



Airedale

Founded in 1974, Airedale is a market leader in the provision of integrated cooling solutions worldwide. With its 25,000 square meter production facility and £2 million test centre based in Leeds, UK, Airedale has established itself as a centre of excellence for the research, development and design of modern air conditioning units.

Innovative product development is the focus of Airedale air conditioning, setting industry standards and successfully overcoming economic, environmental and industry-specific challenges. Airedale has an extremely impressive range of products, distributed to more than 50 countries worldwide through a well-established network of partners and distributors.

All Airedale products are developed with energy efficiency in mind, with the company utilising state of the art carbon reduction and leak detection technology on all of its major products.

Using Simulation to Optimise the Performance of Air Conditioning Units

Background

Airedale is a market leader in the manufacture of precision air conditioning units and chillers, with the ability to customise its designs to meet the requirements of individual users. Historically, Airedale has achieved this through intelligent design and manufacturing.

As a visionary company, it was clear to Airedale that modern simulation techniques could enhance not only its research and development, but also its offerings to customers. In particular, Airedale identified that simulation would address the increasing demand for more efficient and effective cooling systems. For Airedale, a key part of designing its new, improved product range was the use of mathematical modelling techniques, known as computational fluid dynamics (CFD), in order to simulate airflow and heat transfer.

“CFD techniques can be used to verify both internal designs of our products and their performance in varying environments. Airedale reviewed various CFD tools and chose Future Facilities’ 6SigmaDC CFD based tool set because of its focus on data centre design, optimisation and management.”

George Hannah, Product Development Director, Airedale.

In implementing the use of the 6SigmaDC software suite, Airedale has adopted a new methodology known as the Virtual Facility (VF), in order to:

- 1 – Optimise the design of its precision air conditioning units and chillers
- 2 – Predict the performance of its units in situ

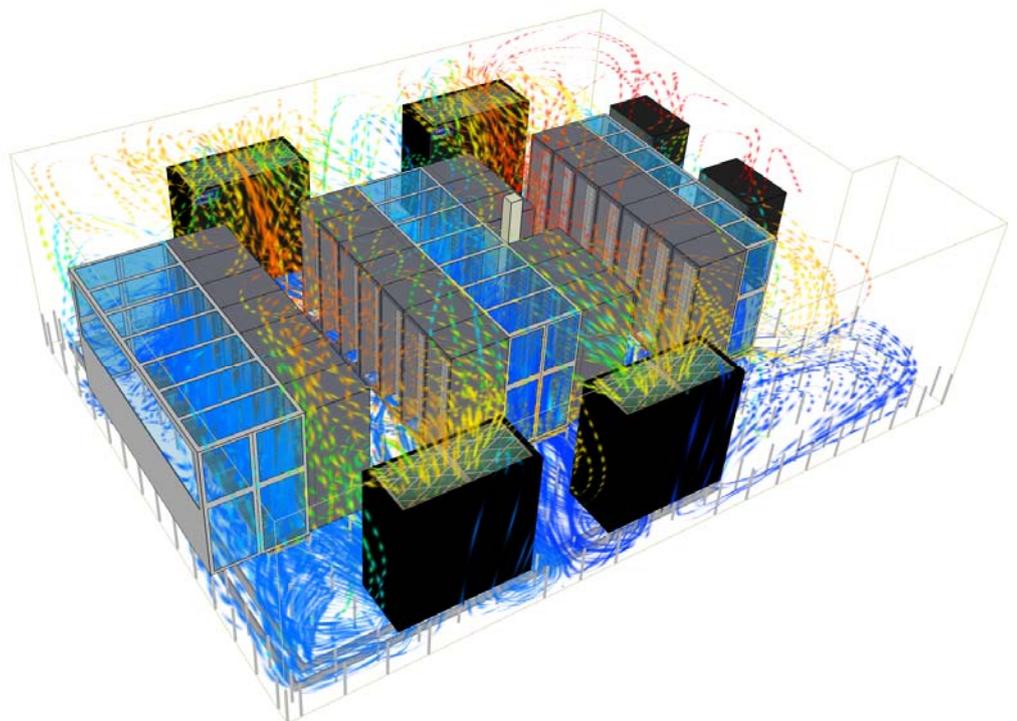


Figure 1: An Example of a Virtual Facility



Future Facilities

Passionate about data center simulation, Future Facilities (FF) is a privately-owned company formed in 2004 with a simple mission: to ensure every data center can be a model data center. One where risk is mitigated and energy efficiency maximised – while both capital and operational costs are reduced to the absolute minimum.

