

# THE CDI QUARTERLY

## Inside This Issue

- [An Introduction](#)
- [Do You Have Sufficient Combustion Air](#)
- [A Brief History...](#)
- [In the Spotlight – Hamworthy-Peabody MSC2 Low NOx Burner](#)
- [New Product Offering](#)

## An Introduction

Welcome to the first quarterly publication from Combustion Designs, Inc. As you may already know, we are New York-based specialists in the field of industrial combustion providing a variety of services to our customers, including engineering and design, service work, and sales. In an effort to bring you the latest industry news, as well as specific information about our capabilities and offerings we will be distributing a quarterly newsletter.

It is our hope that you find the information within these newsletters not only interesting, but also helpful to some aspect of your business. If you have suggestions for topics you'd like to see in the future or would like to request a reprint of an article please send a note to me at [jeb@combustiondesignsinc.com](mailto:jeb@combustiondesignsinc.com) and we will do our best to accommodate your request.

Thank you for your interest in our company and we look forward to working with you again in the future. Please don't hesitate to contact us for any of your boiler room needs. ✖

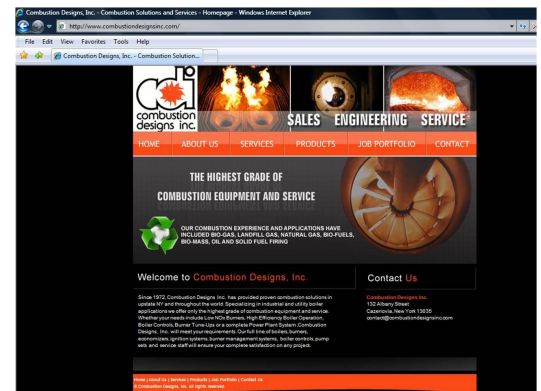
Regards,  
Jeb Benzing

## Do You Have Sufficient Combustion Air?

By Jim Benzing, President

*Having spent over 35 years in boiler rooms across Upstate New York, it has become obvious to me that a number of reoccurring safety, design and maintenance issues exist in many New York boiler plants. Time and time again these*

Have you visited our [website](#)? We encourage you to spend a few minutes reviewing our products, capabilities and job portfolios!



***“Insufficient make-up air not only results in inefficient operation of boilers, it also creates a potentially dangerous situation.”***

*issues, if left untreated, have resulted in damage to property, and in a few cases serious injuries.*

*I have compiled a list of what I consider to be some of the most common problems often encountered in the field. Starting with this article, and in each ensuing newsletter I will cover a new topic for your consideration. If, after reading any of these articles, you find that these conditions, or some variation thereof, exist in your power plant please consider making the necessary corrections and modifications to minimize exposure to injury and potential liability issues.*

### **Do you have sufficient combustion air?**

Perhaps one of the most obvious and often overlooked issues in a boiler room has to do with the amount of air available to support combustion. As we all know, air is an integral component supporting combustion, and as such an adequate supply must constantly be available to maintain a safe and efficient flame. New York State Boiler Code requires that "...the boiler room shall have at least one square foot of opening for the entry of fresh air for every 2,000,000 BTU of fuel burned per hour" (NYS Code 4, Subpart 4-7.3). Meaning that if your boiler room has one 50,000 PPH boiler (63,000,000 BTU/hr) it requires a minimum of 32 sq. ft. of opening for make-up air. To put that in perspective you would need an opening 8 ft tall by 4 ft wide, or just larger than a standard residential door.

Although most boiler rooms were designed with this code in mind, all too often boilers are operated with insufficient make-up air. The reasons are as numerous as they are varied; however, the most common appear to be directly related to the weather or the simple fact that procedures have been modified over time. Cold weather often appears to be the leading culprit, resulting in the closing of windows and doors that would otherwise be left open, and any natural openings or other sources of air being blocked off.

In some cases insufficient combustion air can be directly attributed to the very process being supported by the power house. Specifically, those plants connected to process facilities

with extensive exhaust systems (paper mills, food processing plants, etc.) often appear to lack sufficient combustion air. In these particular facilities a tremendous amount of available air is consumed by large exhaust/drying fans. Other conditions to be on the lookout for include, proximity of large air compressors, remotely mounted exhaust fans and other equipment requiring a significant supply of fresh air.

Another good indicator of a boiler room with inadequate fresh air make-up is one where exterior boiler room doors are difficult to open due to pressurization and where an inrush of air is felt when walking through these doors.

Regardless of the cause, it is important to note that insufficient make-up air not only results in inefficient operation of boilers it also creates a potentially dangerous situation.

Inadequate make-up air creates a fuel-rich condition within a boiler in a very short period of time and results in the generation of excess carbon monoxide, a toxic and potentially explosive byproduct of incomplete combustion. Fuel-rich conditions also result in heavy sooting within the boiler and on furnace walls. A build up of soot within the boiler has many detrimental effects; perhaps the most obvious being the inefficient transfer of heat and energy in the furnace and throughout the generating section.

