Buckman™
Chemistry, connected.

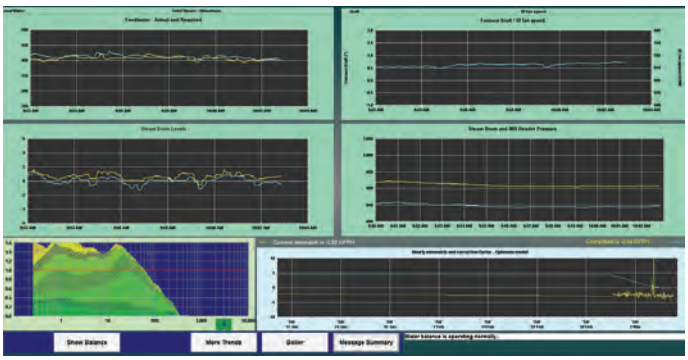
**PAPER** TECHNOLOGIES

# The Recovery Boiler Advisor

## Leak Detection and More — Key Facts and Figures

### Overview

The Recovery Boiler Advisor (RBA) is a comprehensive leak detection system that helps operators decide on the necessity to perform an emergency shutdown procedure (ESP) because of a tube leak in a recovery boiler. It is a tool that helps the operator determine the presence of tube leaks and evaluate situations that may look like a tube leak is present. The system's sensitivity ranges between 0.15 and 0.5 % of the normal feedwater flow to the boiler, depending on the availability and consistency of the boiler instrumentation. It must be stressed that the RBA is a support tool for the operator; the decision to intervene in the operation of the boiler will always be the operator's.



Operator interface main display offers continuous monitoring of water balance

Different methods are used to detect small and large tube leaks.

The system can also analyze boiler trips to determine if the trip was possibly caused by a major tube leak. After a trip, the RBA continues to monitor the boiler and provide supportive information regarding possible dangerous conditions.

If stack emission monitoring equipment is installed, the system can also function as a backup emission prediction tool and can calculate the highest fuel rate without violating emission limits. The RBA further monitors the smelt spouts, dissolving tank and sootblowers and assists in predicting fouling trends in the boiler.

### History

A task force of industry experts defined the combinations of symptoms typical for major tube leaks. In 1991 engineers created the initial release of the Recovery Boiler Advisor based on this expertise. Since the first installation, the system has gone through continuous development, improvements and fine-tuning as valuable feedback from the installed base was incorporated into the system. The most significant improvements were the very high sensitivity and the near complete elimination of false alarms. In 2005 Buckman acquired the technology.

### Benefits

The main function of the RBA is the accurate and sensitive leak detection over a wide range of operating conditions. This significantly reduces the risk of a recovery boiler explosion with possible injury to personnel and resulting production loss. It increases the safety and peace-of-mind of all who are involved with the operation of the boiler.

The RBA also reduces the chance of an unnecessary ESP through intelligent boiler trip analysis. Each ESP causes additional mechanical stress in a boiler, frequently results in lost production and requires extra manpower and expenses to get the boiler back in service.

Several years of field testing has resulted in much insight in the best data models required for stable monitoring during a variety of boiler and plant upset conditions with a minimum of false alarms. The prediction mechanism makes it possible to quickly return to the highest level of accuracy after some instrumentation was temporarily unavailable. Robustness and reliability are important aspects of the RBA.

### Sensitivity

A dynamically compensated water balance is supported by checking for symptoms which are indicative of a tube leak. Boiler trips are analyzed to determine if a tube leak possibly caused the trip. The system has the capability to detect leaks as small as 0.15 – 0.5 percent of the water flow to the boiler. For example, in a boiler that generates 600 KPPH (300 TPPH) of steam, the system is expected to detect leaks as small as 15 to 50 lb/min (2 – 5 GPM, 7 – 20 l/min).

These estimates are based on experience with the installed systems. The system can also warn for impending dry-out conditions (overheating) in the boiler. The low sensitivity limit of the system is determined more by the reproducibility of the instrumentation than the actual accuracy. The absence of any indication of the continuous blowdown flow, either directly or indirectly (e.g., controller output), can result in a lower sensitivity.

A1025H (09/20)

Global Headquarters at 1256 N. McLean Blvd., Memphis, TN 38108, USA • Phone (901) 278-0330 / Fax (901) 276-5343 or call 1 800 BUCKMAN in the USA • knetix@buckman.com

## Advanced features

Many tube failures are found after an outage during a liquor load change or during periods of reduced load. Under these abnormal conditions, leak detection poses its biggest challenges. The RBA has been designed specifically to maintain the highest possible sensitivity during load changes and unusual operating conditions like steam venting. After a short-term outage, leak detection is active within half an hour after the boiler comes back on-line.

## Maintenance and verification

After the system has been installed and tuned, system maintenance time only requires an occasional look at the user interface to check for messages and "flat lines." The system can be tested and verified with a built-in software procedure. More involved methods are available to simulate a leak in a more realistic manner.

## Hardware requirement

The instruments that are recommended by BLRBAC and that are commonly available in recovery boilers provide all the information that is required. No need for any dedicated instrumentation or injection of chemicals, not even a direct continuous blowdown flow meter is required.

System maintenance and fine-tuning can be done through remote diagnostics using a telephone connection or through a VPN connection.

A Distributed Control System with access to the data, using OPC, PI or a vendor based solution, is assumed to be available. For a control system without a gateway, cost effective hardware/software combinations can make PC access possible, but additional investment is likely.

The system requires a single standard PC. One PC is able to accommodate more than one boiler simultaneously. Past experience has shown that an existing data connection normally has sufficient spare capacity to accommodate any additional process data flow.

## Experience

The system has been installed in 20 recovery boilers in the USA, Brazil and Canada, with additional installations ongoing. The first system has been in operation since 1992 and has found a few rather small leaks as well as large ones.

The system has also picked up some less serious problems like a leaking drain valve and a malfunctioning sootblower.

## Value

The cost of an installation is determined by your local Buckman office. Monthly software subscription fees are required.

Historical data compiled by BLRBAC show one explosion for every 100 recovery boiler operating years, although the trend is declining. Based on these data, the statistical payout of our system is less than 3 months. This figure does not include the potential cost of lost production, unnecessary ESPs and other value streams.

## Frequently asked questions

1. **What would be the total cost of the system including installation cost?**

   The cost of an installation is determined by your local Buckman office. A standard PC running Windows is sufficient. To avoid security issues, we prefer that the customer provides the PC and does the basic configuration. A single PC can be used to monitor more than a single boiler.

   As mentioned above, access to real-time data (preferably using OPC, PI or a vender provided protocol) greatly facilitates the installation.

2. **What is the total time required to ship the system and install it on-site?**

   Total installation time is estimated to be 1 month, assuming that real-time data access is available. The total time on-site is estimated to be 1–2 weeks. If possible, part of the work is done off-line, like generating the mathematical models required by the system and the customization of the operator interface.

3. **Is a boiler shutdown necessary to carry out the installation?**

   No.

4. **Are technical support, software updates and maintenance provided on an ongoing basis?**

   Yes. Technical support, updates and maintenance are included under the digital license agreement. Updates become available when additional refinements or additional functionality are added to the system.

## A Support Tool

The RBA is a support tool for use and incorporation your comprehensive Recovery Boiler monitoring program. The RBA is focused on providing the operators with additional information and monitoring which allows operators to make decisions based on data, experience and expertise. The operator, and not the RBA, must always be the final determining factor as to what type of intervention is required.