Use of Probabilistic Statistical Techniques in AERMOD Modeling Evaluations

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ABSTRACT

The advent of the short term National Ambient Air Quality Standards (NAAQS) prompted modelers to reassess the common practices in dispersion modeling analyses. The probabilistic nature of the new short term standards also opens the door to alternative modeling techniques that are based on probability. One of these is the Monte Carlo technique that can be used to account for emission variability in permit modeling.

Currently, it is assumed that a given emission unit is in operation at its maximum capacity every hour of the year. This assumption may be appropriate for facilities that operate at full capacity most of the time. However, in most cases, emission units operate at variable loads that produce variable emissions. Thus, assuming constant maximum emissions is overly conservative for facilities such as power plants that are not in operation all the time and which exhibit high concentrations during very short periods of time.

Another element of conservatism in NAAQS demonstrations relates to combining predicted concentrations from the AMS/EPA Regulatory Model (AERMOD) with observed (monitored) background concentrations. Normally, some of the highest monitored observations are added to the AERMOD results yielding a very conservative combined concentration.

A case study is presented to evaluate the use of alternative probabilistic methods to complement the shortcomings of current dispersion modeling practices. This case study includes the use of the Monte Carlo technique and the use of a reasonable background concentration to combine with the AERMOD predicted concentrations. The use of these methods is in harmony with the probabilistic nature of the NAAQS and can help demonstrate compliance through dispersion modeling analyses, while still being protective of the NAAQS.

KEYWORDS

Monte Carlo, AERMOD, background concentrations, EMVAP