

AMERICAN FOREST & PAPER ACCOCIATION (AF&PA)

Wayne Grilliot

North American Recovery Boiler Report

Wayne Grilliot, American Forest & Paper Association, Recovery Boiler Program

The North American Pulp & Paper Industry has made remarkable progress over the past 60 years in improving recovery boiler safety. This presentation covers the safety trends in North America, some of the major milestones on the journey to improve safety, and the current focus for making further improvements. Progress was slow initially, but the coordinated efforts among many organizations including Recovery Boiler Manufacturers, BLRBAC, Eastern & Western Canada BLRBAC, American Forest & Paper Association, TAPPI, Research Universities, and others in the recovery boiler community yielded very impressive results. While the safety results are much improved, the industry is still encountering occasional problems with recovery boiler and dissolving tank explosions. Efforts by these organizations are aimed at further reducing these occurrences and the negative impact on personnel and equipment.

In the late 1950's and early 1960's, the North American Pulp & Paper Industry was experiencing 4 to 6 recovery boiler explosions per year. To address this serious problem, the Black Liquor Recovery Boiler Advisory Committee (BLRBAC) was formed in late 1961 by several groups of concerned professionals that had become alarmed by the number of Black Liquor Recovery Boiler explosions that had resulted in many injuries and death to personnel operating these boilers. These groups consisted of Insurance Companies, Boiler Manufacturers, and Paper Company professionals that were involved in operating, insuring, or manufacturing Black Liquor Recovery Boilers.

The American Forest & Paper Association (AF&PA) Recovery Boiler Program was established in 1974 to develop programs and assist companies operating recovery boilers to improve the safety, integrity, and reliability of the recovery boiler operations. The Program is under the direction of a Steering Committee to provide a forum for the members to develop information, reference manuals, audit guidelines, checklists, and training aids useful in evaluating: Safe Operating Procedures; Specifications and Construction; Maintenance Programs; Organization and Training; and Research & Development Programs. Program Membership is open to all companies operating recovery boilers. The AF&PA Recovery Boiler Program and BLRBAC work closely together to continuously improve the safety of recovery boiler operations.



