**CHAM Limited**
Pioneering CFD Software for Education & Industry

Data Centre Simulation
Using PHOENICS/FLAIR

CFD analysis performs a vital role within data centre design, management and operational processes. CFD helps maximise the performance of cooling and ventilation systems, model the impact of additional loading and equipment distribution, and investigate emergency shut-down scenarios.
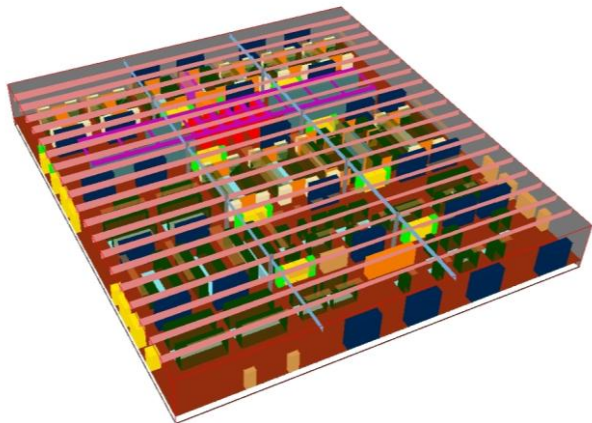

CHAM's PHOENICS CFD software, incorporates standard and product-specific objects for high- and low-density cabinets, racks, servers, PDU's, CRAC's and ACU's, as well as fans, diffusers and emergency fire suppression measures. Under-floor ventilation systems, cabling ducting, permeable and semi-permeable floor tiling are all taken into consideration, plus ceiling vents, grilles, extracts and recirculation systems.

A streamlined method has been developed at CHAM that constructs a list of data centre contents together with their key parameters (e.g. layout of all cabinets, dimensions, air flow rates, heat output, orientation and other parameters for each one) within a single spreadsheet.
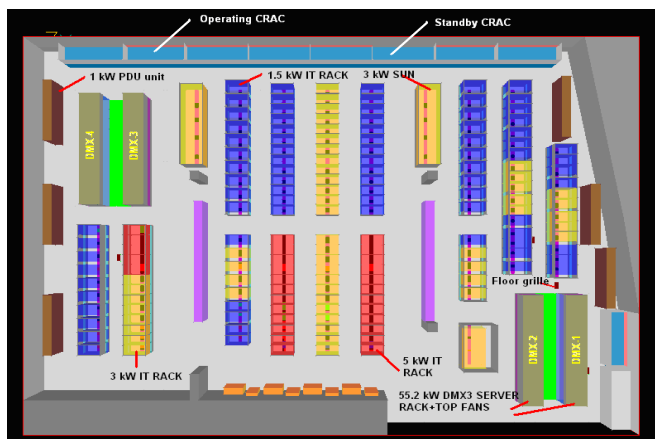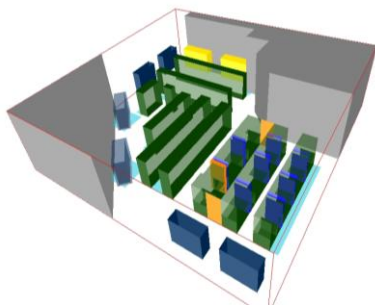

The spreadsheet is read by PHOENICS, enabling common data centre objects (i.e. CRACs, cabinets, floor / ceiling grilles) to be constructed automatically. This method allows rapid changes to be affected, such as scaling IT loads by changing a single value in the spreadsheet.
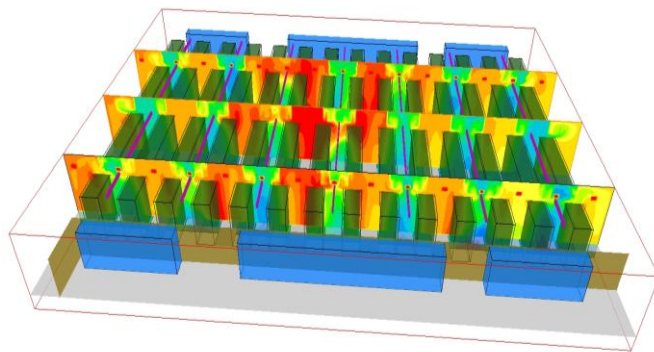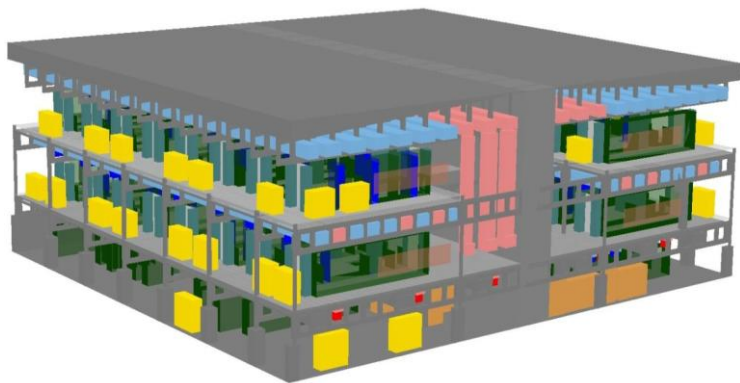

