

Wind Tunnel Modelling

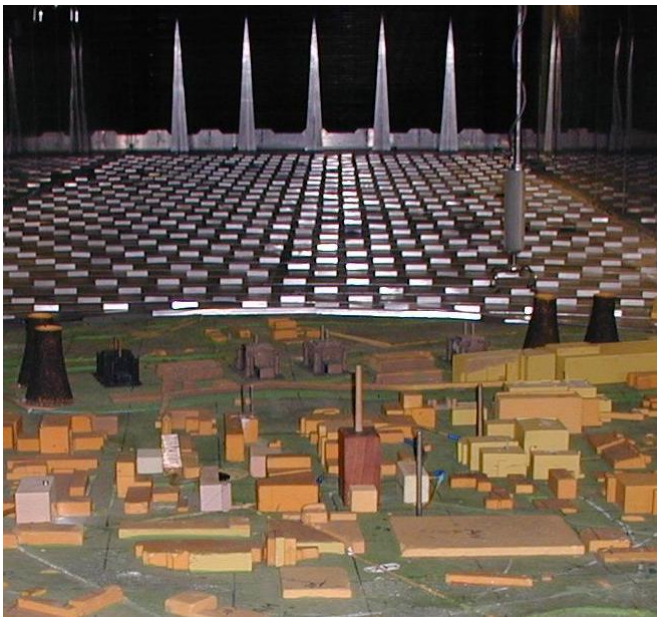
Wind tunnel modelling is a method of simulating flow and dispersion in a controlled environment. Wind tunnels are ideal for investigating the near-field flow and dispersion behaviour associated with complex terrain or the turbulence effects of urban or industrial areas. The basis of a physical modelling approach is the solution of the equations of motion and transport through simulation of fluid behaviour at a reduced scale in a controllable and repeatable environment. The method bridges the gap between analytical and numerical models of turbulence and dispersion and their field application. Physical modelling provides improved understanding of fluid transport, assisting in the development and validation of analytical or numerical modelling tools.

Wind tunnel modelling employs a real fluid, as opposed to a numerical or 'virtual' representation of a fluid, and thus is implicitly turbulent, non-hydrostatic, with variable fluid properties and non-slip boundary conditions. Physical modelling

approaches that employ real fluids, such as air or water, are in effect simulations with near infinite memory and infinitesimal resolution. Use of a real fluid provides a more reliable representation of important characteristics of the fluid behaviour, and particularly the fluctuating or turbulent behaviour. Whereas, a numerical approach, which typically only provides mean flow characteristics, is limited by grid resolution and available memory. Physical modelling can be used for the direct assessment of the affect of individual structures on the flow and the interaction resulting from regions of complex urban or industrial structures or terrain features.



Boundary layer wind tunnels enable simulation of the mechanical stresses of surface features on the atmospheric boundary layer flow. For a number of decades boundary layer wind tunnels have provided the basis for research into building affected flow and flow in the urban environment. Boundary layer wind tunnels provided much of the background science for the development of Buildings Modules incorporated into regulatory atmospheric dispersion models as well as assisting in the wind engineering design of high-rise and complex buildings and structures.



Meteorological wind tunnels enable simulation of meteorological effects on atmospheric boundary layer flow, typically incorporating the influence of both mechanical and thermodynamic forcing on the flow and turbulence structure. With an ability to control the temperature of the flow; meteorological wind tunnels can be used to investigate unstable and stable atmospheric boundary layer flows.

Meteorological wind tunnels have been used to investigate many complex issues of stability such as the stability driven recirculation that may occur in an open pit mine and the effect of atmospheric stability on dispersion in an urban or industrial environment.

Engineering Air Science has world leading expertise in meteorological wind tunnels and the simulation of complex flow and dispersion; unique hands-on experience combining buoyant and dense releases, neutral, stable and unstable atmospheric flow and dispersion from complex industrial sites.



Engineering Air Science provides wind tunnel modelling experience developed across structural wind engineering and environmental air quality.

Experience in the application and development of specialist equipment and instrumentation to characterise complex turbulent flow and dispersion behaviour.

Knowledge gained through the application of specialist boundary layer and meteorological wind tunnels to fundamental research and applied industrial consulting on domestic and international projects.

Expertise in boundary layer and meteorological wind tunnels to the simulation of flow and dispersion in complex terrain and stability, and across industrial and urban environments, with the integration and application of outcomes to research, regulatory assessment and design.

Services

- Complex Flow Modelling, CFD & Physical
- Meteorological Modelling & Monitoring
- Air Quality Modelling & Monitoring
- Data Analysis & Statistics
- Peer Review

Engineering Air Science provides be-spoke solutions on issues relating to **air quality** and the **environment**, **atmospheric flow** and **meteorology**, industrial **fluid mechanics** and **thermodynamics**.

Contact us to discuss your specific needs.