

Course Name: Introductory Air Dispersion Modelling

Course Description: This training course is structured to provide sufficient background in dispersion modelling theory to allow the participants to make informed decisions on model inputs, modelling methodologies and approximations.

Target Audience: This course is designed for personnel dealing with environmental/air quality issues at all levels of industry and government.

Course Outline: This course addresses the following topics:

- **Air Pollution Meteorology** - Introduction to the meteorological parameters important in air dispersion modelling including:
 - Atmospheric stability (Convective, Neutral and Stable Boundary Layers)
 - Calculating Monin-Obukhov length
 - Adiabatic lapse rate
 - Boundary layer profile equations
 - Definition of mixing layer height and estimation methods
 - Surface Roughness (methods for estimating)
 - Effects of meteorology on plume dispersion (shoreline fumigation, land-sea breezes, etc)
 - AERMET processor
- **Meteorological Data Processing Exercise** - Participants will use the AERMET pre-processor to develop meteorological data sets for use with the AERMOD dispersion model. The US EPA wind rose program WINDROSE will be used to develop wind roses from the data.
- **Atmospheric Dispersion** - Basic theory of atmospheric dispersion will be introduced, including:
 - Gaussian plume/puff equations
 - Equations for plume height adjustment:
 - Stack Tip Downwash
 - Buoyant Plume Rise
 - Momentum Plume Rise
 - Interaction with Mixing Layer
 - Plume spread equations
 - Terrain Effects (AERMAP processor)
 - Building Wake Effects (BPIP-PRIME processing)
- **Building and Terrain Processing, Screening Model Exercises** - Participants will use the US EPA BPIP-PRIME processor to develop building wake effects inputs for the dispersion models for several scenarios and the US EPA AERMAP processor to develop receptor grids with terrain effects.
- **Introduction to the US EPA AERMOD Dispersion Model** - The basic theory of the model and the set-up of input files will be discussed.
- **AERMOD Exercises** - Participants will create AERMOD input files, run the dispersion model, and evaluate the results.

- **Introduction to CALMET/CALPUFF** - The basic features of the CALMET and CALPUFF models will be discussed. Inputs for the CALMET model will be discussed.
- **Model Validation** - Validating dispersion modelling results with ambient air monitoring will be discussed, including:
 - Quality assurance and control of ambient monitoring to ensure accuracy and precision
 - Representativeness of monitors
 - Quantile-quantile plotting
 - Robust highest concentration calculation method
- **CALPUFF and Model Validation Exercise** - Participants will prepare CALPUFF input files, run the model, analyze and validate the results with ambient monitoring data.

Length of the Course: 5-8 days depending on components/models presented.

Course Location: To be determined.

Course Evaluation and Certification: Successful completion of all exercises and attendance at all lectures is required. A certificate of completion will be issued at the end of the course to all participants meeting these criteria.

Course Pre-requisites: An engineering or sciences background is suggested.

Materials: Course notes and public domain dispersion model software/manuals are supplied.

Supplementary reading(s): n/a

Instructor Information: Gregory Crooks, M.Eng., P.Eng., has over 15-years experience in air quality modelling and monitoring. Mr. Crooks has carried out ambient air and source monitoring studies for industrial clients that have included site selection, QA/QC of data, remote data acquisition, and software and hardware design and development. He has performed numerous projects involving dense gas dispersion modelling, physical and numerical modelling of dispersion in urban environments and complex terrain, noise monitoring, emission inventory development, and software development. He has been involved in the development of a state-of-the-art dense gas dispersion model that accounts for terrain and obstacle effects. His Masters thesis examined concentration fluctuations in plumes dispersing in complex terrain.

Gregory has conducted several training courses for industry on air quality management, dispersion modelling and ambient air monitoring. In 2000, Greg taught a one-week course to about 30 representatives of six departments of the Government of Thailand (including the Electrical Generation Authority of Thailand) and in 2005 taught an 8-day dispersion modelling course to the Abu Dhabi Marine Operating Company in the United Arab Emirates Gregory has taught a two-day training course on advanced dispersion modelling for Ontario Power

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Generation, and taught several one-day dispersion modelling courses to various industrial clients, including General Motors of Canada Limited. Greg has also taught one-day dispersion modelling courses on the use of the new US EPA dispersion model AERMOD through the Jacques Whitford Training Institute.

Other Important Information: n/a

Available Support Services: If you have any questions, please contact course_admin@jacqueswhitford.com or call Course Admin at JWTI (613) 738-0708 ext. 3204.