure:	Roof top was welded all around, both outside and inside. Smelt spout box and cover repaired – it took 8 hrs. Boiler was back on line 7 hrs later.
Future prevention:	Density pot must be lined up every time pump is changed even for shorter periods

APPENDIX A – SUMMARY OF INCIDENTS (Continued)

EXPLOSION DISSOLVING TANK

SPRING 2009 - 1109	**Intl 1109**
Classification:	**(Explosion – Dissolving Tank)**
Location:	**SAPPI Usutu, Swaziland**
Unit:	#**2** RB, 16033/2 1971 ICAL Contract SB 130,
Unit Size:	516 t ds/day, 60 t/hr steam at - bar, 400 °C, 620 psig design, 2-drum DCE Decanting
Incident Date:	December 14, 2008
Downtime hrs, leak/total:	189 hr
ESP?	No
Leak/Incident Loc:	n/a
How discovered:	
Wash adjacent tube:	n/a
Root cause:	Continued firing of oil resulted in a large pool of smelt behind the spout which then rushed out once the spout was opened, over coming the shatter sprays. Sulfidity was very low, making smelt more viscous.
Leak detection:	n/a
Bed cooling enhanc	n/a
Last full inspection:	
Sequence of events:	Dec 13, 15:00 entire country was load shed, causing entire mill blackout, while on maximum BL load. Spouts rodded. 16:21 power back. Difficult start-up issues with instrumentation delayed oil fire until Dec 14, 02:30. At 05:30 unit hot, some smelt flowing, took short outage to install new UPS for ESP system. 06:45 oil back in, but bed had cooled and spouts had plugged. After 6 hours trying to clear spouts, adjusting oil burners, two more power outages occurred within an hour (13:05 & 13:50), with bed resolidified. At 17:30, one spout finally cleared and smelt flowing normal. While working on next spout, the cleared spout started heavy runoff. Area cleared. Huge flow overwhelmed shatter jets, and **three large explosions** occurred. The entire roof of the tank lifted, damaging one spout, shatter jets, cooling water piping, and instruments.
Repair procedure:	Replaces tank roof and support steel. Replaces both spouts. Replaced spout cooling and shatter jet piping. Replaced instrumentation. NDT'd local pressure parts. Did hydro.
Future prevention:	Updated spout clearing SOP and maintaining correct sulfidity SOP

APPENDIX B – ESP REPORT SLIDES

ESP Subcommittee

Committee Report
Wednesday October 8, 2008

BLRBAC 1

Meeting Attendance

- Closed session Monday October 6th
  - 12 of 13 members represented
  - Shawn Casey represents W Canada
- Open session Tuesday October 7th
  - 12 of 13 members
  - About 180 guests

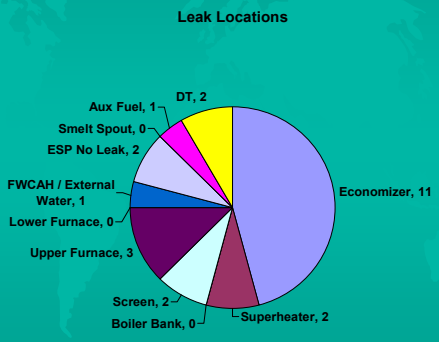
BLRBAC 2

Incident Questionnaire Review

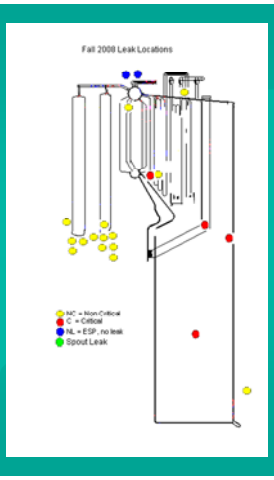
- 25 North American incidents
  - 4 Explosions
    - 1 Aux Fuel
    - 1 Unknown
    - 2 DT Explosions
  - 4 Critical
  - 15 Non-critical
  - 7 EPD'd
    - 4 Critical
    - 100% of Critical that Should ESP
  - 2 ESP w/ no leak

BLRBAC 3

Incident Locations

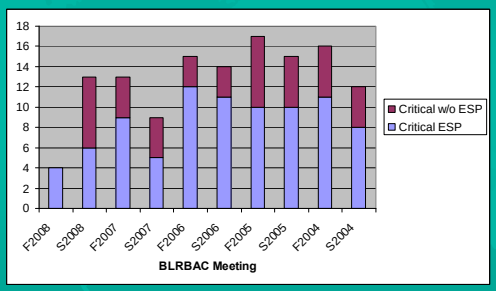


BLRBAC 4



BLRBAC 5

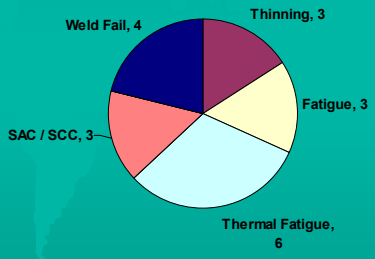
ESP History



BLRBAC 6

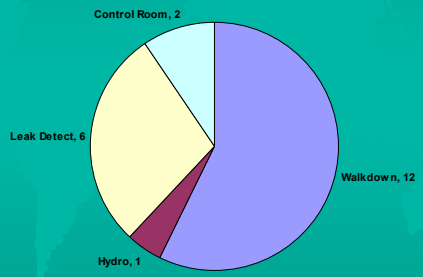
APPENDIX B – ESP REPORT SLIDES (Continued)

Root Cause



BLRBAC 7

How Discovered



BLRBAC 8

Leak Detection Systems

- Leak Detection Systems installed – 12
  - Indentified leak – 6
  - Confirmed leak - 1
  - Economizer leaks – 6