AMERICAN FOREST & PAPER ASSOCIATION RECOVERY BOILER PROGRAM

NORTH AMERICAN REPORT

WAYNE GRILLIOT

June 6, 2019

55th Anniversary International Recovery Boiler Conference

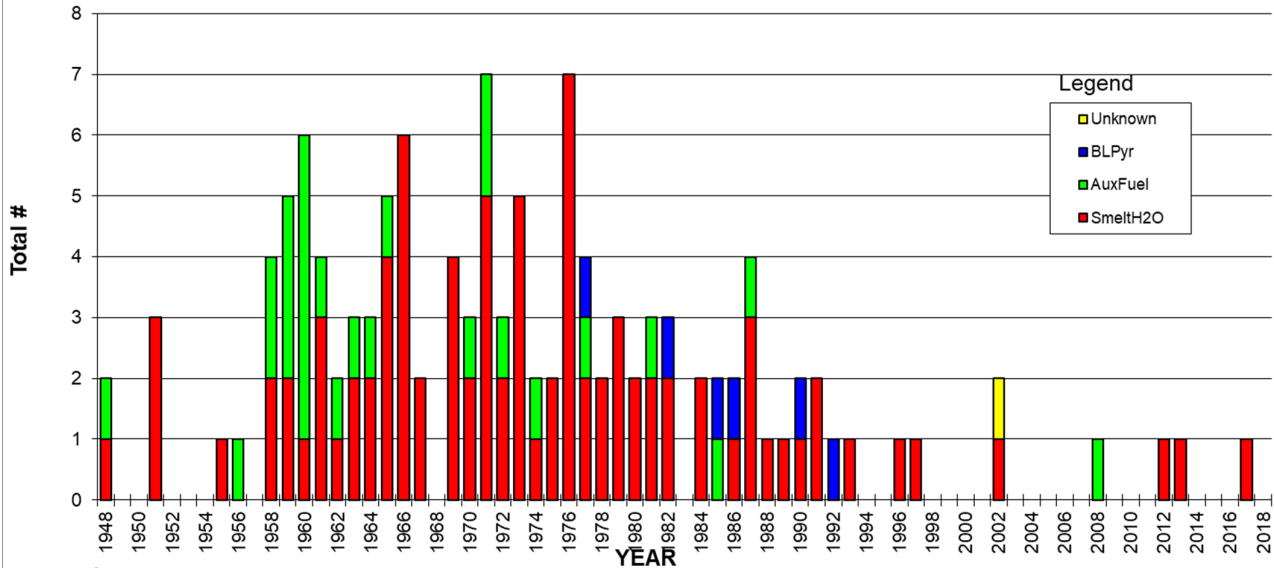
Topics

- **Recovery Boiler Safety Trends**
 - BLRBAC North American Information
- **American Forest & Paper Association**
 - AF&PA Recovery Boiler Program
 - AF&PA Recovery Boiler Conferences and Operational Safety Seminars
- **Some Key Safety Learnings**

Recovery Boiler Explosion History

KRAFT RECOVERY BOILER EXPLOSIONS

North America Pulp and Paper Industry



BLRBAC Data

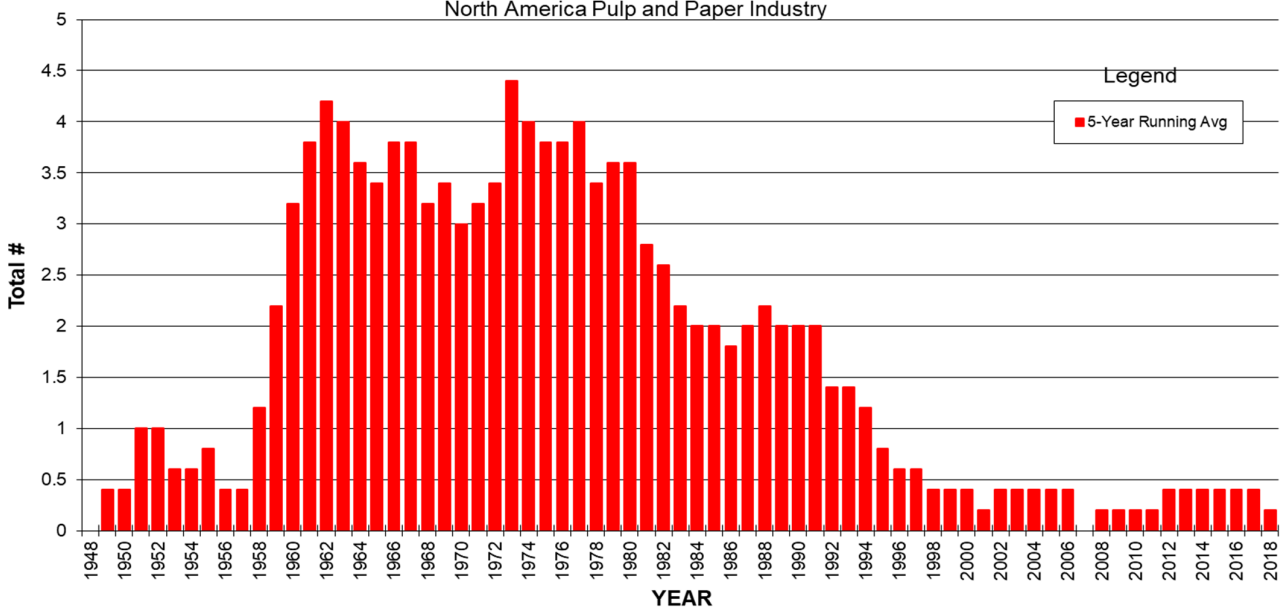
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Explosion History - Five Year Avg.

KRAFT RECOVERY BOILER EXPLOSIONS - Five Year Running Average

North America Pulp and Paper Industry



BLRBAC Data

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2018 Recovery Boiler Incidents

➤ 39 North American Incidents Reported

- 1 Smelt Water Explosion
- 0 Dissolving Tank Explosion
- 13 Critical
- 23 Non-critical
- 2 ESP – No Leak
- 0 Smelt Spout Leak

➤ 11 ESP (Emergency Shutdowns)