Numerical results are displayed in tabular form with XY plots. In addition, temperature, velocity, humidity and pressure values are displayed in an interactive 3D graphical environment, together with residence-time data streamlines, iso-surfaces and concentration levels. Results can be displayed using either SI or Imperial units.

PHOENICS/FLAIR handles with ease complex room and equipment layouts, non-standard units, and both multi-room and multi-storey environments.

External influences, such as solar gain, are readily introduced.

The versatility of PHOENICS/FLAIR is such that it is also appropriate for modelling related equipment, such as the performance of externally-located chilling units subject to the influence of varying environmental conditions, heat extracts from generators and exhaust outlets.
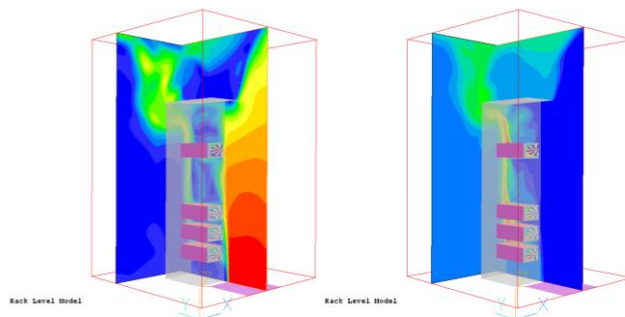
Case 4-Generators, Sloped Chimneys

As well as full-size data centre models, PHOENICS/FLAIR options include:
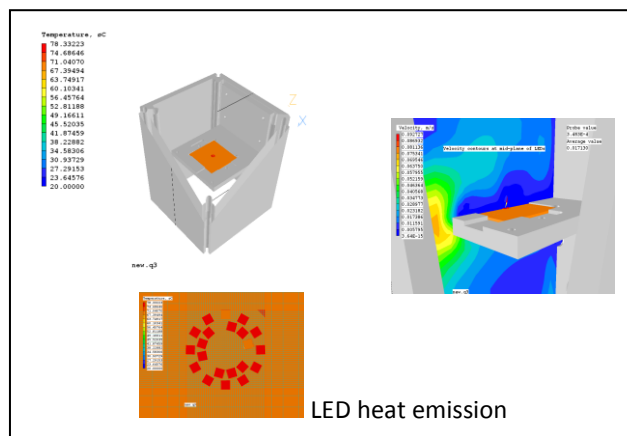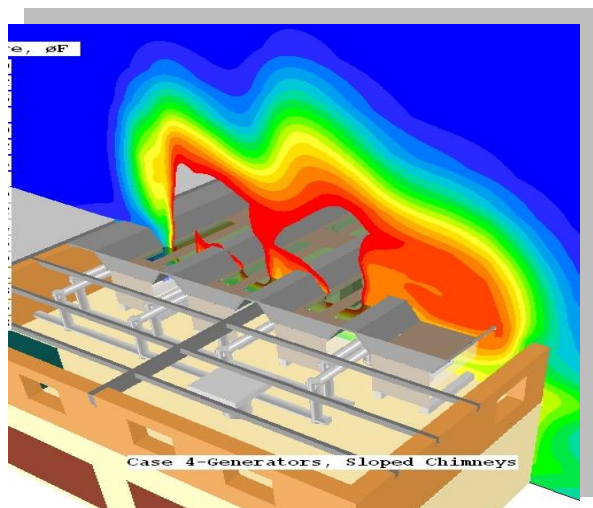
Rack-level models for studying and optimising the performance of individual cabinets and their influence upon one another.

Rack Level Model   Rack Level Model

Ventilation and cooling systems for racks, blades and circuit board LED heat releases can be studied and exported to the larger scale model.

LED heat emission

From macro-scale to micro-scale data centre problems, PHOENICS/FLAIR offers a solution.