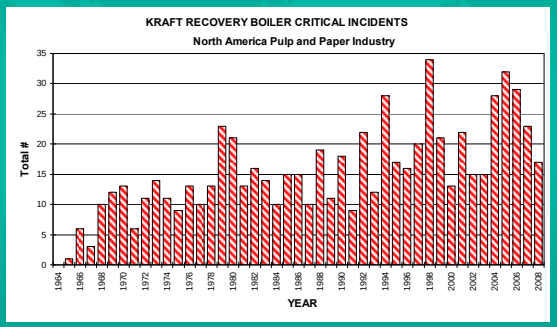
BLRBAC 9

Initiation of ESP

- Ranged from 1 minute 6.4 Hrs
- Median was 33 minutes
- One incident with smelt water reaction

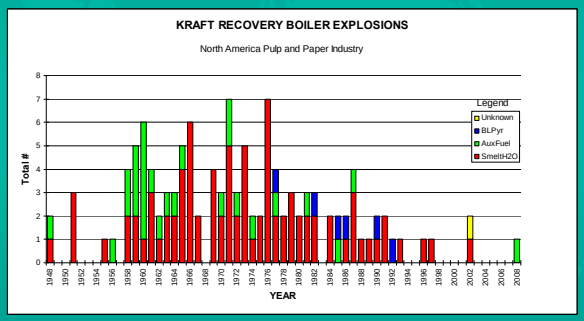
BLRBAC 10

Critical Incidents to Date



BLRBAC 11

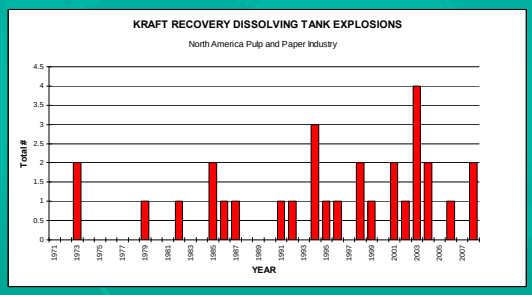
Boiler Explosion History



BLRBAC 12

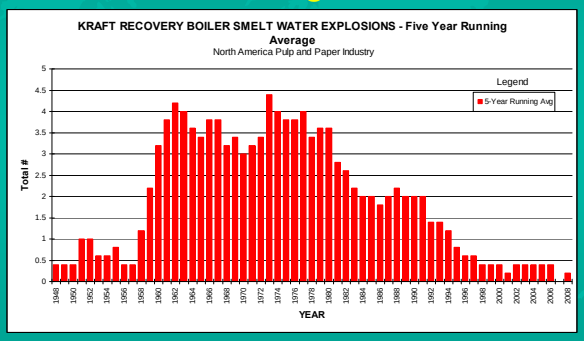
APPENDIX B – ESP REPORT SLIDES (Continued)

Dissolving Tank Explosions



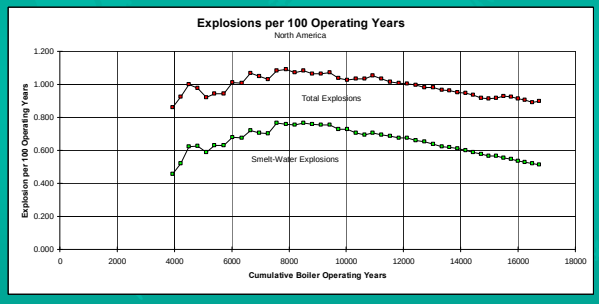
BLRBAC 13

Explosion History - Five Year Avg.



BLRBAC 14

Explosion History per 100 Oper Yr



BLRBAC 15

Learnings

- Need to establish reference or benchmark level for smelt pool to shut down boiler before all the spouts plug
- Need to include appropriate time interval between high FP and low DL for closing feedwater control valve.
- Several incidents reported of initiating ESP w/o having to visually confirm leak.
- Handhole repair procedures continue to be a problem

BLRBAC 16

Learnings

- Clearing Superheaters
  - Graph of SH tube outlet temps valuable to show spike in temperature when tube clears
- Char Bed Cooldown
  - Thermal imaging guns are tool to identify hot areas of the bed but thermocouples should be the final determination
  - Probe all areas of bed not just those accessible
  - Post ESP Procedure – Chapter 8
  - Personnel Safety – Chapter 2.7

BLRBAC 17

Testing of ESP System

In Section 2.2 Routine Operator Checks:

At least annually, also verify the "alternate means" to actuate individual ESP elements and any "remote" means to initiate the ESP or actuate individual ESP elements will transmit a signal to the intended ESP element. Actuation of the ESP device is not necessary; only verification that a signal is transmitted to the device.

BLRBAC 18

APPENDIX B – ESP REPORT SLIDES (Continued)

ESP Architecture

Suggested Language

Recommended Change to second sentence of Chapter 1:

Upon initiation of the Emergency Shutdown Procedure, a ~~dedicated, stand-alone~~ the system shall perform the following automated actions:

BLRBAC 19

ESP Architecture

Add paragraph to the after bulleted items on Page 4

The Emergency Shutdown Procedure functions must be activated and controlled either by means of relay technology and hard-wiring or other dedicated system as defined in Chapter 2 of the *Instrumentation Checklist and Classification Guide*. In the latter case, it must not be possible to carry out reprogramming during operation or in error. See also Chapter 4 of the *Instrumentation Checklist and Classification Guide*. Whatever technology is utilized, the BMS or DCS systems can be used to monitor operation of the functions.
Any time modifications are made to the system, the system shall be functionally tested prior to putting the unit back on line.

