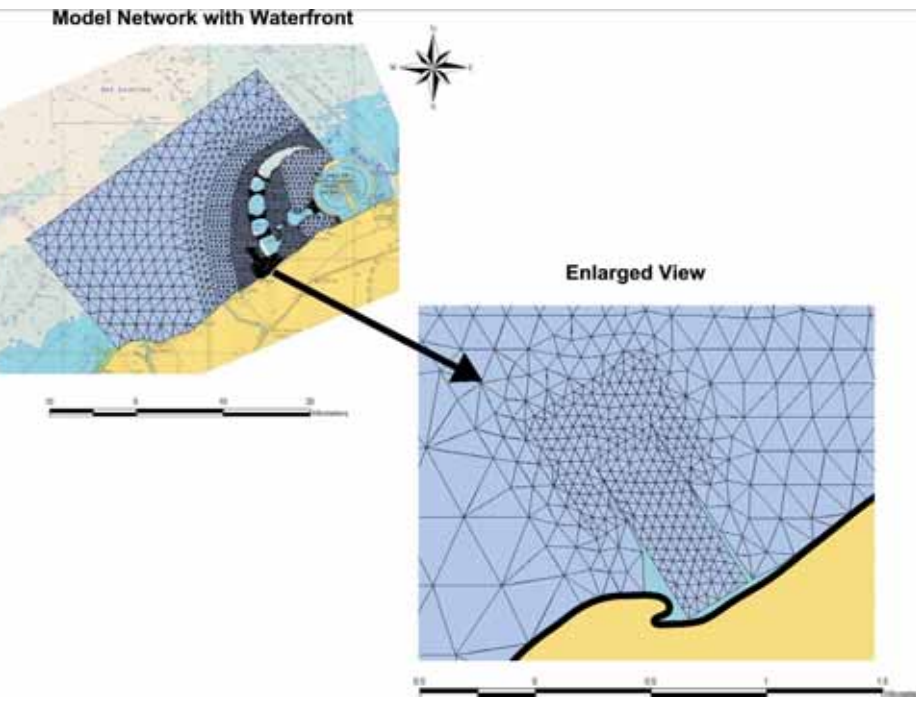


Three-dimensional (3D) flow and water quality modelling (computational fluid dynamics or CFD) has seen significant development over the last few years. It has moved from a research activity to become a powerful, practical tool to simulate and understand complex environments and processes.



Modelling recirculation of cooling water for a power station in the Gulf

Mott MacDonald's team of hydraulic modellers and environmental scientists have been at the forefront of these developments.

CFD modelling offers significant benefits throughout the project cycle including:

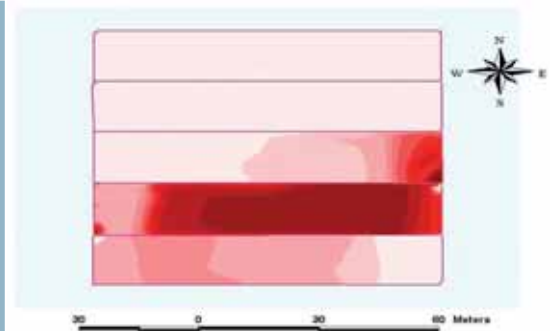
- quantitative analysis of impacts for environmental impact assessments
- demonstrating compliance with water quality regulations and directives
- conceptualisation to assess the feasibility of designs
- optimising designs, saving capital and operational costs
- ensuring functionality of the system

It offers an opportunity to reduce or eliminate the need for costly time-consuming physical models. It also allows solutions to be re-visited at later stages in a project to further refine designs.