➤ 7 International Incidents

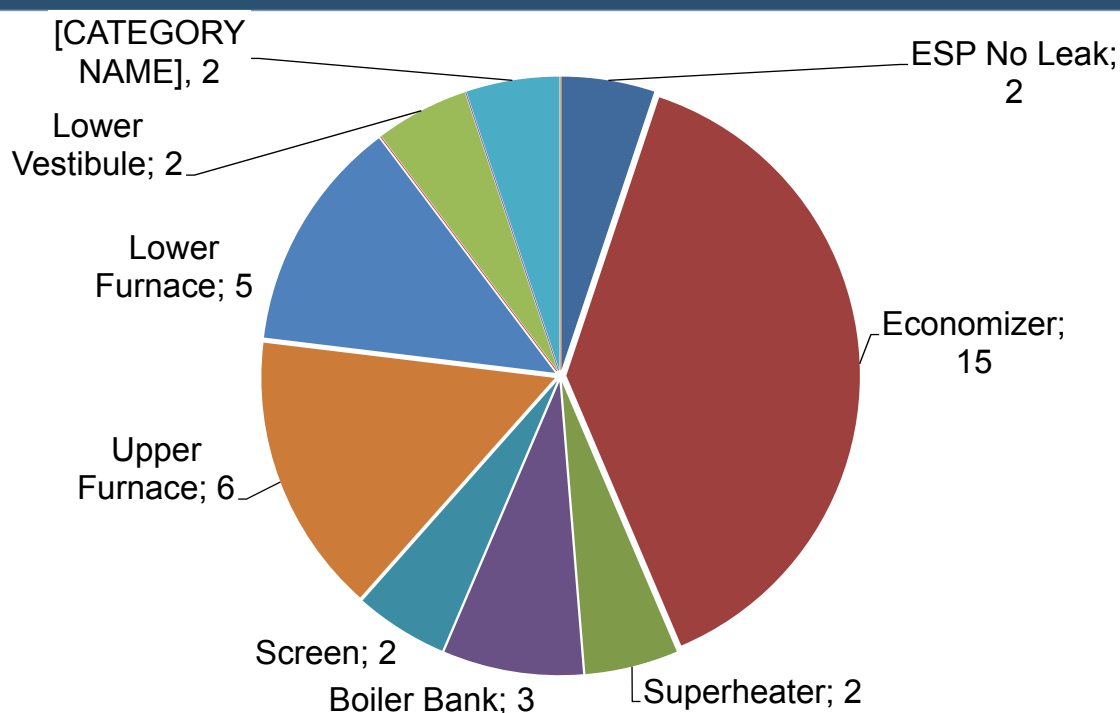
- Not included in statistical analysis

BLRBAC Data

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2018 Incident Locations



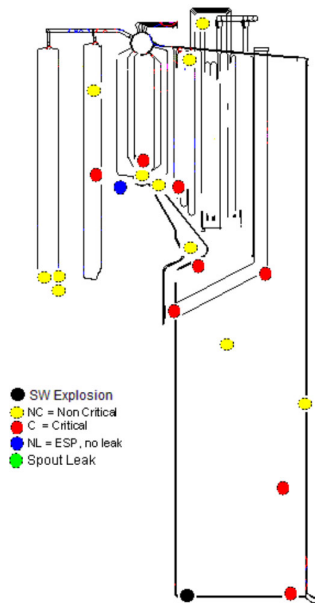
BLRBAC Data

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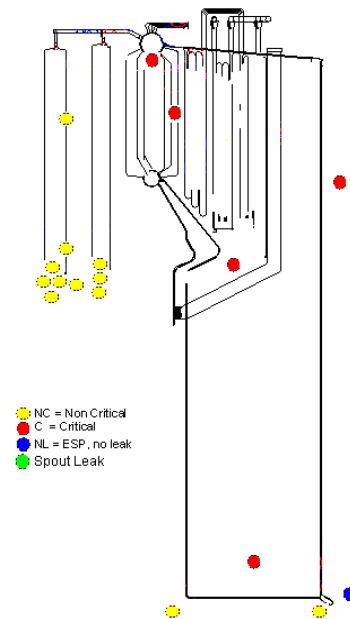