BLRBAC 20

Operating Boiler Lists

- List of Operating Boilers in US and Canada posted on BLRBAC website.
  - Jules Gommi will maintain
  - Contact Jules with any corrections or updates

BLRBAC 21

Thank You Jack

Jack Clement will be stepping down from the committee after many years of serving as secretary and member

BLRBAC 22

APPENDIX C - STRENGTH OF RECOVERY BOILER TUBES CONTAINING SCC

THE STRENGTH OF RECOVERY BOILER TUBES CONTAINING STRESS-ASSISTED CORROSION

W. B. A. (Sandy) Sharp
SharpConsultant, Columbia, MD

Paper 04513 published in symposium on stress-assisted corrosion of boiler tubes at NACE CORROSION/2004 conference, Houston, TX, 2004
Paper 4443 published at 11th International Symposium on Corrosion in the Pulp and Paper Industry, Charleston, S.C., 2004

OUTLINE

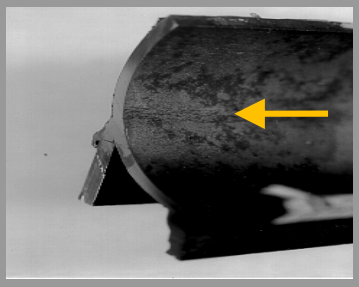
INTRODUCTION TO SAC
- Nature of SAC
- EPRI research
- Paper industry response

EFFECTS ON TUBE STRENGTH
- Concern because "cracks" forbidden
- Size estimation by radiography
- Measurement of burst strength

CONCLUSIONS AND RECOMMENDATIONS

2

NATURE OF SAC

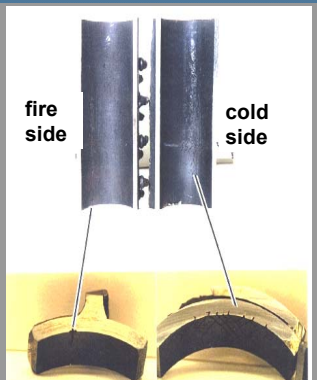


Fissures "under" attachment welds in water-filled boiler tubes that propagate radially outwards

3

NATURE OF SAC

Example: SAC under scallop bar weld attachment



4

EPRI STUDIES

- 1960s: Reports of water leaks at attachment welds in water-filled tubes
- Late 1970s: Most water leaks "inside-out" not "outside-in"
- Late 1980s: "corrosion fatigue" leaks were greatest cause of availability loss in utility boilers
- 2001:
  - > Thermal stresses from attachment welds fracture internal Fe_3O_4
    Propagation only when strains >0.2% coincide with excursions to low pH

5

SAC IN RECOVERY BOILERS

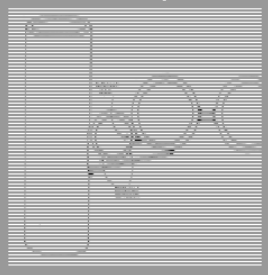
- > Leaks in recovery boilers much more serious
- > P&P discounted EPRI studies, concluding lower pressure boilers would not develop "corrosion fatigue"
- > Little response to bulletins about "stress-assisted corrosion" (B&W, 1987) and "corrosion fatigue" (CE, 1988)
  - No inspection guidelines
  - No acceptability criteria

6

APPENDIX C - STRENGTH OF RECOVERY BOILER TUBES CONTAINING SCC (Continued)

SAC IN RECOVERY BOILERS

- June 1991 catastrophic smelt-water explosion in Missoula, Montana
  - 1 fatality
  - 150 days to repair



7

Sketch is Sharp's impression of failure geometry, based on reports at TAPPI C&ME committee

SAC IN RECOVERY BOILERS

- Soon afterwards Foley, FL mill found severe SAC
- P&G/INDT developed semi-quantitative RT methods
  - Source and film positioned to "shoot down fissures"
  - Fissure depth estimated from film density using EDM standards
- RT methods, SAC risks discussed at TAPPI meetings
- SAC inspections promoted by NDT vendors

8

SAC IN RECOVERY BOILERS

- Initial RB inspections showed SAC widespread
- One consultant made ~1/3 of inspections in first 2–3 years. Of 70 recovery boilers:
  - 16 replaced lower furnace tubes primarily because of SAC
  - 46 showed significant SAC
  - only 8 had none

9

SAC IN RECOVERY BOILERS

During 25 years since Missoula accident

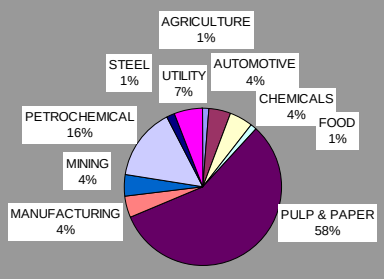
- half a dozen recovery boilers decommissioned, several dozen others replaced lower furnace because of SAC

- Yet, after initial inspections/repairs in early 1990s, P&P pays less and less attention to SAC
  - propagation seems slow
  - no uniform FFS standards
  - no clear remedy

10

SAC AFFECTS ALL INDUSTRUAL BOILERS

Origin of SAC samples sent to one national failure analysis laboratory



11

WHAT IS THE RISK?

- Many U.S. mills claim to apply ASME design code to RBs
  - This means "no cracks" , i.e. no fissures > 3 times deeper than wide
- Yet many RBs operate with some SAC fissures
  - A regulatory inspector could refuse a permit
- What is the risk?

