Combustion Control Guidelines

For
Multiple-Burner
Boilers

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FOREWORD

This publication has been prepared by the American Boiler Manufacturers Association (ABMA) to provide concerned parties, whether boiler owners, suppliers, or designing/consulting engineers, with current minimum industry practices and application guidelines for boiler combustion controls. This publication was prepared by the ABMA Burner Group, under the supervision of the ABMA Technical Committee and appropriate ABMA product/market groups. The guidelines for multiple-burner boiler combustion controls contained herein are a consensus of the ABMA member companies based on their collective experience with the equipment that they provide to the boiler market.

The ABMA believes that the lack of a national comprehensive combustion control recommendation represents a significant void in the industry's existing safety guidelines. The ABMA hopes that the recommendations contained herein will be incorporated as part of future industry standards. The various NFPA, UL and ASME standards have become the accepted industry standards for owners and manufacturers of equipment for boilers. However, these documents do not currently provide owners and designers with detailed recommendations for boiler combustion controls.

The contents of this publication are offered as guidance only. The American Boiler Manufacturers Association does not assume responsibility or liability for consequences arising from the implementation or failure to implement the guidance contained herein. The contents of this guide should not be construed as an endorsement by the ABMA of any product or manufacturer.

This guide is intended as a supplement to the other sources of information that are available on this topic. Information furnished by specific equipment manufacturers and/or designing engineers must also be consulted regarding individual combustion controls applications. This information is intended as a guideline of acceptable industry practices, but may not represent the best current practice. It is not a substitute for experience and sound engineering principles.

ABSTRACT

Traditional combustion controls packages are relatively simple and effective for responding to a variable process steam or hot water load. However, simultaneous technological advances on two fronts (low NOx burner operation, and digital controller standardization) have complicated the task of selecting and implementing new combustion controls for new or retrofit boiler applications.

Low NOx burners typically incorporate different fuel and air mixing patterns that lead to reduced boiler emissions. Additionally, these applications may incorporate controlled variables that are not present in traditional burner packages. The required band of control for a low NOx combustion control application can be narrower than that of a traditional burner application. As regional NOx requirements continue to trend lower, the required band of control for low NOx combustion control systems also narrows. With this requirement for a narrow band of control, coupled with additional controlled combustion variables, more precision/repeatability is required from the combustion controls system.

Advances in digital controller technology have made it possible for the controller hardware to enhance the overall boiler performance, while also adding new safety features.

The boiler owner is ultimately responsible for the safe and reliable long-term operation of his boiler. There are five primary factors that the owner or his representative must control for a successful long-term boiler combustion control application. These are:

- Proper selection and engineering of the control scheme
- Proper selection of the controller hardware, final control elements, and field measuring devices
- Proper commissioning
- Proper operation (including operator training and staffing)
- Proper maintenance

The member companies of the ABMA feel that this publication will enhance the understanding of boiler owners and system designers in the complicated and dynamic field of combustion controls.

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1 Introduction

1.1 Purpose and Scope of this Publication

This guideline was written by the American Boiler Manufacturers Association (ABMA) to provide boiler owners and operators, as well as consulting or design engineers and contractors, and other interested parties with current minimum industry guidelines to enhance the safety and reliability of the combustion controls for industrial and utility boilers. The paper focuses on gas and/or liquid fired boilers, and covers the design of the two predominant combustion control schemes (Parallel Positioning, & Metering) and the applicability of each. Also, it includes minimum recommended features for the hardware required for a combustion controls application. The paper discusses the proper commissioning of a new combustion control application, and the importance of maintenance, operator training and adequate operator staffing. An example of the system design and commissioning cycle for a hypothetical metering control system is also offered.

The specific goals of this guideline are to:

- Provide concerned parties with an understanding of the requirements for safe and reliable combustion controls so that they can be properly specified for new and retrofit applications.

- Provide concerned parties with an understanding that combustion controls are a "system". This system incorporates the control scheme (suitable for the requirements of the application), the actual controller, the final control elements, the field measurement devices, the startup/commissioning and the subsequent operation and maintenance. The safe and reliable implementation of a combustion controls application on a multiple-burner boiler requires thoughtful attention to all of these elements of the control system.

- Provide concerned parties with the understanding that lower boiler emissions requirements drive the need for additional combustion control precision. This need for added precision and attention to detail applies to the design, selection, installation, operation and maintenance of new or retrofit combustion control applications.

- Provide specific guidelines regarding the design and selection of components for combustion control systems.