2018 Incident Locations

Spring 2018 Incidents



Fall 2018 Incident Locations

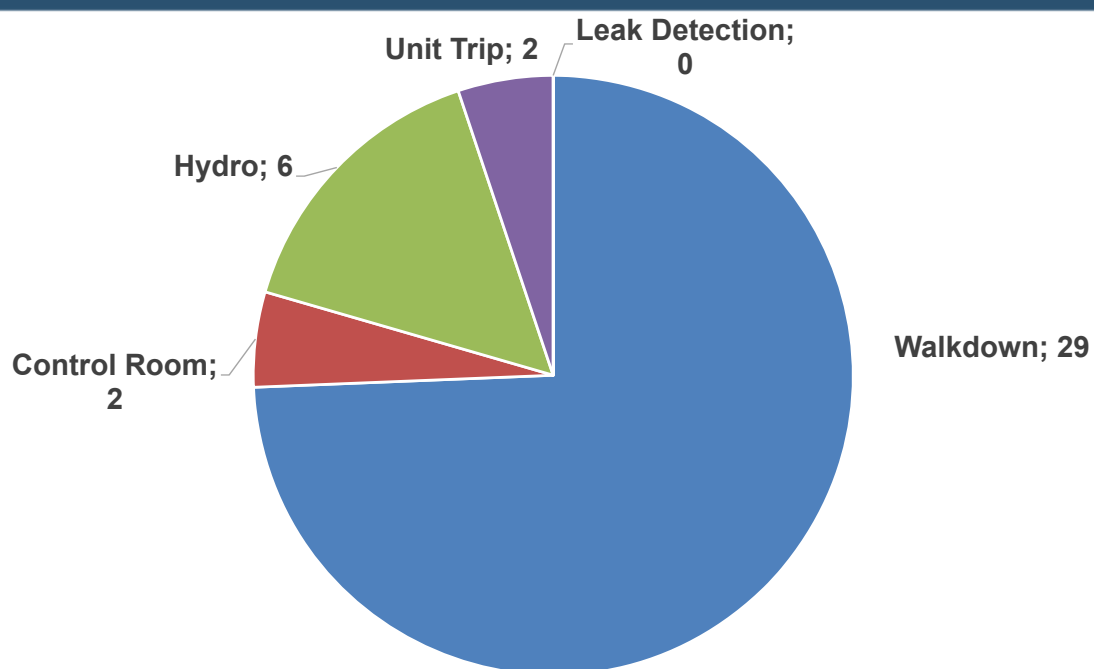


BLRBAC Data

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2018 Leaks - How Discovered



BLRBAC Data

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BLRBAC Reported Leaks (US + Canada) 2004 thru 2018

Location	15 Year Total	Average/Year
Economizer	374	24.9
Upper Furnace	120	8.0
Superheater	114	7.6
Lower Furnace*	89	5.9
Boiler Bank*	87	5.8
Screen*	36	2.4
Smelt Spout	27	1.8

*Three Smelt-Water Explosions Recorded 2004 thru 2018
One Screen Tube Leak (2012), One Boiler Bank Leak (2013), One Floor Leak (2017)