12

APPENDIX C - STRENGTH OF RECOVERY BOILER TUBES CONTAINING SCC (Continued)

EFFECTS ON TUBE STRENGTH

QUANTITATION OF EFFECTS ON TUBE STRENGTH

RESEARCH TO UNDERSTAND MECHANISM OF SAC

> Tube panels in areas susceptible to SAC retrieved during rebuild of one CE and one B&W RB

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EFFECT OF TUBE STRENGTH

Tube panels from CE unit

14

EFFECT OF TUBE STRENGTH

Tubes from B&W unit

15

EFFECT OF TUBE STRENGTH

SUSCEPTIBLE LOCATIONS

Smelt box attachment

16

EFFECT OF TUBE STRENGTH

SUSCEPTIBLE LOCATIONS

Primary air port attachment

17

EFFECT OF TUBE STRENGTH

SUSCEPTIBLE LOCATIONS

Liquor gun port box attachment

18

APPENDIX C - STRENGTH OF RECOVERY BOILER TUBES CONTAINING SCC (Continued)

EFFECT OF TUBE STRENGTH

SUSCEPTIBLE LOCATIONS

Buckstay attachment

19

EFFECT OF TUBE STRENGTH

SUSCEPTIBLE LOCATIONS

Floor to sidewall attachment

20

EFFECT ON TUBE STRENGTH

- Panels radiographed to inspect for SAC
  - Same film/source orientation as in RB
  - Severity rated according to risk by same SAC specialist
- SAC detected in 22 of 57 tubes from boiler A
- SAC detected in 25 of 39 tubes from boiler B

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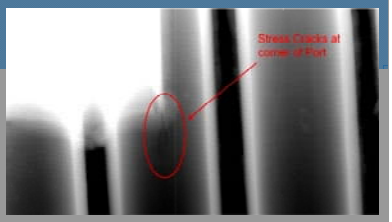
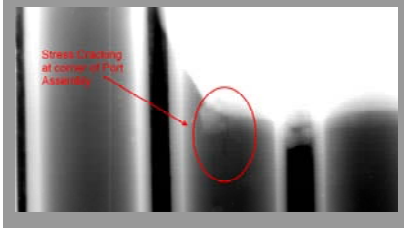
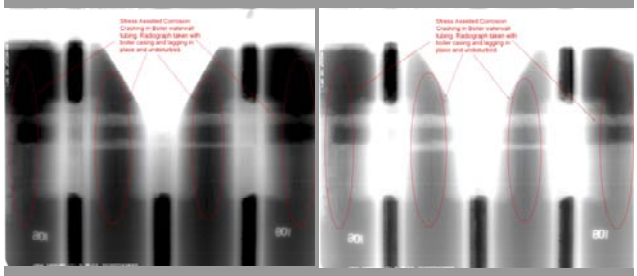
RT IMAGES





22

RT IMAGES



23

EFFECT ON TUBE STRENGTH

Caps welded to 24" tube lengths for burst testing

24

APPENDIX C - STRENGTH OF RECOVERY BOILER TUBES CONTAINING SCC (Continued)

EFFECT ON TUBE STRENGTH

Tubes panels after burst testing

25

EFFECT ON TUBE STRENGTH

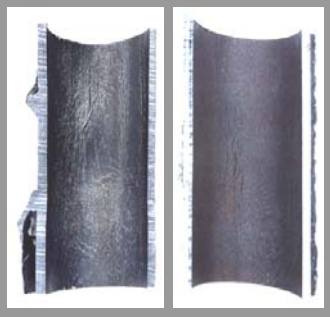
- 21 of 22 tubes from boiler A burst away from the SAC fissures
- All 25 tubes from boiler B burst away from the SAC fissures
- Burst tubes were sectioned to measure max. depth of SAC fissures

26

EFFECT ON TUBE STRENGTH

Tubes that did not fail at SAC fissures

Sample A7
SAC severity 1.75
Deepest 0.056”
Burst at 8,093 psi



Sample A2
SAC severity 2.0
Deepest 0.056”
Burst at 9,993 psi

27

EFFECT ON TUBE STRENGTH

The one tube that failed at an SAC fissure

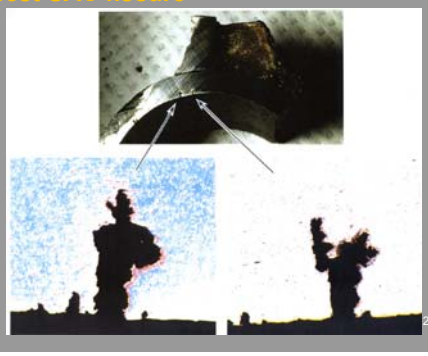
Sample A1
SAC severity 3.0
Deepest 0.120” (wall 0.185”)
Burst at 7,005 psi

28

EFFECT ON TUBE STRENGTH

Second-deepest SAC fissure

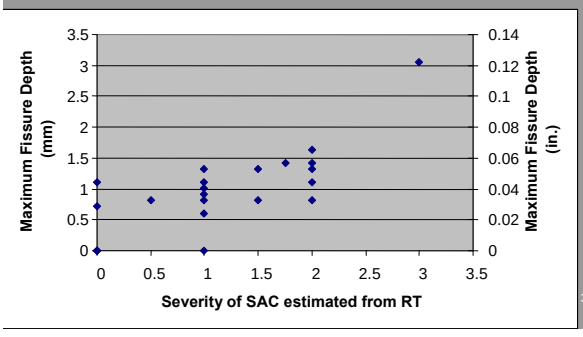
Sample A3
SAC severity 2.0
Deepest 0.064”, 0.044”
Burst at 8,992 psi



