Upgrading Air Quality Regulatory Models Using Wind Tunnel Experiments

Ron L. Petersen[1], John J. Carter[2], James O. Paumier[3], William Lin[2].

[1]Petersen Research and Consulting, LLC., [2]Cermak Peterka Petersen, Inc., [3]Consultant.

September 13, 2022

Abstract

Currently, BOEM assesses the air quality impacts of air emissions released from Outer Continental Shelf sources using USEPA's older Offshore and Coastal Dispersion Model (OCD). The OCD model has not been substantially changed since 1997 and it does not provide outputs that are directly comparable to the statistical forms of the NAAQS. The current approved model for assessing NAAQS is AERMOD. AERMOD includes a building downwash program called PRIME that is appropriate for solid structures but is not appropriate for platform type structures that are porous and have openings near ground (sea) level. Hence, BOEM commissioned this wind tunnel modeling study which will be used to make AERMOD appropriate for modeling dispersion for platform type structures. This study measured concentration and velocity data in a three-dimensional sampling grid. The measurements were taken downwind of 1:200 scale models of four actual platforms (Jackup, Semisubmersible, Medium and Small production platforms) and generic platforms with two different porosities and three leg heights.

This presentation provides an overview of the wind tunnel testing methods and results. AERMOD versus wind tunnel comparisons were made and generally showed that AERMOD tends to underpredict maximum ground-level concentrations. Changes to several algorithms in PRIME were made and better agreement with wind tunnel observations was achieved. Overall, the results of this study have shown that AERMOD can be updated to achieve better agreement with wind tunnel observations for platform type structures. To achieve optimal agreement with observations, additional research is needed to validate and update several algorithms in AERMOD.