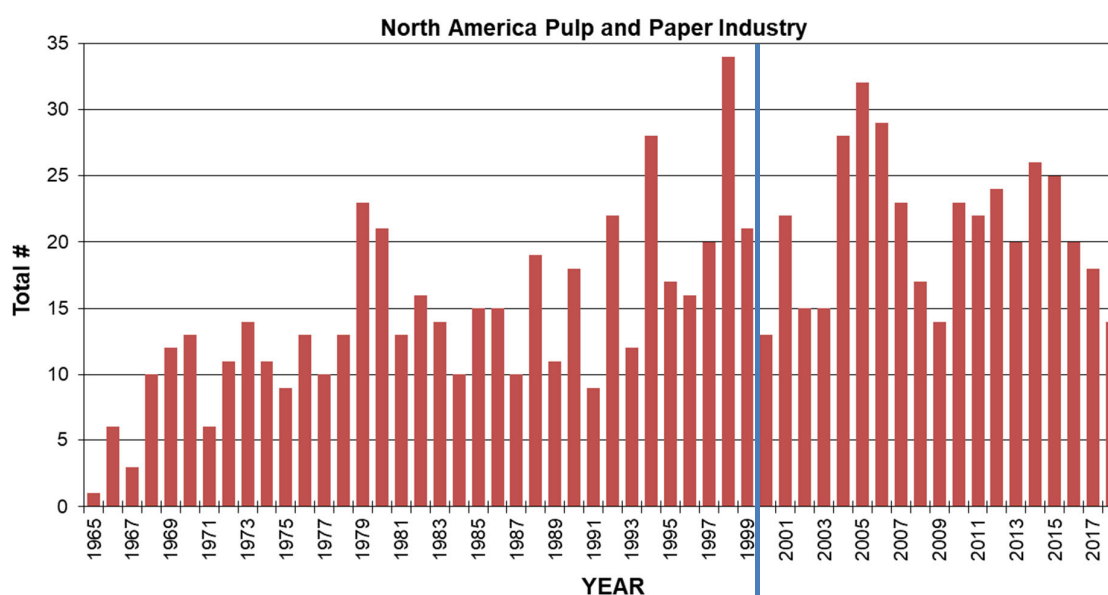
BLRBAC Data

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Critical Incidents to Date

KRAFT RECOVERY BOILER CRITICAL INCIDENTS



Definition change Sept 1999 - Increase in critical incidents

BLRBAC Data

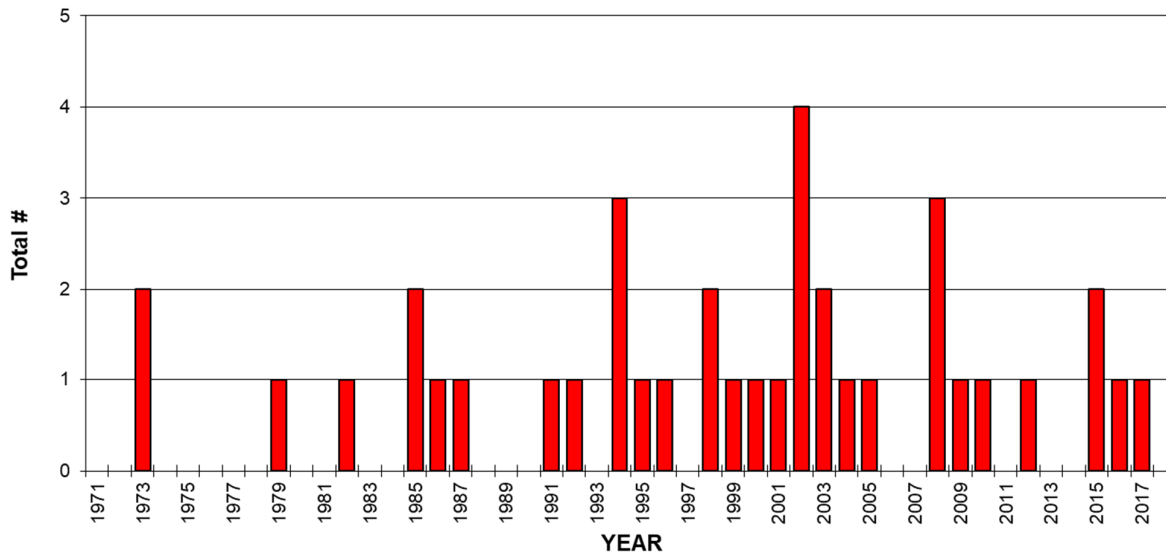
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Dissolving Tank Explosions

KRAFT RECOVERY DISSOLVING TANK EXPLOSIONS

North America Pulp and Paper Industry



BLRBAC Data

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Black Liquor Recovery Boiler Advisory Committee (BLRBAC)

- BLRBAC is a “Trade Association” that promotes improved safety of recovery boilers through the interchange of knowledge, experience, and data.
- This organization was formed late in 1961 by several groups of concerned professionals that had become alarmed by the number of Black Liquor Recovery Boiler explosions that had resulted in many injuries and death to personnel operating these boilers.
- These groups consisted of Insurance Companies, Boiler Manufacturers, and Paper Company professionals that were involved in operating, insuring, or manufacturing Black Liquor Recovery Boilers.
- BLRBAC has a number of active sub-committees that are constantly reviewing and updating our safety guidelines to reflect current technology and knowledge.
- Meets twice a year in Atlanta, GA, USA usually in April and October.