29

CONCLUSIONS

1. RADIOGRAPHY CAN ESTIMATE FISSURE DEPTH

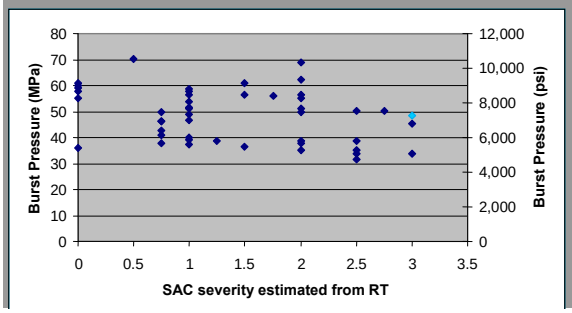


30

APPENDIX C - STRENGTH OF RECOVERY BOILER TUBES CONTAINING SCC (Continued)

CONCLUSIONS

2. ESTIMATED SEVERITY OF SAC SHOWED LITTLE CORRELATION WITH BURST STRENGTH



31

CONCLUSIONS

3. THE TUBE WITH A FISSURE SEVERE ENOUGH TO INITIATE FAILURE RETAINED A VERY HIGH BURST STRENGTH

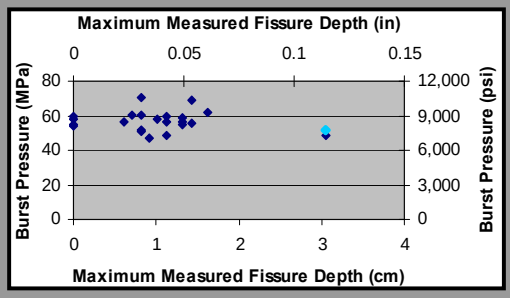
Tube A1 burst at a fissure that penetrated 60% through the tube wall

Even so, Tube A1 did not burst till pressure reached 11.7 times the (600 psi) RBs operating pressure

32

CONCLUSIONS

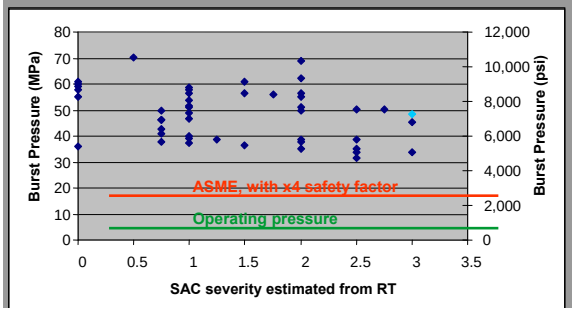
4. ACTUAL DEPTH OF SAC FISSURES SHOWED LITTLE CORRELATION WITH BURST STRENGTH



33

CONCLUSIONS

5. MINIMUM BURST STRENGTH WAS > 7.6 TIMES OPERATING PRESSURE IN BOTH BOILERS



34

CONCLUSIONS

1. All the tubes with SAC retained nearly twice the (x4) burst strength required by the ASME design code, i.e.
   burst pressure > 7.6 x operating pressure
2. SAC fissures <32%t did not affect FFS of boiler tubes
3. Tubes containing fissures <32%t were more strengthened by attachments than weakened by the SAC that attachments had produced

35

RECOMMENDATIONS

1. Detect/evaluate severity of SAC by (digital) RT
2. Establish acceptance criteria before inspecting
3. Evaluate FFS of tubes containing SAC by NBIC Part 2: 4.4.7.2.j/4.4.8.7 → ASME/API FFS-1 Part 5 (groove-like flaw), not ASME, i.e. evaluate SAC as grooves or pits but not cracks
4. Avoid high restraint in welds to water tubes, e.g. by making welds to membrane, not tube

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APPENDIX C - STRENGTH OF RECOVERY BOILER TUBES CONTAINING SCC (Continued)

RESEARCH

> Sarma, Pawel, Singh, NACE CORROSION/2006

> FEA results consistent with RB observations
> In CS tubes, attachment welds produce high tensile waterside hoop stresses within 1" of weld in axial direction
> Tensile stresses increase when boiler cools
> W/o welds, waterside stresses become compressive on shut down, inhibiting SAC
> *Note SAC requires both tensile hoop stresses and water chemistry upsets*

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RESEARCH

>Sarma, Pawel, Singh, NACE CORROSION/2006

>Composite (304L over SA-210) tubes w/o attachment welds develop same stresses as CS tubes w/o attachments
>Tensile stresses develop under composite tube welds during operation but decrease on shutdown. Stresses lower in composite than in CS tubes.
>FEA data consistent with absence of SAC in composite tubes

38

RESEARCH

>Sarma, Pawel, Singh, NACE CORROSION/2006

>Composite (304L over SA-210) tubes w/o attachment welds develop same stresses as CS tubes w/o attachments
>Tensile stresses develop under composite tube during operation but decrease on shutdown. Stresses lower in composite than in CS tubes.
>FEA data consistent with absence of SAC in composite tubes

39

RESEARCH

>Yang, Singh and Neu (J Eng Matls Tech 129, 559-566, October 2007)

>SAC simulated in SSR tests
>SAC initiates only when boiler water contains dissolved oxygen. Crack numbers and rates ↑ as temp ↑
>Pits help SAC initiation but are not essential
>Blunt industrial boiler SAC fissures are same as sharp utility boiler CF "cracks". Lower feedwater quality blunts RB fissures

40

RESEARCH

>Yang, Singh and Neu (J Eng Matls Tech 129, 559-566, October 2007)

>Bulbous fissures may be caused by shutdown corrosion or chemical cleaning
>SAC of SA210 CS tubes can be avoided by keeping dissolved oxygen < 5 ppb

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(Continued next page)

APPENDIX C - STRENGTH OF RECOVERY BOILER TUBES CONTAINING SCC (Continued)

RECOMMENDATIONS

1. Avoid SAC initiation by keeping [O_2] < 5ppb, i.e. add O_2 scavengers during/after shutdowns
2. Avoid high restraint in welds to water tubes, e.g. by making welds to membrane, not tube

42

RECOMMENDATIONS

4. Evaluate severity of SAC by (digital) RT in boilers > 7 years old
5. Establish acceptance criteria before inspecting for SAC
6. Evaluate FFS of tubes containing SAC using NBIC, not ASME, and evaluate SAC fissures as pits, not cracks

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APPENDIX D – INSPECTION OF RECOVERY BOILERS

INSPECTION OF RECOVERY BOILERS

W. B. A. (Sandy) Sharp

SharpConsultant,
Columbia, Maryland, U.S.A.

