Don't Let DUST Be Your DOWN FALL

Metalcasting facilities looking to expand could be hamstrung as EPA continues to tighten its particulate matter standards.

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Particulate emissions have always been one of the primary air emissions associated with metalcasting operations, and the facilities have used a number of particulate control devices to limit emissions from melting, sand handling, shakeout and finishing operations. The newest particulate matter standard will regulate smaller particles than ever before. Commonly referred to as $PM_{2.5}$, these particles can be composed of a variety of materials (sand, metal, etc.) and are equal to or smaller than 2.5 microns (about 3% of the diameter of a human hair).

Until the beginning of 2011, full implementation of the rules that regulate $PM_{2.5}$ had been delayed. But now that the rules are in place, the regulation of $PM_{2.5}$ poses significant challenges for metalcasting operations and in some cases may pose an insurmountable obstacle for new facilities or plants seeking to modify or expand their operations.

Development of a Fine Particulate Standard

Particulate matter has been regulated as a "criteria pollutant" since the early 1970s. In 1987, the U.S. Environmental Protection Agency (EPA) promulgated a standard for particulate matter with a diameter of 10 microns or less. In 1997, a new standard was adopted for $PM_{2.5}$. The $PM_{2.5}$ standard was lowered in 2006. EPA argued this movement toward greater emphasis on smaller particles was based on the health impacts of small particles penetrating deeper in the respiratory system.

Table 1 summarizes the current PM_{10} and $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS), which are expressed as a concentration in micrograms per cubic meter (µg/m3). For most metalcasting processes, especially those controlled using devices such as baghouses, the magnitude of PM_{10} and $PM_{2.5}$ emissions are similar. Because the $PM_{2.5}$ standard is approximately 20% of the 24-hour PM_{10} standard, it would be significantly harder to meet.

Area Designations and Regulating $PM_{2.5}$

Different areas of the U.S. are classified as meeting the air quality standard (attainment areas or unclassified areas) or not meeting the standard (non-attainment areas) based on measurements of $PM_{2.5}$ values at monitoring sites located primarily in more urbanized areas. Compliance with the standard is determined based on the 98th percentile for each year and averaged over a three-year period. Most $PM_{2.5}$ monitors provide a 24-hour value every three days.

The 98th percentile value is usually the third highest reading over the course of a year. To obtain a "design value" for the area rep-

Table 1.

Current National Ambient Air Quality Standard

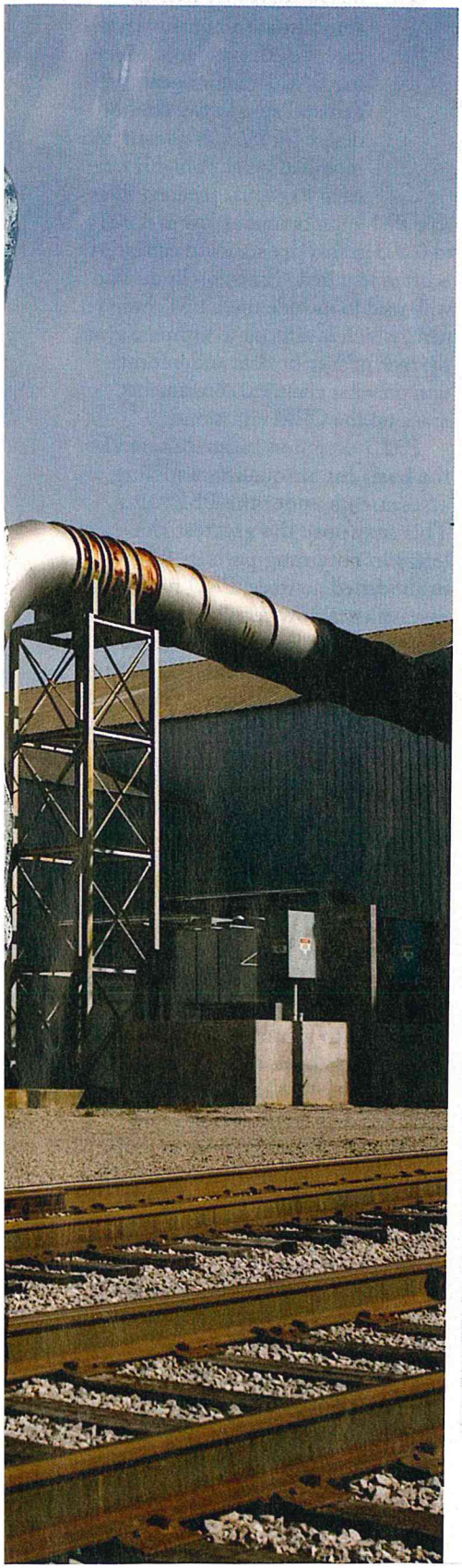
Particle Size	NAAQS 24-Hour Average (µg/M3)	Annual Average (µg/M3)
PM_{10}	150	50
$PM_{2.5}$	35	15

resented by the monitor, the 98th percentile value for each of three consecutive years is then averaged. This is also the value used as the background concentration for modeling and can significantly influence how difficult it is to meet the air quality assessment requirements of the Prevention of Significant Deterioration (PSD) permitting rules that may apply to new or modified metalcasting operations.