BLRBAC Information

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Black Liquor Recovery Boiler Advisory Committee (BLRBAC)

Some Early Milestones

1962

- The first meeting with representatives of insurers, boiler manufacturers, and users to “work towards improving the safety of recovery boilers and their auxiliaries through the interchange of technical knowledge, experience, and data on prior and any future casualties”

1963

- Adopted first Emergency Shutdown Procedures (ESP)

1965

- Began organizing smelt-water research efforts with 85% participation of North American tonnage (USA & CANADA)

1966

- Formed the Personnel Safety Subcommittee
- First emergency rapid drain of an operating recovery boiler
- Issued final report on smelt-water research

BLRBAC Information

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Black Liquor Recovery Boiler Advisory Committee (BLRBAC)

Some Early Milestones

1967

- Issued first guidelines for safe firing of auxiliary fuel
- The idea for the use of a single (PANIC) button to initiate an ESP was first proposed
- Established the 8 foot level as a part of the emergency shutdown procedures

1969

- First formal meeting to discuss use of sodium bicarbonate for smelt cooling

1971

- Held first operating problems session

1974

- AF&PA Recovery Boiler Program established

1985

- First AF&PA Recovery Boiler Operator Training Seminars
 - This was a major step in implementing BLRBAC Recommendations

BLRBAC Information

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AF&PA Recovery Boiler Program

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

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

AF&PA Recovery Boiler Program

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

AF&PA Recovery Boiler Program

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

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

AF&PA Recovery Boiler Program

Documents developed by the Program:

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

AF&PA Recovery Boiler Program

- The Program sponsors R&D projects
 - **Safety Improvements**
 - **Process Improvements**
- Drive improvements in:
 - **Safety**
 - **Operations**
 - **Maintenance**
 - **Recovery Boiler Integrity**

AF&PA Recovery Boiler Program

- Two Standing Subcommittees
 - **Operation & Maintenance Subcommittee**
 - **Frank Navojosky** – International Paper (Co-Chair)
 - **Wes Hill** – Georgia-Pacific (Co-Chair)
 - **Research & Development Subcommittee**
 - **Karl Morency** – Georgia-Pacific (Co-Chair)
 - **Jeff Wagoner** – International Paper (Co-Chair)
 - **Subcommittee Membership**
 - Representatives from the Member Companies

Membership

- In 2018, the Recovery Boiler Program was opened up to all Canadian Mills that operate Recovery Boilers
- The AF&PA Recovery Boiler Program
 - **21 Member Companies in North America**
 - **94% of the USA Chemical pulp production**
 - **27% of Canadian Chemical pulp production**

Operational Safety Seminars

- The **O&M Subcommittee** sponsors the **Recovery Boiler Operational Safety Seminars**
 - Main objective – Safe Operation of Recovery Boilers
 - Two (2) Safety Seminars are held each year
 - April & May - Atlanta Airport Marriott Hotel
- Operators, supervisors, superintendents, maintenance professionals, engineers, and managers attend.
 - 104 participants in 2019, representing
 - 13 companies
 - 29 mills