In addition to its negative impact on combustion, insufficient make-up air causes an increase in ambient temperatures within the boiler room as well. High ambient temperatures, in turn, can be directly linked with numerous electrical and mechanical equipment failures; continuing the spread of negative impacts associated with insufficient make-up air.

A quick survey of your boiler room should provide all the necessary information required to determine whether or not

your equipment is receiving sufficient make-up air. Regardless of the outcome of this survey, here are some points to consider regarding make-up air:

- In order to minimize the likelihood of snow and dust entering the make-up air system, fresh air inlet grills should not be located at ground level.
- Points of entry should avoid plumbing (specifically water lines) whenever possible to minimize the likelihood of freezing during the winter season.
- Make-up air should not be drawn from areas with prolonged exposure to automobile exhaust.
- If make-up air is to be preheated during cold weather, we often recommend that our customers use an indirect glycol-based system rather than direct steam or hot water heat to prevent coil “freeze-up” due to the lower freezing point of glycol-based solutions.
- It may be necessary to draw or force air into the boiler room to ensure sufficient make-up air is available.

This article identifies only a few of the most common reasons why combustion air is often in short supply within boiler rooms. If any of these conditions exist in your boiler room you are encouraged to address the issue as soon as possible to limit inefficient operation or potentially dangerous situations. ✖

## A Brief History...

By Jeb Benzing

Combustion Designs, Inc. was formed in 1972 to fill the need for expertise in the field of industrial combustion throughout the state of New York. Jim Benzing, president and founder of

### DID YOU KNOW?

Did you know that Subpart 227-2.4 of NYS Air Resources Regulation requires annual tune-ups for boilers with capacities between 20 MBTU and 50 MBTU by properly trained personnel?

Combustion Designs, Inc. had previously spent 11 years honing his skills in the very trade he was now going to support as an independent businessman. He knew what it was going to take to be successful in this field and knew that he had the skills necessary to provide solutions to his customers. His impressive resume includes some 48 years in the field, including 10 years with Hauck Burner Company and Iroquois Gas Company, as well as a lengthy list of high profile and diverse customers with equally diverse and challenging needs.



A dedicated and knowledgeable individual, Jim has transferred that knowledge and passion for the industry on to his employees, insisting on excellence through hard work and a hands on approach with customers. At Combustion Designs we take great pride in meeting and exceeding the demands of our customers and we are very proud of our long and successful history in the industry. ✨

# Hamworthy-Peabody MSC2™ Low NO<sub>x</sub> Burner

By Jeff Cobb

Combustion Designs, Inc. is proud to represent quality manufacturers that are willing to invest the time and effort to continually improve their product. One such example of this is the MSC2™ burner developed by Hamworthy-Peabody Combustion. Hamworthy-Peabody has combined years of scientific research with the latest in technology to develop this burner; a burner specifically designed for new and retrofit applications where low NO<sub>x</sub> and high efficiency combustion applications are required. The [Hamworthy-Peabody MSC2™](#) burner is capable of applications ranging from 20 MM BTU/hr to 400 MM BTU/hr while firing natural gas, landfill gas, bio-gas and fuel oils. Designed for low excess air and high combustion efficiency, this low NO<sub>x</sub> burner is a great choice for any retrofit application.

The design behind the MSC2™ burner utilizes multi-staged combustion to provide stable low NO<sub>x</sub> operation for all firing rates while providing high efficiency operation. To accomplish this multi-staged combustion Hamworthy-Peabody employs Q-Jet™ technology, which introduces fuel into primary and secondary combustion air streams. Combustion is then maintained in the primary air stream through the use of the new Stableflame™ design, which provides a strong root flame for extreme stability. The secondary zone stages the flame to help regulate thermal NO<sub>x</sub> production by lowering overall flame temperature.

In the field, the MSC2™ burner has achieved <20 PPM NO<sub>x</sub> with limited flue gas recirculation while firing natural gas.

For the end user, retrofit applications targeted to increase operating efficiency or reduce NO<sub>x</sub> emissions can be justified by low upfront equipment and installation costs. The MSC2™ burner operates at 10% excess air or less, and is capable of achieving less than 100 PPM CO while maintaining a 10 to 1 turndown. Simply put, this burner supports the most stringent emissions requirements, improves operating efficiencies, and provides a significant return-on-investment, often paying for



The MSC2™ Burner

**PRESS RELEASE**  
GLOBAL SOLUTIONS • LOCAL DELIVERY

### Next Generation Low NO<sub>x</sub> Burner Introduced

With the constantly evolving emissions regulations, Hamworthy Peabody Combustion has decided to build upon the success of our MSC™ burner. The development of the MSC2™ included the use of Hamworthy Peabody Combustion's Stableflame™ technology, and the resources of Hamworthy Combustion's World leading Advanced Technology Center (14 test burners) with the capability of testing burner capacities up to 700 MM BTU/hr.

The basis for the MSC2™ burner's operation is Multi-Stage Combustion (MSC). The staged Q-Jet™ design introduces fuel into primary and secondary air streams. The primary stream allows for a new Stableflame™ design, creating an ultra-stable root flame for extreme stability. The secondary zone stages the flame to regulate thermal NO<sub>x</sub> production.