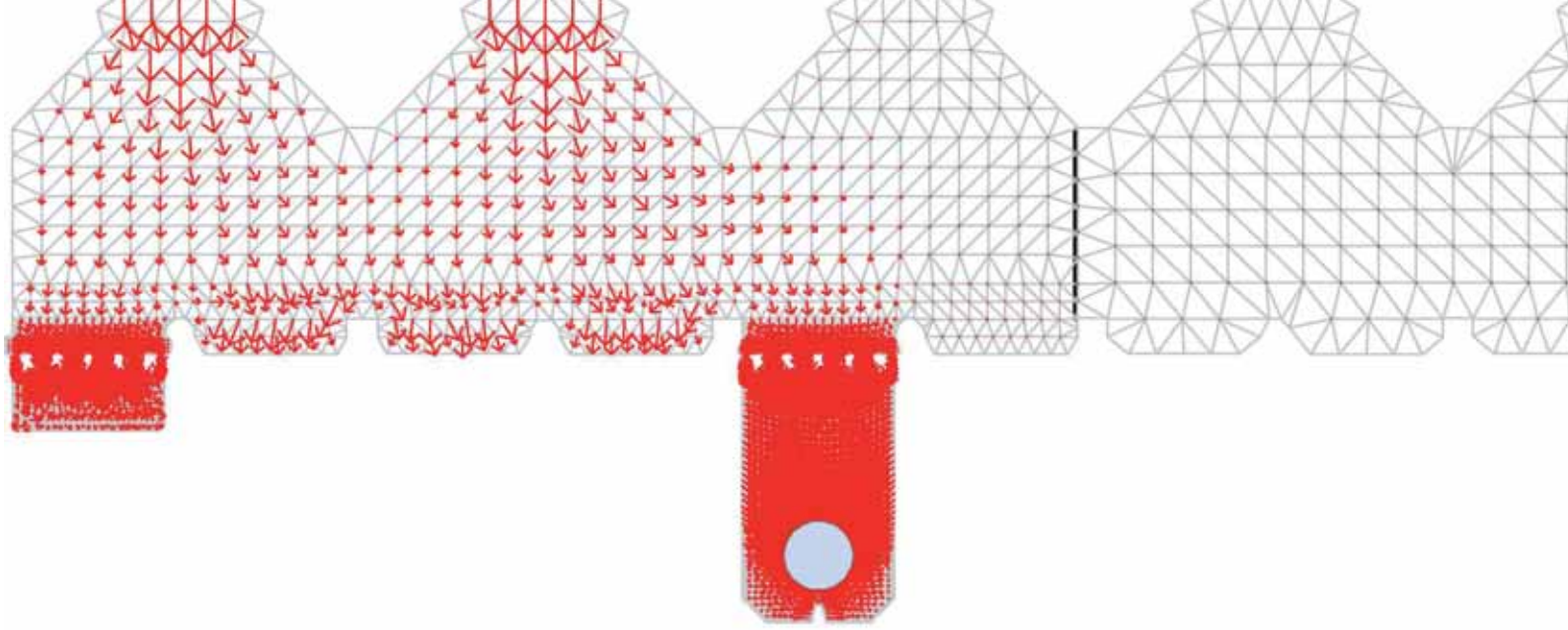
Applications

We have considerable experience of applying CFD modelling to a wide range of real-world applications. This has allowed our clients to reduce scheme costs, demonstrate environmental compliance and improve comprehension of complex environments.

3D hydraulic and water quality modelling



Testing the performance of various design configurations for a waste stabilisation pond (Mexico)



Optimising the design of a pump station inlet to improve flow hydraulics

Contact us

Andrew Kirby

E andrew.kirby@mottmac.com

Professor Gugs Gugesarajah

E gugs.gugesarajah@mottmac.com

T +44 (0)1223 463500

F +44 (0)1223 461007

The applications of CFD modelling techniques are widespread and include:

Cooling water disposal/heat dumps – The modelling of heat dissipation from cooling water disposal systems. This allows accurate analysis of thermal recirculation and the impact on the environment of a wide range of water quality parameters.

Waste stabilisation ponds – Optimising the design and operation of new and existing waste stabilisation ponds.

Design of effluent outfalls – Determining the effects of the outfall on water quality in the receiving water body, and assisting in the design of the outfall.

Sediment movement – The modelling of scour and deposition zones at structures such as barrages and bridges.

Pumps and hydraulic structures – The modelling of complex flows at pump inlets and at hydraulic structures.

A range of water quality parameters can be simulated include temperature, sediment, velocity, salinity, ammonia, nitrate, nitrite, orthophosphate, organic nitrogen, organic phosphorus, dissolved oxygen, biological oxygen demand, algae such as chlorophylla, faecal and total coliform bacteria. User-defined parameters can also be simulated.

Multi-disciplinary approach

Our team of experienced modellers is supported by a diverse range of technical specialists including engineers, environmental scientists, marine and terrestrial ecologists to interpret and apply the model results.

Technical advantage

We have developed in-house a fully dynamic, 3D, computational fluid dynamics model, HYDRO-3D. It uses finite element and finite integral methods to model spatial and temporal distribution of water particles and water quality parameters and discrete buoyant particles and the movement and dispersion of a buoyant plume. HYDRO-3D has been applied to over 20 schemes in 15 countries. It is integrated with standard GIS software and has pre and post processing facilities. This allows rapid input of spatially varying parameters and aids interpretation and presentation of results. Continued research collaboration with Surrey University has provided detailed independent critique and ensured that the model has kept abreast of recent developments in modelling methodology.

www.mottmac.com

m Mott
MacDonald