Operational Safety Seminars

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

Operational Safety Seminars

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

Operational Safety Seminars

➤ The 2020 Operational Safety Seminars

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

Annual Conference & Meetings

2019 AF&PA Recovery Boiler Annual Conference & Committee Meetings

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

Annual Conference & Meetings

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

2020 Annual Conference

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

Smelt Dissolving Tank Studies

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

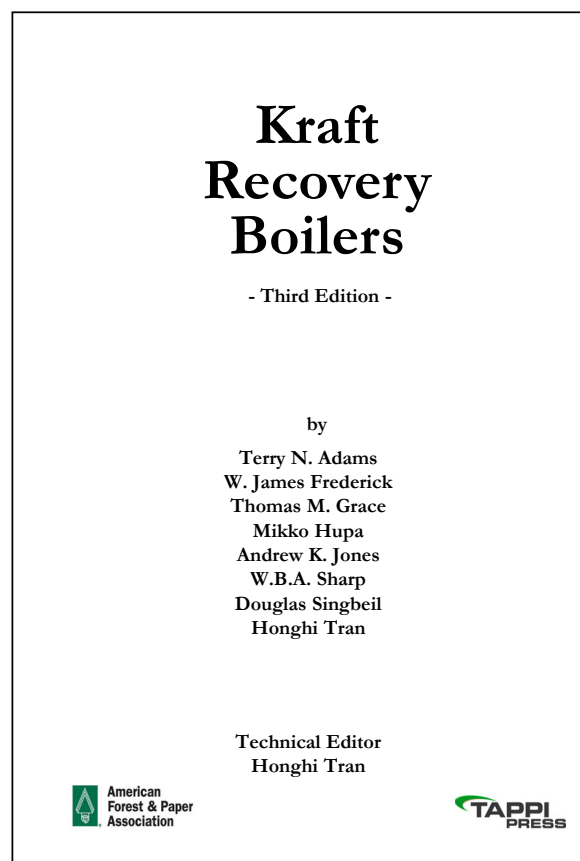
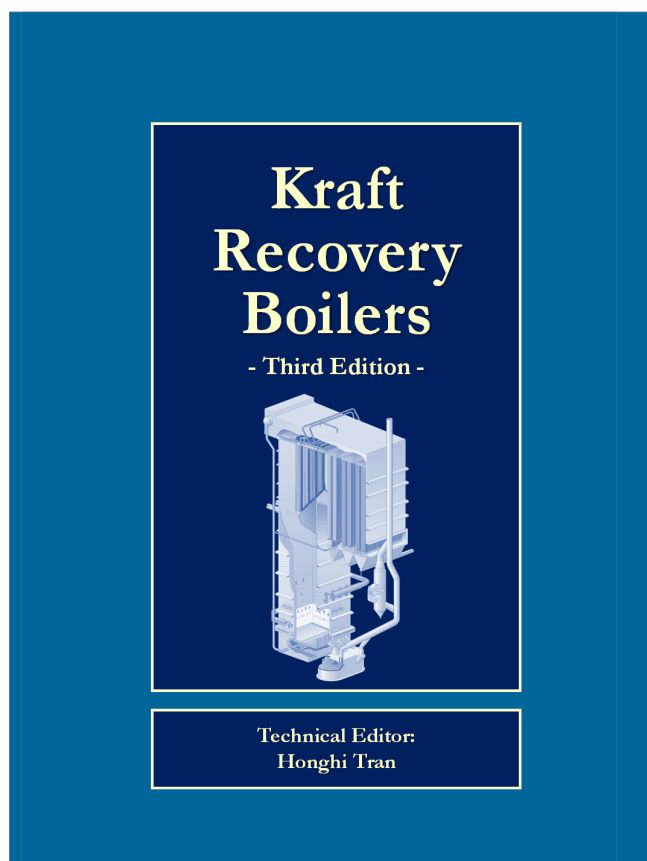
Best Practices

- The **O&M Subcommittee** developed the “**Recovery Boiler Functional Checks AF&PA Example Document**”
 - The document is posted on the AF&PA Recovery Boiler Program Website & is available to everyone
 - We encourage all mills to review the document
- The **O&M Subcommittee** is currently working to formalize recommendations from the “Dissolving Tank Survey and BLRBAC Incidents Study” completed by Dr. Tom Grace
 - It will be finalized at the February 4, 2020 meeting
 - Next O&M Sub. Project - The Impact of extended run time on Recovery Boiler operation, maintenance, risk, areas of concern, & criteria for allowing extensions

Kraft Recovery Boilers - Third Edition

- **Dr. Honghi Tran** of the University of Toronto is leading the effort to author a new **“Kraft Recovery Boilers” Textbook**
- Dr. Tran and other well-known recovery boiler experts have completed the 16 chapters of the new book
- Published by TAPPI Press – Approx. 550 pages
- The new Kraft Recovery Boilers textbook will be used in **TAPPI’s Kraft Recovery Operations Course**
- The new book will be available in fall 2019!!!

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Protective Clothing

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

Recovery Boiler Generating Bank and Screen Tube Studies

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

Some Key Safety Learnings

- Actionable and timely information in the hands of well-trained and empowered operators is the most important
- Every incident must be thoroughly analyzed and the resulting recommendations broadly shared
- Normal personnel turnover necessitates continuous training
- Use incident history to focus training, standards updates, and research priorities
- Multiple organizations working together is beneficial: AF&PA, BLRBAC, Eastern & Western Canada BLRBAC, and TAPPI

Recovery Boiler Program Information

- AF&PA Recovery Boiler Program Website:
<http://www.afandpa.org/our-industry/recovery-boiler-program>
- Available Documents
 - Publications
 - Studies
 - Training Aids
 - Standards
 - General Program Information

Contact Information

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

Thank You!