Every aspect of the burner has been reviewed and updated from air entry to gas and oil injection to ensure all were comprehensively subjected to precision combustion testing, balancing minimal flame temperature with precise flame shaping. Low CO and particulate performance while maintaining low NO<sub>x</sub> with lower PSCR has been attained. For liquid fuels, the standard QJET™ low-NO<sub>x</sub> injector is replaced, or, as an option, the QJET™ injector offers low NO<sub>x</sub> performance plus ultra-low atomization and low consumption.

Ignition is achieved using Hamworthy Peabody Combustion's highly innovative line of Gas-Electric Igniters. These have the capacity for a wide variety of fuels, minimal gas pressure, color-coded gas, and low NO<sub>x</sub> Class 1, 2 or 3, depending upon the application requirement. The highly reliable, self-cleaning, and low maintenance Chromator™ (a Hamworthy Combustion Group company) High Energy Electro Spark Igniter can also be supplied. This one-of-a-kind hot wire spark igniter, with timing induction allows the operator to observe the ignition conditions during operation. This also eliminates the need for an igniter fuel tank.

In summary, the MSC2™ is a highly reliable, efficient, low excess air burner NO<sub>x</sub> burner that can meet the emission reduction needs for today and tomorrow.

Throat Diameter:	1.0 to 5.0 inches
Firing Rate:	20 – 400 MM BTU/hr
NO <sub>x</sub> :	<20 ppm firing Natural Gas or Hydrolysis Gas
	<60 ppm w/o FGR firing Natural Gas or Refinery Gas
	<75 ppm firing Oil, 2 PSCR Oil
CO:	<100 ppm
Excess Air Operation:	10% or less, typical
IGNITER:	Gas-Electric, Pyrolytic or Natural Gas
Fuel Pressure:	Oil, 150 psig typical Gas, 10 psig typical
Combustion Air Temperature:	Ambient to 300 °F
Oil Atomization:	Steam, Air, or Mechanical
Auxiliary Ports:	Flame Scanner, Sight Port
Turndown Ratio:	10:1 Natural Gas, 1:1 Oil (typical)

An ISO 9001:2000 Approved Company  
**HAMWORTHY Peabody COMBUSTION**

For more information about our products and services visit [www.hamworthy-peabody.com](http://www.hamworthy-peabody.com)  
Hamworthy Peabody Combustion, Inc. 10 Green Technology Center, Suite 101, Suite 101  
PO Box 400, 1918 Fax: 215-625-1414 Email: [info@hamworthy-peabody.com](mailto:info@hamworthy-peabody.com)

[Download](#) Hamworthy-Peabody's Press Release on the MSC2™ Burner

itself in less than one year at many installations.

Combustion Designs, Inc. is pleased to be able to support our clients' need to meet lower emissions requirements and/or to improve operating efficiencies. We can offer a complete turnkey low NO<sub>x</sub> burner system package, or individual component upgrades. A complete turkey package includes an Industrial Air Technologies combustion air fan, CDI Burner Management System, CDI combustion controls, installation and startup services. Call us today for a free burner efficiency evaluation to see how your installation could benefit from a MSC2™ burner upgrade. ✖

## **New Product Offering!**

By Jeb Benzing

Combustion Designs is pleased to announce that we have recently added Industrial Air Technology Corp. to the list of companies we represent. A relative newcomer to the industrial fan market, Industrial Air Technology manufactures a complete line of centrifugal fans designed and built for users who value

## **Prepare for the Heating Season Today!**

Combustion Designs, Inc. offers combustion efficiency testing, steam plant efficiency evaluations, combustion tuning and safety limit testing. We are also your single-source supplier of spare parts for Hamworthy-Peabody, Weishaupt, Coen and Faber burners, as well as Fireye® and Honeywell equipment, safety limit switches, safety shutoff valves and control valves. Call

quality craftsmanship and reliable performance.



The Industrial Air Technology standard product offering includes backward inclined, industrial exhausters, radially tipped, and high pressure/turbo series fans. Nonstandard products are available to be customized to meet the specific needs of the customer's application. In addition to product manufacturing, Industrial Air Technology also provides repair and rebuild services, vibration analysis and balancing, performance assessments and general fan education.

We are especially pleased to be able to offer the Industrial Air Technology product line to our customers and are confident this new partnership will enable us to meet and exceed all of our customer's centrifugal fan and industrial blower needs. Please follow the link from our website or visit [Industrial Air Technology Corp.](#) for a full listing of [products](#) and services available. ✂

us today to ensure you are prepared for tomorrow.

This newsletter was sent to our valued customers in an effort to provide them with the latest industry news and information about our capabilities.

To unsubscribe from this mailing please [email](#) us with the word 'unsubscribe' in the subject line.

Combustion Designs, Inc.  
PO Box 643  
132 Albany Street  
Cazenovia, NY 13035

[contact@combustiondesignsinc.com](mailto:contact@combustiondesignsinc.com)

[www.combustiondesignsinc.com](http://www.combustiondesignsinc.com)

Copyright © 2009 Combustion Designs, Inc. All rights reserved.