Flowmaster
Fluid thinking for systems engineers

Case Study

Senior Aerospace BWT

Senior Aerospace BWT Lowers ECS System Design Pressures with Flowmaster

Leading aerospace manufacturing organisation increases its engineering capabilities while reducing project lead times and costs through long term investment in CFD System Simulation software

Senior Aerospace BWT is recognised as a world leader in ultra-lightweight low pressure air distribution and insulation systems. As part of Senior plc, they make up a group of international manufacturing companies with operations in 11 countries manufacturing components and systems for global aerospace OEMs.

From early in the company's history Senior Aerospace BWT has shown to be an investor in the latest technology to maintain its leading position in the market. For 12 years Flowmaster has played an integral part of the continued development of BWT's ability to meet customer demands in terms of time and accuracy of simulation results.

BWT's early work prior to using Flowmaster, mainly focused on supporting the analysis work on project designs, often using the manually intensive process of hand calculations. By taking the strategic decision to grow the services it could offer to the larger OEMs, BWT's role in aircraft development shifted from that of simply supporting system design and analysis to one of providing a complete design and manufacturing solution for air distribution systems. This shift in focus generated a need to harness the power of the latest design and manufacturing software.

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The decision to invest in CFD technology was largely project driven as BWT became heavily involved in the development of a number of large regional jet projects. These contracts would see the company move from supporting the analysis of system performance to a position of being completely responsible for it. With this extra responsibility came the requirement to invest in a tool that would allow them to design entire air distribution systems and provide a level of resultant validation to its clients that hand calculations never could. Due to its industry reputation and BWT's close links with existing users in the Aerospace sector, Flowmaster was chosen.

Flowmaster injected a greater level of automation to simplify system changes.

The benefits of using Flowmaster were immediately realised. Compared to hand calculations, where the user starts from scratch each time creating a new spreadsheet for each system, Flowmaster injected a greater level of automation to simplify system changes. Tim Wright, BWT's Technical Manager commented;

"Flowmaster's in-built data and supplied ECS components enable us to create new system designs in a more automated manner, removing the labour intensive process of hand calculations and use of spreadsheets"

Continuing to say that;

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Around the same time BWT increased its investment in other CAD technology (Catia and AutoCAD) to compliment the CFD technology and the successful use of both CAD and CFD technology has proved vital for the pace at which the organisation were able to complete subsequent large projects.

Flowmaster's place in BWT's Development Process

Senior Aerospace BWT use Flowmaster throughout their development process, particularly in the design and optimisation of the air distribution systems. Once the volumetric space of the aircraft is known, the air distribution system is agreed and flow rates specified, BWT's design engineers make initial choices on system layout and component sizes. These decisions are based largely on past experience and previously captured flow balancing calculations to highlight which of their existing components to use. At this stage Flowmaster is often used as a

conception tool. Tim Wright describes the benefit of employing Flowmaster at this point in the process:

"By not requiring 3D data, Flowmaster enables us to gain a good understanding of the system performance from the most basic of starting information."

Once this basic system architecture is agreed, a 'Sketch' model is created in Catia to ensure the basic design fits the space envelope of the aircraft, before swiftly creating the Flowmaster model, breaking down detail of the 3D parts; such as length, diameter and inputting them into Flowmaster components. Once the concept model is built the entire system is simulated to ensure pressure loss performances are met.

Once the 3D CAD model has reached a certain maturity, Flowmaster is then employed to optimise the system.

BWT successfully use Flowmaster to optimise CAD Models

BWT uses the simulation results to further refine firstly the Flowmaster system and secondly the 3D CAD model. Once the 3D CAD model has reached a certain maturity, Flowmaster is then employed to optimise the system. By harnessing the power of Flowmaster's in-built flow-balancing functionality engineers are able to analyse and optimise the properties of individual components around the network, identifying where waste can be minimised and costs reduced, without risking the performance of the overall system. Tim explained that:

"By being able to quickly simulate a drop in pressure across the system we are able to make fast decisions on material selection. If we can prove the system can work as effectively when the pressure is reduced by as little as 0.1PSI, we can improve our material selections and deliver greater savings in terms of material weight and costs"

"The Flowmaster model enables us to further validate our systems designs and plays a vital part in reducing material wastage and overall development costs, helping to ensure the project stays within budget."

Going on to say:

"The ability to quickly optimise individual components on-screen in key areas within the Flowmaster model enables us to further validate our systems designs and plays a vital part in reducing material wastage and overall development costs, helping to ensure the project stays within budget."

This optimised data is then fed back into the final 3D Model ready for manufacture.

As the accuracy of system performance and efficiency levels are becoming ever more critical factors in aircraft development, companies are continually requiring greater validation of analysis data before manufacture. BWT has found the ability

to demonstrate the performance of a system live on-screen, to clients a powerful asset in proving the credibility of results, saying;

"Flowmaster's reputation for accuracy adds an extra layer of validation to our results. By demonstrating system designs and running simulations live within Flowmaster in-front of our customers we can prove our results and give our customers greater confidence that our systems will perform within specification."

Senior Aerospace BWT continues to pride itself on delivering an unrivalled, fast and flexible service to its clients. It recognises that this is only achieved through the continual investment in the latest advanced computer aided design, simulation and analysis technologies. Tim highlighted that the latest developments made in Flowmaster V7 will allow them to move their design process to another level in terms of efficiency and workflow.

"The new configuration control and audit trail functionality in Flowmaster V7 is a massive step forward in the software and will be a key benefit to increasing efficiency at the early stages of system designs"

Looking to the future, Senior Aerospace BWT continues to investigate new ways to maximise their investment in new technologies to help them secure and deliver products for tomorrow's aircraft. With integration and better automation between their CFD and CAD technologies identified as an important development to their design process. Flowmaster V7's new open API and system integration tools will provide the solutions to help them maximise the potential of further integrating their design and development, and analysis systems.

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