The senior team at FF boasts several acknowledged experts in the design and application of computational fluid dynamics (CFD) software for the data center industry. And in June 2006, after two and a half years of painstaking R&D, FF launched 6SigmaDC – a suite of integrated software products that tackles head-on the challenges of data center lifecycle engineering through the Virtual Facility (VF).

FF is passionate about what the VF can do for the design and operation of the data center industry – a passion shared by every one of its 35-strong team of experts. No simulation there whatsoever.

FF is based in the heart of London, a few minutes journey time from the Houses of Parliament. It also has offices in San Jose, United States, and Tokyo, Japan.

Optimisation of Air Conditioning Units and Chillers

Using 6SigmaRoom, a module of the 6SigmaDC software suite, Airedale built detailed virtual models of its units by importing complex geometries from existing CAD designs, enabling the analysis of both airflow and heat transfer to the finest detail. This scientific approach has eliminated traditional inefficiencies in prototyping at the design stage and has resulted in improved performance, surpassing even Airedale's progressively high standards.

"The 6SigmaDC software suite has proved to be an invaluable asset to the optimisation of our product designs prior to prototyping. This has reduced the time to market and consequently provided a better quality product." Rinku Patel, CFD Design Engineer, Airedale.

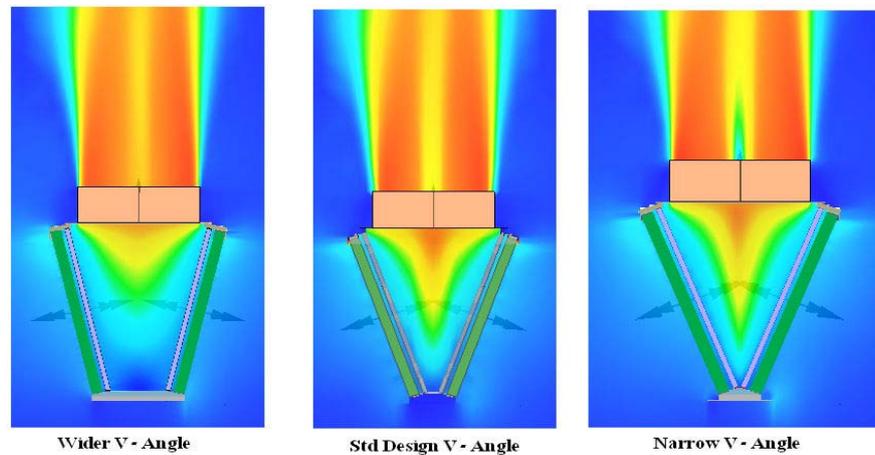


Figure 2: Velocity Result Planes for the Testing of Optimum V Angle

One of the product designs optimised by Airedale using 6SigmaDC is the Deltachill Free Cool chiller. Analysis was undertaken in order to find the optimum V-angle for the V-block arrangement inside the chiller (See Figure 2). This is a clear example of how Future Facilities' 6SigmaDC can be used to optimise performance before product prototyping.

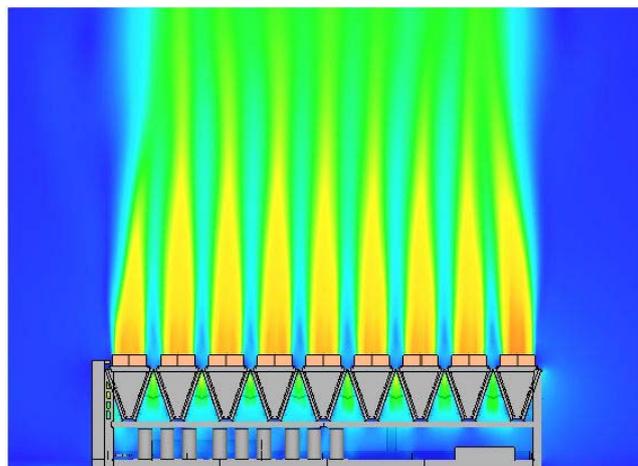


Figure 3: Velocity Result Plane using the Optimum V Angle

Figure 3 shows the velocity result plane from 6SigmaDC, demonstrating the performance of the V-block using the optimised V-angle. Once the product prototype had been manufactured the V-block was tested in order to validate the results from the simulation. The results from the physical testing showed that the actual product matched the performance that the CFD simulation had predicted. This gave Airedale confidence in the new methodology that it had adopted and a greater confidence in its products.