States with areas designated as non-attainment for $PM_{2.5}$ must develop plans and new regulations to lower $PM_{2.5}$ emissions to meet the NAAQS. Major new or modified sources in non-attainment areas

For new operations to meet the updated standard, more efficient dust collection systems may be required.

must meet the requirements of the Non-Attainment New Source Review (NNSR) permitting rules, which include using the "lowest achievable emission rate" and offsetting any increase in emissions by reducing emissions from other sources. Areas designated as attainment or unclassifiable do not require the development of new regulations, but major new and modified emission sources are required to meet the requirements of the PSD permitting rules, including the use of "best available control technology" (BACT) and demonstrating that the NAAQS and PSD air quality increments will be protected. The requirements of these two federal pre-construction permitting rules pose the greatest challenges for metalcasting sources seeking to modernize or expand operations.



What is $PM_{2.5}$?

$PM_{2.5}$ is comprised of three distinct components, including:

1. Solid or liquid particles equal to or smaller than 2.5 microns (referred to a "filterable" $PM_{2.5}$).
2. Compounds that are gases in the stack but condense to form sub-micron particles in the atmosphere and can be measured using standard stack test methods for condensable particulate matter (CPM).
3. Other pollutants, such as SO_2 and NO_X (termed precursors), that can form particulates in the atmosphere.

When measuring ambient $PM_{2.5}$, filterable, condensable and precursor emissions are seen as part of the total weights measured. However, when measuring $PM_{2.5}$ from individual stacks or estimating emissions of $PM_{2.5}$, only the first two components are added together. For many areas, nitrates, sulfates and ammonia compounds form the majority of the chemical constituents measured by the ambient monitors. To date, control strategies have focused on reductions of SO_2 and NO_X from power plants. Many of these measures already have been implemented, and a number of areas have met the standard and will soon be reclassified to attainment.

Quantifying $PM_{2.5}$ Emissions

$PM_{2.5}$ emissions estimates are used to determine whether certain rules may apply and as the basis for enforceable emission limits and air quality assessments. The primary stumbling block for making these estimates is the limited amount of data available from most metalcasting sources. In addition, emission levels vary considerably, especially for CPM emissions. EPA's "Compilation of Air Pollutant Emission Factors," or AP-42, is of limited assistance for several reasons:

- Most of the emission factors are for total PM.
- Limited data is available on the size distribution of PM.
- None of the factors include the condensable portion of the emissions.
- The variability and reliability of the factors may not support the level of accuracy needed for permitting.

Given the limited availability of suitable emission factors, sources must often rely on source test data from their specific operations or data from similar sources at other metalcasting facilities. EPA has specific test methods for measuring both filterable $PM_{2.5}$ emissions (Method 201A) and CPM (Method 202). Method 201A measures the weight of the solid or liquid particles captured on a filter (after the larger particles are segregated). Method 202, also referred to as the dry impinger method, condenses materials that may have passed through the filter in ice cooled impingers. The combined result of these two methods is reported as the $PM_{2.5}$ value.

A variation on the above methods allows for cooling the gases to ambient temperatures (less than 85F) prior to filtering so the filter is assumed to have collected both the filterable and condensable portions. In this case, the filterable emissions are reported as the total $PM_{2.5}$. These methods were modified and refined in late 2010 in response to concerns over the accuracy of results. Historic test data for metalcasting facilities has either not included Method 201A (which is less of a concern if testing a baghouse) and Method 202 or been based on older versions of the test methods. As such, historic data has limited use for future regulatory purposes and may overestimate emissions.

To balance the limitations identified above with the need to estimate

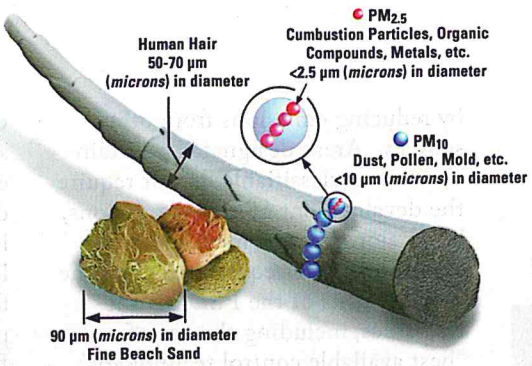


Image courtesy of U.S. EPA

The magnitude of PM_{10} and $PM_{2.5}$ emissions are similar for most casting operations. But the $PM_{2.5}$ standard is harder to meet because it is approximately 20% of the 24-hour PM_{10} standard.