Published in notes of TAPPI Kraft Recovery Course
St. Petersburg, Florida, January 12-15, 2009

1

OUTLINE

- Purpose of inspections
- Inspection methods
- Scope and frequency of inspections

2

PURPOSE OF INSPECTIONS

- Verify that critical control and safety systems are operating properly, e.g.
  - ESP test
  - Flame safety function tests (aux fuel and BL)
  - Drum level and low solids trip tests
  - Safety valve tests
  - Instrument function tests
  - Instrument calibration tests
- Verify integrity of pressure parts to evaluate needs for maintenance and/or repair

3

TYPES OF INSPECTION

- Routine
  - e.g. walkdowns
- Scheduled
  - Major inspections at planned shutdowns
- Opportunistic
  - When boiler becomes available for inspection for other reasons

4

CORROSION INSPECTIONS ONLY ONE PART OF PERFORMANCE AUDIT

- Operational performance
- Personnel organizations, progression, training
- Operator procedure checklists
- Boiler and auxiliary system inspections
- Corrosion inspections
- Rectification of non-compliant items
- Audit scope needs regular review

5

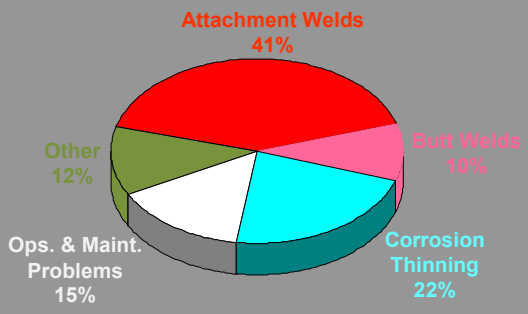
APPENDIX D – INSPECTION OF RECOVERY BOILERS (Continued)

WHY DO WE NEED THESE EXPENSIVE CORROSION INSPECTIONS?

- Must prevent critical leaks
- Scheduled repairs much less expensive than unscheduled
- Cannot predict corrosion rates from boiler operation parameters

7

CAUSES OF CRITICAL LEAKS



Data from: Bauer D. G. and Sharp W. B. A., TAPPI J., 74 (9), 92-100, 1991

8

INSPECTION ACTIVITIES

- Inspect visually
  - To identify potential problems
- Measure tube thickness
  - To detect thinning problems
- Find fireside cracks
  - That could propagate into leaks
- Find waterside fissures
  - That could propagate into leaks
- Evaluate waterside deposits
  - That could cause overheating

10

INSPECTION METHODS (1)

- Visual inspection (every scheduled shutdown)
  - by plant workers
  - by outside experts
  - to focus NDT
  - particularly important with composite tubes – every port, every spout, every outage
  - Don't expect journeyman NDT technicians to make visual inspections

11

INSPECTION METHODS (2)

- Measuring tube wall thickness (every scheduled shutdown)
  - Carbon steel tubes (total wall)
    - digital UT
    - oscilloscope UT
    - internal eddy current or UT in gen. bank tubes
    - automated UT for near-drum scanning
  - Composite tubes (protective stainless layer)
    - magnetic lift-off gauge
    - eddy current instrument
    - measure only at air ports, smelt spouts, smelt line, or if DWD very high

12

APPENDIX D – INSPECTION OF RECOVERY BOILERS (Continued)

INSPECTION METHODS (3)

- Look for fireside cracks in areas subject to thermal shock, esp. on composite tubes, with PT
  - Surface preparation is critical (TIP 0402-30)
  - Measure crack depth by exploratory grinding (or shear wave UT)
  - Greater risks in air port tubes than in floor tubes
- Look for waterside SAC in susceptible areas with (digital) RT
  - Beam must aim down, not across, fissures
- Analyze waterside deposits

13

INTERPRETING INSPECTION DATA

- You will not find critical defects unless you look where they are and use a method that can find them
- Judge fitness-for-service (consequences of discovered defects) using jurisdictional and insurance rules
  - National Board Inspection Code (ASME in some states)
  - Where possible use API/ASME FFS-1 – may require skill in fracture mechanics

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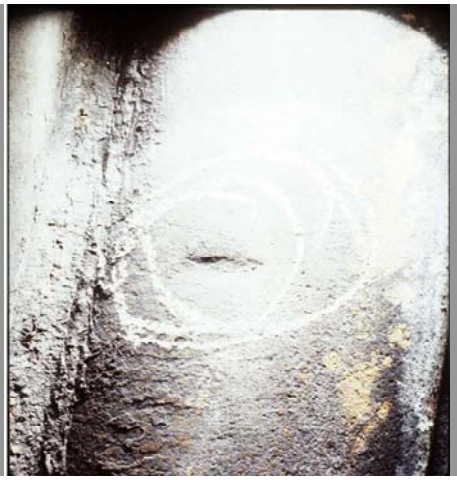
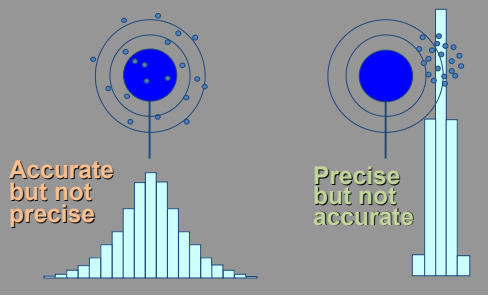