6SigmaDC

6SigmaDC is the unique software suite from Future Facilities for data center operators, data center designers, facilities managers, field engineers and equipment designers. In fact, it is a powerful tool for anyone with an interest in contributing to designing and/or maintaining a model data center.

This comprehensive toolset allows you to build and test an entire Virtual Facility (VF) – the holistic 3D mathematical representation of your data center at any point in time – past, present and future. Indeed, you can use software modules from the suite to check out the configuration at almost any level, right down to the design of a specific item of IT equipment.

The VF provides a standard way for any stakeholder to share their ideas, plans and proposals with each other. Not only does it allow one to design or evaluate space, power, cooling and network decisions, but the VF also provides a great communication methodology between interested parties. It can be used to coordinate design, planning and implementation throughout the data center lifecycle.

The first full range of 5*-rated library items in 6SigmaDC is just one product of the work that Airedale and Future Facilities have undertaken together (see Figure 4). A 5* library item incorporates high-level data that allows the ACU model to perform in any VF environment as close to reality as CFD can simulate.

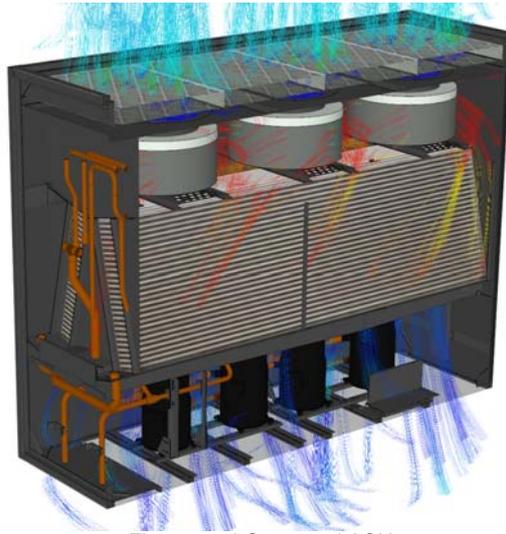


Figure 4: 5* Smartcool ACU

6SigmaDC Release 7 (R7) comes with 5* models of the entire range of Airedale's Smartcool ACUs, with 5* models of Easicool and Alphacool ACUs to follow shortly. These models are a great asset to have when modeling a facility.

"These latest 5 Airedale libraries provide a great leap forward in the accuracy we can guarantee to our end customers. This is the first time that we have worked directly with a manufacturer to produce libraries and it has strengthened our knowledge of air handlers and enhanced our end product."* Stephen Hitchcock, Technical Library Manager, Future Facilities.

Predicting Air Conditioning Performance in Situ

Airedale has created a VF that is an exact replica of the test facility in which its prototypes and final products are developed and verified. This VF representation allows Airedale to analyse its product design and product performance in the test facility (See figure 5).

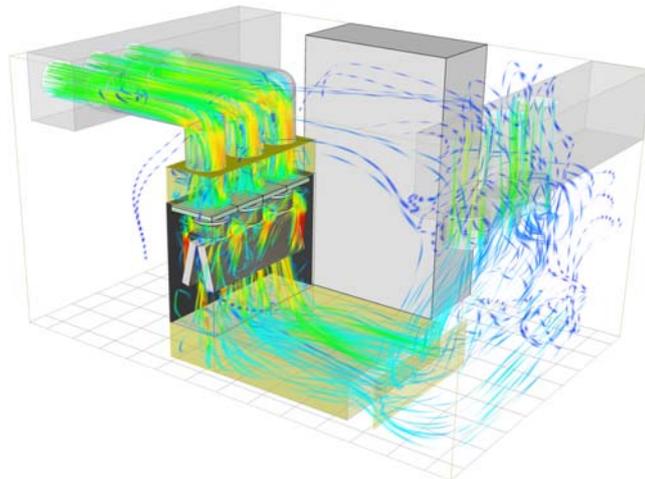


Figure 5: VF representation of Test Facility

The primary focus of an owner-operator is in the performance of the air conditioning unit in their own facility. This represents a complex interaction between the performance of the unit and the control systems of the facility. Future Facilities' 6SigmaDC software suite allows Airedale to use its calibrated ACU libraries within a VF that represents its customer's actual facility. This unique approach allows Airedale to cover all aspects of a customer's requirements.

For more information on the topics of this paper, please contact:

info@futurefacilities.com