$PM_{2.5}$, metalcasters can do two things. They can assume the results can be used to represent filterable $PM_{2.5}$ when PM_{10} or PM test results for filterable emissions are available from tests downstream of an effective control device such as a baghouse. This assumption is based on the fact that particulates passing through the fabric filter would likely be less than 2.5 microns. If CPM data is not available, the metalcaster must include an estimate of its value.

Alternatively, metalcasters can obtain $PM_{2.5}$ data from emission units the next time they are required to conduct stack testing (or sooner if the data is needed for a permit application for a new or modified emission source). Testing should include both filterable and condensable emissions.

Permitting New Metalcasting Facility Projects

Under current federal permitting rules, emission estimates are used to determine whether a particular physical change at a metalcasting facility would have to meet the requirements of the NNSR or PSD permitting rules. Under both rules, the threshold is an increase of 10 tons/year for an existing major source. Slight modifications, which may require significant time and resources to permit, have to meet BACT or lowest achievable emission rate emission limitations, and metalcasters may have to demonstrate air quality levels meet health standards. Meeting BACT requirements will demand an effective control device for most or all new and modified units. A highly efficient baghouse meeting filterable $PM_{2.5}$ limitations as low as 0.002 to 0.005 grains/dry standard cubic feet is often required. Emission limits also will need to include the CPM component, which is difficult to estimate given the lack of specific data and information on what chemical constituents make up the CPM emissions.

$PM_{2.5}$ emission estimates are also the basis for air quality modeling assessments under the PSD rules. This may pose the greatest challenge in obtaining permits for new or modified sources. PSD modeling assessments now require the use of both filterable and condensable emissions. The assessments examine both the specific impacts associated with the new or modified emission units and the overall impact of the source, other sources in the vicinity of the facility and background emission levels. However, in many areas the background values for the 24-hour standard (35 µg/m3) may range from 23 to 31 or higher, leaving little room for new sources of $PM_{2.5}$. A number of recent metalcasting facility projects have not been able to achieve these levels, and the projects have either been shelved or delayed while the companies have tried to find ways to accommodate the modeling needs. EPA is currently preparing guidance that will require the inclusion of $PM_{2.5}$ precursor emissions (SO_2 and NO_x) in the modeling assessments, which will make it more difficult to perform the required demonstrations under the PSD rules.

When modifying or adding emission units to address these challenges, sources may be able to avoid

review by demonstrating a project is not a major modification. This can be done using various tools in the PSD rules, including comparisons of actual to projected actual emissions, establishing the benefits of recent or concurrent emission reductions to offset increases, or applying more effective controls. Sources subject to the PSD rules and facing challenges in meeting the air quality assessments may be able to adjust available background data to remove the impacts of sources that do not affect the area where the source is located. It also may be possible to demonstrate the emissions from the specific modification are below the significant impact levels and thereby avoid the need to consider background and other sources in the assessments. Metalcasting facilities also may need to examine stack locations and consider raising them to heights that reduce ground-level impacts. MC

FORWARD LOOKING STRATEGY

On June 14, EPA proposed to lower the $PM_{2.5}$ annual standard even further, to between 12 and13 µg/m3, while retaining the current 24-hour standard. Final action to revise the standard is scheduled to occur by the end of this year, and as a result, additional areas are expected to become non-attainment. In the areas that remain in attainment, the margins available for source expansions will become tighter.

Use the following roadmap to allow your metalcasting facility to grow in the face of these standards:

- ***Understand the Regulatory Framework.*** Existing $PM_{2.5}$ emissions from many manufacturing operations, including metalcasting, are not well understood. Current regulations are making it difficult and at times impossible to expand U.S. operations.
- ***Improve $PM_{2.5}$ Emission Estimating.*** Review your current facility $PM_{2.5}$ emission inventory and identify areas for improvement. Conduct $PM_{2.5}$ emission testing to fill in holes, especially if costs can be reduced by conducting tests that coincide with existing testing requirements.
- ***Allow Proper Planning for Capital Projects.*** Ensure sufficient time is allowed to determine applicability of the regulations, avoid the regulations if necessary or determine if a permit for the project can be obtained.
- ***Engage Government Officials.*** Whenever possible, let your state and federal government officials know how this regulation is affecting your ability to remain viable and competitive. MC