

# Mathematical Modelling for External and Internal Flows

Simulating the behaviour and transportation of fluids for tunnel systems and building structures.

BHR Group is an independent industrial research and technology organisation specialising in the application of fluid engineering for industrial processes & design. We are a multi-disciplinary company with a large array of in-house expertise in the fields of civil, mechanical and chemical engineering; providing services and consultancy to many industrial sectors.

Our experienced engineers can provide state of the art solutions for environmental flows using Computational Fluid Dynamics Modelling (CFD), Odour Modelling Software and Optimisation Algorithms that can be utilised in the assessment of the conceptual viability of;

- New designs
- Redesigns
- Troubleshooting current systems.

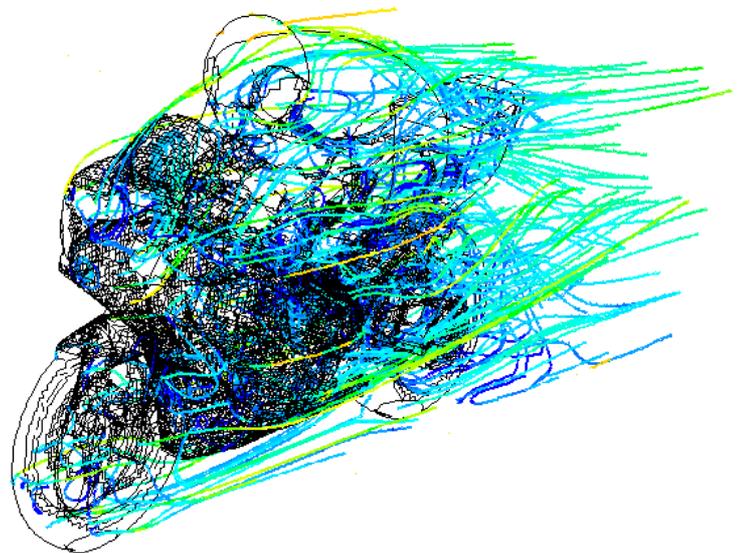
Many industrial sectors are already taking advantage of our research, consultancy, testing, modelling and training services that offer a unique combination of:

- Independent specialist expertise and
- Industry focused solutions

## Applications

Our Mathematical Modelling studies can be applied in identifying, predicting and assessing;

- Tunnel ventilation systems
- Contaminant dispersion in tunnels and urban areas
- Building aerodynamics
- Impact of wind at street level (pedestrian comfort and safety)
- Odour dissipation
- Possible fire sources and smoke extraction
- Wind turbine efficiency



*CFD Model of a motorbike made in-house using Fluent v.13. Shows streamlines around a motorbike and a biker in a tunnel.*

## State of the art Software used at BHR Group

At BHR Group our engineers are trained in using the most up to date software packages including;

- ANSYS Fluent
- OpenFOAM
- ODOURsim
- US EPA
- AERMOD

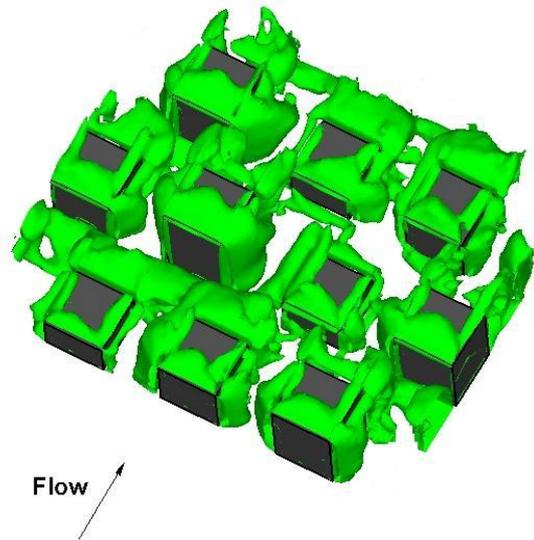
## CFD and odour assessment software

CFD is a powerful tool that can help Managers and Engineers alike in making the right investment decision. Alternative design options are evaluated using:

- Dispersion models for pollutant transport
- Visualisation of flow field patterns.
- 'Contour maps' indicating areas of high contaminant concentration or heat sources
- Pressure distribution

Which can assist in:

- Analysing the effect on pedestrian comfort and contaminant propagation in urban areas with highly vortical structures
- Identifying potential odour sources that may require abatement
- Determining the maximum permissible concentration levels of gases in tunnels
- Assessing odour threshold values



*CFD Model showing vorticity iso surfaces in an urban environment*

## Optimisation Algorithms

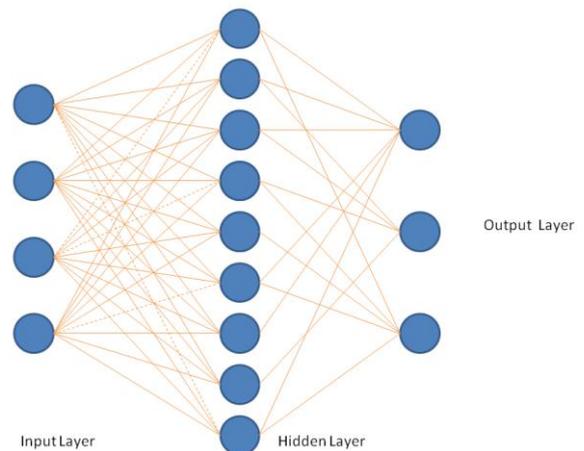
Optimisation algorithms are an invaluable tool for minimising solution timescales when creating new models by;

- Providing sets of variables to achieve an optimal solution
- Reduce the number of 'what if' scenarios
- Being easily applied to non-linear systems

## Advantages

Using Mathematical Modelling tools you can easily;

- Compare the available design options
- Attain cost effective assurance for your design
- Analyse and view performance at full operating conditions



Contact us for more information or visit our website [www.bhrgroup.com](http://www.bhrgroup.com)

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