NAAQS and Your Facility: Today and Tomorrow

NAAQS Background

With the promulgation of new, more stringent National Ambient Air Quality Standards (NAAQS), existing facilities are often unsure on where they stand with regard to their compliance with these standards. Often, facilities are planning on undertaking renovations or expansion without realizing that their existing operations may be already violating these newly promulgated NAAQS. This can have a profound effect on future plans, as well as existing operations.

The Clean Air Act of 1970 was enacted by the U.S. Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, the U.S. Environmental Protection Agency (EPA) promulgated NAAQS for the following criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) (PM10 and PM2.5), carbon monoxide (CO), ozone (O_3), and lead (Pb). Individual states' ambient air quality standards are either identical to or more stringent than the federal NAAQS.

NAAQS specify concentration levels for various averaging times and include both "primary" and "secondary" standards. Primary standards are intended to protect human health, whereas secondary standards are intended to protect public welfare from any known or anticipated adverse effects associated with the presence of air pollutants, such as damage to vegetation. The more stringent of the primary or secondary standards are applied when determining compliance with the NAAQS. The standards were developed by EPA to protect the human health against adverse health effects with a margin of safety. They are reviewed every five years by the EPA and the Clean Air Scientific Advisory Committee, and any revisions are made via EPA's notices of proposed rulemaking.

Within the last five years or so, EPA has promulgated a number of new or revised standards, which are significantly more stringent than the existing standards. These standards are typically the first step in the critical path of determining a facility's compliance with the NAAQS.

A one-hour NO_2 standard of 100 parts per billion (ppb) was promulgated on January 22, 2010. The final rule for the new hourly NO_2 NAAQS was published in the Federal Register on February 9, 2010 and became effective on April 12, 2010. The form of this standard is the three-year average of the 98th percentile of the daily maximum one-hour concentrations.

Similarly, a one-hour SO_2 standard of 75 ppb was promulgated on June 2, 2010. The final rule for the new hourly SO_2 NAAQS was published in the Federal Register on June

22, 2010 and became effective on August 23, 2010. The form of this standard is the three-year average of the 99th percentile of the daily maximum one-hour concentrations.

The inhalable particulate (PM10) NAAQS were promulgated on July 1, 1987 at the federal level with the intent of replacing the existing standards limiting ambient levels of Total Suspended Particulate (TSP). EPA also promulgated a Fine Particulate (PM2.5) NAAQS, effective July 18, 1997. The PM2.5 standards have since been strengthened to an annual standard of 12 $\mu g/m^3$ and a 24-hour standard of 35 $\mu g/m^3$.

The other NAAQS also reflect various durations of exposure. The short-term periods (24 hours or less) refer to exposure levels not to be exceeded more than once a year. Long-term periods refer to limits that cannot be exceeded for exposure averaged over three months or longer.

Along with the EPA (for larger sources), most state environmental agencies have some sort of air permitting requirements (for both larger and smaller sources). The air permitting process usually involves engineering analysis, forms, and a determination if your proposed installation will comply with the NAAQS.

Use of Modeling to Meet Air Quality Standards

One way to determine if a facility currently meets (or will meet) air quality standards is through the use of dispersion modeling. Modeling is the preferred method due to its relatively low cost and timeframe (versus monitoring). Modeling also allows one to predict how any physical changes to the facility or changes in operations will affect the determination. Finally, modeling is a requirement of many permit applications to show that no standards are (or will be) violated.

Dispersion modeling involves the use of computer software, along with meteorological and geographical inputs to predict, within a reasonable level of conservatism, pollutant concentrations at specific locations in the vicinity of the source. For smaller sources, often the level of detail can be reduced, but essentially the analysis must be performed in order to get the air permit.

The sources including in the modeling can range from solely the existing facility or proposed project, to all onsite sources, to interactive sources (other sources in the area not related to the project). The size of the source, the level of permitting triggered, and the impacts of the project all factor into the source inventory which are included in the analysis. Overall, there are a large number of factors which will determine your impact and status with regard to the NAAQS.

Experience has shown us that most often institutions (large hospitals, campuses, etc.) are most at risk for having existing operations exceeding the recently promulgated NAAQS. Often, these types of facilities already have a number of existing sources onsite, such as emergency generators, incinerators, and small boilers. They are often in urban areas, where many other combustion sources are located, and in areas with high background concentrations already. Finally, their owners and/or engineers may not be aware of these new standards, or the existing equipment predates any requirements for dispersion modeling. Replacing existing equipment or installing new equipment often opens up the facility for a permit review by the regulatory agency.

As part of the permitting of the new source, the regulatory agency requires dispersion modeling of both the new source, as well as any existing sources to assure that the facility is not contributing to a "condition of air pollution" by intentionally installing a large number of smaller sources permitted individually, to circumvent the more involved permitting and review process that would be required for a larger source.

An established college campus or large hospital complex may have as many as 10 to 20 emergency generators, a few incinerators, and maybe a larger central heating plant. Often these sources are older, emitting larger amounts of pollutants, and either never have been permitted, or have been permitted years ago, when NAAQS were less stringent. Stacks, especially on older emergency generators, are generally relatively low to the ground and within areas of building downwash effects. Since regulators often request all facility-owned sources to be included in the modeling analysis, it is highly likely that the current NAAQS would be exceeded with simply including the existing sources.

With the eagerness for these types of facilities to migrate to cogeneration, also known as combined heat and power (CHP), this issue is arising far more often. The mechanical engineers are hired to design a CHP and when it's time to permit the unit, the permitting engineer/modeler finds that existing sources are causing NAAQS violations and these violations must be addressed before the CHP project can continue.

The result of this is trifold, at best. Firstly, re-engineering of the project must be done. The proposed project must be either downsized, or the existing sources must be upgraded to help meet the standards. Secondly, schedule is impacted as the permit application cannot be submitted showing modeled violations. Thirdly, unexpected costs may be incurred to upgrade existing equipment. At worst, the results are a complete project-killer.

Occasionally, often due to complaints, facilities are visited by enforcement agents of regulatory agencies looking for violations to federal and state environmental regulations. Often smaller sources are found to have not been permitted, and/or are designed improperly, according to the regulations. For example, Massachusetts has a requirement that all diesel emergency generators over 37 kilowatts of engine power have a vertical, unobstructed stack. Even on relatively new construction, we have found that horizontal stacks are installed exiting building walls at relatively low heights above grade. Massachusetts regulators can require the stack to be changed, and as part of an “enforcement order” or “notice of violation,” request dispersion modeling to show NAAQS are not exceeded.

Conclusion

Although one cannot predict the levels of the NAAQS in future years, we can expect them to become increasingly stringent. It is highly likely, if a facility has not upgraded its equipment, or performed any dispersion modeling for any reason in the last five to ten years, that its current equipment does not meet at least one of the NAAQS, notably the 1-hour NO_2 or SO_2 standards, or the PM2.5 standard. It would be prudent, that at the onset of any new combustion project that dispersion modeling be done to determine if other existing sources could possibly derail the project.

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