



Casting Emission Reduction Program

Prepared by:

**TECHNIKON LLC**

5301 Price Avenue ▼ McClellan, CA, 95652 ▼ (916) 929-8001

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

## US Army Task N256 Scrubbers Technology

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# **TECHNICAL REVIEW OF SCRUBBERS**

**WBS: 2.1**

**REPORT ON THE TECHNICAL REVIEW OF  
THE CAPABILITY OF CUPOLA WET  
SCRUBBERS TO MEET LIMITS TO BE  
IMPOSED BY FEDERAL USEPA MACT  
STANDARDS**



## Report on the Technical Review of the Capability of Cupola Wet Scrubbers to Meet Limits to be Imposed by Federal USEPA MACT Standards

N256 Subtask 2.1

April 9, 2001

Reviewed and Approved by: William C. Walden *Walden* Date: 9 April 2001

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### **A. Summary**

The United States Environmental Protection Agency (USEPA) will propose the Maximum Achievable Control Technology (MACT) regulation for Iron and Steel Foundries in May 2001. This MACT will propose that foundries with more than a specified level of Hazardous Air Pollutant (HAP) emissions either reduce emissions below that level (to “opt out” of the regulation) or to upgrade/replace existing emission control systems to meet levels established in the MACT. This report reviews the ability of Wet Scrubbers on Cupolas to meet these new requirements.

### **B. Background**

Foundry operations face many environmental and competitive challenges in today’s regulated society. The 1990 Clean Air Act Amendments contained a set of mandates that includes the Maximum Achievable Control Technology (MACT) requirements. These MACT regulations, when promulgated, will require foundries to meet the HAP emission levels equal to the average of the best 12% of the industry. A foundry has to comply with the MACT requirements if they emit up to 10 ton per year of any single HAP or 25 tons per year of total HAPs.

The Iron and Steel MACT proposed regulations are expected to be published in the May 2001 Federal Register. The final rule is expected by May 2002 with a compliance date of three years after the final rule. State Air Pollution Control Agencies are likely to start requiring MACT type controls or changes once the draft rule is published. After the Iron and Steel MACT has been implemented, USEPA will analyze the “Residual Risk” from foundries after MACT compliance is achieved and determine the need to further regulate the industry.

The overall MACT rulemaking process has brought about a move to more accurately identify foundry Hazardous Air Pollutants (HAPs) emissions. Many other initiatives aimed at reducing low-level ozone concentrations have also identified and targeted foundry emissions of volatile organic compounds (VOCs). A percentage of these VOC emissions, both from core making and from pouring, cooling and shakeout, are HAPs that may be regulated through MACT.

The Iron and Steel MACT Regulatory Process, as well as state initiatives in response to local air toxics and VOC regulations, have yielded a limited number of HAP emission estimates for different types of foundry processes. Consultants and stack testing contractors who did not fully understand the processes being tested or the appropriate test protocols have done much of the testing. This

condition has yielded many different emission factors for similar processes and added to the already difficult task of determining HAP emission rates.

The MACT will propose that all melting systems must comply with an emission limit of 0.005 grains per dry standard cubic feet (gr/dscf) of particulate matter (PM) after the control system. The USEPA has proposed to use PM as a surrogate for metallic HAP emissions. Additionally all dust collection systems, wet or dry, must have an afterburner system to remove the organic HAP emissions. Of all the limits in the proposed MACT, this will be the most difficult and most costly to comply with if the foundry is using older air pollution control technology.

### **C. Objective**

The objective of this study was to determine if existing emission control systems used by foundries on Cupola melting furnaces could comply with requirements that will be contained in the proposed MACT standards.

### **D. Procedure**

A review of the results of field stack emission tests performed on Cupola melting systems was conducted. This information came from the EPA "Long Form" questionnaire submitted to EPA by all medium and large foundries in the United States. Although the EPA requested stack-testing data from 485 foundries the data reviewed was all that was available. From the responses two types of dust collectors were determined to be the primary systems on existing emission control systems used by foundries:

- a) High Energy Wet Scrubbers (25 data points were reviewed);
- b) Dry Baghouse Dust Collectors (6 data points were reviewed).