15

MINIMIZING ERRORS IN TUBE THICKNESS MEASUREMENTS



17

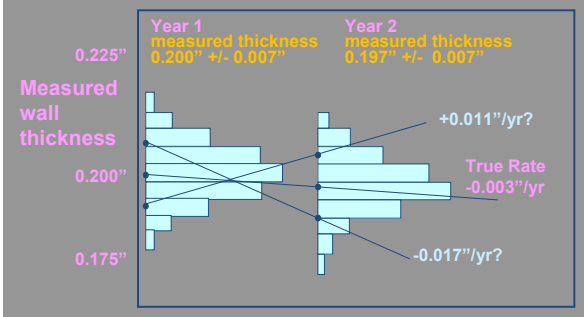
ERRORS IN TUBE THICKNESS MEASUREMENTS

- Standard error in precision 0.005” - 0.007”
- Standard error in accuracy 0.004” - 0.006”
- Combined standard error about 0.007”
  - so expect/check incorrect readings

18

APPENDIX D – INSPECTION OF RECOVERY BOILERS (Continued)

SINGLE POINT RATE CALCULATIONS ARE NOT ACCURATE



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TO MINIMIZE ERRORS IN TUBE THICKNESS MEASUREMENTS

- Use only technicians pre-qualified by TAPPI TIP 0402-21
- Recalibrate UT instruments every 100 readings, or every 15 minutes - repeat measurements if calibration drifted
- Check unexpected measurements - use different technician, different instrument

20

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SCOPE AND FREQUENCY OF RECOVERY BOILER INSPECTIONS

- Alert observation during normal operations
- Systematic inspection during outages:
  - Visual inspection and appropriate NDT to find critical defects
  - Thickness measurements to estimate remaining life
- No national standards for scope, methods, frequency
- Develop an individual inspection plan for each boiler (5-year)

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SCOPE AND FREQUENCY OF RECOVERY BOILER INSPECTIONS

- Useful documents:
  - AF & PA Recovery Boiler Manual, 1992
  - NACE (composite tubes), 1992
  - TAPPI (UT surveys): TIP 0402-18, 2001 (Technician qualification): TIP 0402-21, 2002
  - ASTM E543 (qualification of NDT contractors)
  - ASNT TC-1A, current edition
  - API/ASME FFS-1 Fitness-for-Service code (2007)

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APPENDIX D – INSPECTION OF RECOVERY BOILERS (Continued)

ESTABLISHING INSPECTION SCOPE AND FREQUENCY

- Three approaches have been taken:
  1. Thickness measurements at predetermined grid locations
  2. Thickness measurements based on risk of critical leaks
  3. Visual observations, damage-appropriate NDT and corrosion rate calculations

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1. PREDETERMINED GRID LOCATIONS

- No established standards for grid size or frequency
  - wide diversity in practice
- Increasing number of thickness readings generally does not increase probability of detecting critical flaws
- Tailor inspection plans according to
  - historical behavior of this unit
  - Problems found in similar boilers

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1. PREDETERMINED GRID LOCATIONS

- Use grid readings to:
  - estimate average corrosion rates
  - estimate remaining life
  - "flag" thinned areas
- Supplement grid readings with smaller grids or scanning:
  - in areas known to be critical
  - in areas found to be thin
- Calculate number of readings required to establish thinning rate in different areas of the boiler

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1. PREDETERMINED GRID LOCATIONS

- Remember grid methods will not detect:
  - fireside cracking of composite tubes
  - air port balding of composite tubes
  - thinning caused by sootblowers
  - near-drum thinning of generating bank tubes
  - fireside cracking at attachment welds and at headers

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1. PREDETERMINED GRID LOCATIONS

- Grid methods will also not detect:
  - thinning next to tube-to-tube membrane
  - localized thinning at ports and at the smelt line
  - cold-side corrosion of non-membrane water wall tubes
  - waterside corrosion fatigue cracking (SAC)
  - excessive waterside deposits
- All these issues require other forms of inspection

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APPENDIX D – INSPECTION OF RECOVERY BOILERS (Continued)

2. RISK OF CRITICAL LEAKS

- 32% in lower water wall,
  + 8% in floor + 6% at spouts
- 15% in upper water wall
- 12% in furnace screen
- 18% in generating bank

Data from: Bauer D. G. and Sharp W. B. A., TAPPI J., 74 (9), 92-100, 1991 31

2. RISK OF CRITICAL LEAKS

- Relative grid sizes:
  - Floor 4 x 4
  - Lower water wall 1 x 1
  - Upper water wall 2 x 2
  - Generating bank 2 x 2
  - Roof 2 ¼ x 2 ¼
  - Furnace screen 2 $^{2}/_{3}$ x 2 $^{2}/_{3}$
- Why is this a bad approach?

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2. RISK OF CRITICAL LEAKS

- Critical leaks show what careless inspectors have missed, not what careful inspectors have found
- So, since most leaks occur at welds formed when the boiler was built, use critical leak data for planning QA programs rather than for planning inspections

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3. CORROSION RATES

- Establish scope and frequency of grid measurements to obtain statistically significant estimates of corrosion rate in each part of the boiler
- To estimate rates with fewest measurements, measure thickness at same exact locations
- Typically at least 100 measurements must be repeated in each part of the boiler on at least 4 occasions

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3. CORROSION RATES

- Computer generated thickness maps show patterns of thinning useful for refining grid sizes
- Computer programs can:
  - calculate thinning rates
  - estimate remaining life
  - indicate the probable accuracy of these predictions
- Don't try to calculate corrosion rates at individual points

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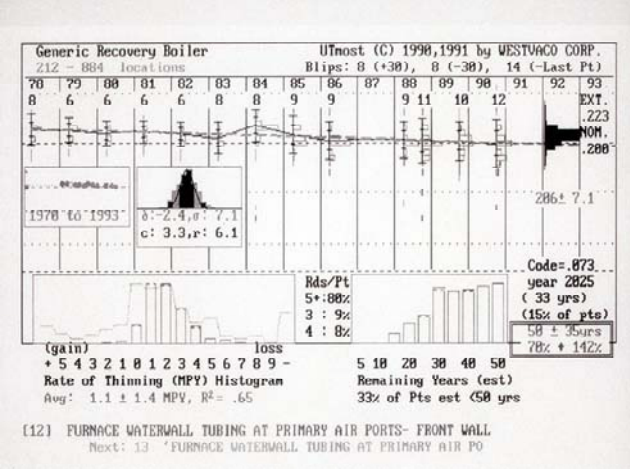
APPENDIX D – INSPECTION OF RECOVERY BOILERS (Continued)



SCOPE AND FREQUENCY RECOMMENDATIONS

- Use expert visual inspectors to seek critical flaws
- Use grid measurements to estimate corrosion rates
- Do additional NDT in areas:
  - of concern from previous inspections
  - of concern to current inspectors
  - of concern because of findings elsewhere in the industry

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KEYS TO SAFE, LOW MAINTENANCE OPERATION

- Quality assurance during design and construction/rebuild to avoid creating problem welds
- Careful operation by well-trained operators
- Regular, systematic, and well-documented inspection
- Planners and Inspectors aware of new inspection technology and of problems found elsewhere (TAPPI, NACE, BLRBAC)
- Timely maintenance with accountability

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CONCLUSIONS

- Most critical leaks occur at attachment welds
- AF & PA manual contains useful inspection planning checklists
- NDT methods are available to detect and evaluate every type of thinning, cracking and internal defect
- Proper analysis of UT data can indicate thinning-dependent remaining life in various parts of a recovery boiler

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APPENDIX D – INSPECTION OF RECOVERY BOILERS (Continued)

RECOMMENDATIONS

- Use expert visual inspectors to direct the search for thinnest tubes and critical flaws
- Take care to minimize errors in UT data
- Because of (0.007") errors in individual thickness readings, use UT data (only) to establish corrosion patterns and schedule repairs/ rebuilds
- In light of critical leak data, improve weld design in new construction and rebuilds

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RECOMMENDATIONS

- Stay aware of all damage mechanisms in recovery boilers
  - WRC Bulletin 488, TAPPI, NACE, BLRBAC
- Establish inspection methods/frequencies to evaluate each type of damage
- After condition of boiler has been established, develop a rolling 5-year inspection plan for each recovery boiler
- Document findings/ update inspection plan with expert visual inspector after each inspection
  - Add notes regarding opportunistic inspections

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RESEARCH

- Sarma, Pawel, Singh, NACE CORROSION/2006
- FEA results consistent with RB observations
- In CS tubes, attachment welds produce high tensile waterside hoop stresses within 1" of weld in axial direction
- Tensile stresses increase when boiler cools
- W/o welds, waterside stresses become compressive on shut down, inhibiting SAC
- *Note SAC requires both tensile stresses and water chemistry upsets*

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RESEARCH

- Sarma, Pawel, Singh, NACE CORROSION/2006
- Composite (304L over SA-210) tubes w/o attachment welds develop same stresses as CS tubes w/o attachments
- Tensile stresses develop under composite tube welds during operation but decrease on shutdown. Stresses lower in composite than in CS tubes.
- FEA data consistent with absence of SAC in composite tubes

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RESEARCH

- Sarma, Pawel, Singh, NACE CORROSION/2006
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- FEA data consistent with absence of SAC in composite tubes

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RESEARCH

- Yang, Singh and Neu (J Eng Matls Tech 129, 559-566, October 2007)
- SAC simulated in SSR tests
- SAC initiates only when boiler water contains dissolved oxygen. Crack numbers and rates ↑ as temp ↑
- Pits help SAC initiation but are not essential
- Blunt industrial boiler SAC fissures are same as sharp utility boiler CF "cracks". Lower feedwater quality blunts RB fissures

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APPENDIX D – INSPECTION OF RECOVERY BOILERS (Continued)

RESEARCH

- Yang, Singh and Neu (J Eng Matls Tech 129, 559-566, October 2007)
- Bulbous fissures may be caused by shutdown corrosion or chemical cleaning
- SAC of SA210 CS tubes can be avoided by keeping dissolved oxygen < 5 ppb

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RECOMMENDATIONS

1. Avoid SAC initiation by keeping [O_2] < 5ppb, e.g. by adding O_2 scavengers during/after shutdowns
2. Avoid high restraint in welds to water tubes, e.g. by making welds to membrane, not tube

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RECOMMENDATIONS

4. Evaluate severity of SAC by (digital) RT in boilers > 7 years old
5. Establish acceptance criteria before inspecting for SAC
6. Evaluate FFS of tubes containing SAC using NBIC, not ASME, and evaluate SAC fissures as pits, not cracks

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