The data from these 31 stack tests was charted and reviewed by type of collection system and compared to the USEPA proposed limit. USEPA has established that the top 12% of the operating systems had an average PM emission rate of 0.005 gr/dscf.

### **E. Results**

Review of the available data indicates that Cupola systems controlled by wet scrubbers would not meet the proposed limit. Cupola systems controlled by dry collectors would most likely meet the proposed limit (6 test is not enough to statistically say that 100% could comply).

Figure 1 depicts emission data from EPA Long Form submittals for these two technologies.

Figure 2 depicts emission data from EPA Long Form submittals for each wet scrubber tested (25 in all).

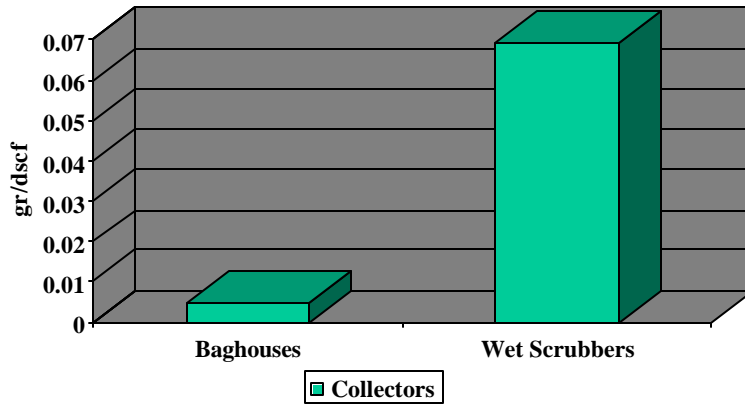
From the data wet scrubber systems on Cupola furnaces cannot meet the limits that will be in the proposed MACT standard. Replacement of these wet scrubbers is an extremely expensive modification, which is estimated to cost between \$5 and \$15 million per cupola (depending on size of the furnace and plant layout). Foundries may not have footprint space available to build a large baghouse near the melting area. Weeks to months of production time could be lost during transition from the old system to the new system. At a minimum, transition involves tear out of the old system and installation of new ductwork and controls. It is estimated that 40 Cupola wet scrubbers systems may have to be replaced. At an average cost of \$10 million per system this amounts to \$400 million.

## **F. Conclusions**

Wet scrubber systems on Cupola furnaces cannot meet the limits that will be in the proposed MACT standard. Therefore, a significant number of major source foundries will be required to retrofit wet scrubber technology with dry dust collector technology.



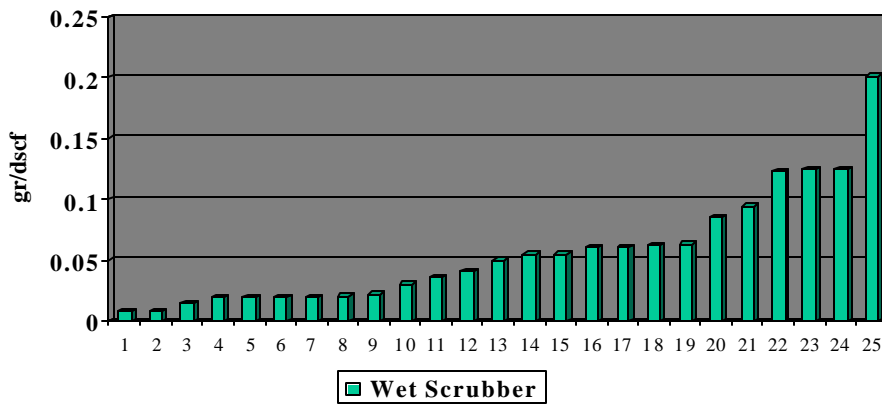
**Figure 1**  
**Average Cupola PM Emission by type of Control Technology**



EPA Proposed limit is .005 gr/dscf



**Figure 2**  
**Cupola Emission Data on Wet Scrubbers**



EPA Proposed limit is .005 gr/dscf