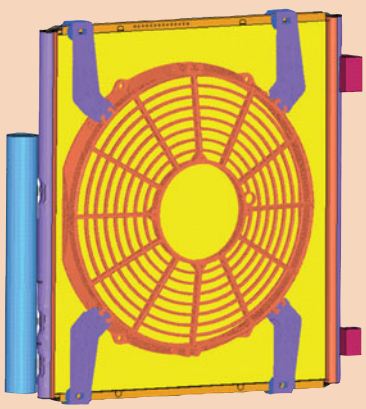
Subros leverages Altair HyperWorks to build optimised product designs

The company achieved 60% reduction in simulation time and 40% in prototyping costs while using the Altair suite.

Subros Limited was founded in 1985 as a joint venture public limited company with 40% ownership by the Suri family of India and 13% ownership each by Denso Corporation and Suzuki Motor Corporation. Subros is the leading manufacturer of thermal products for automotive applications in India and operates in technical collaboration with Denso.

The company has grown from a capacity of 15000 AC units in 1985 – comprising largely of an assembly operation – to being the largest and only integrated manufacturing unit in India for auto air conditioning systems. Subros manufactures compressors, condensers, heat exchangers and all connecting elements required to complete the AC loop. Their product line caters to all vehicle segments such as passenger vehicles, buses, trucks, refrigeration transport, off-roaders, and railways. Subros has manufacturing plants at Noida, Manesar, Pune, Chennai and Sanand with an annual capacity of 1.5 million AC kits. They also have a well-equipped R&D center and tool room in Noida.

Fresh air duct (FAD) in HVAC assembly



Condenser assembly with shroud fan assembly

Challenges Faced

Being a major supplier of AC units to the predominant automotive segments and all classes of vehicles produced by global players in the country, it is crucial for Subros to honor deadlines of product delivery with agreed benchmarks of quality. Automotive manufacturers churn out new models of their vehicles with continual upgradation that requires thermal products like AC units to be more efficient and lighter. As the time of vehicle launch is important for these manufacturers, the pressure of timelines vis-à-vis product development is automatically transferred to Subros.

The Subros team realised the importance of simulation to save time in the product development cycle and started using a CAE software tool available in the market. The team created load and boundary conditions, beam elements, and then set the product model for simulation in the software. The team found out that the software took more time to simulate and was also not user friendly. To top it, the software was susceptible to human error, which occurred frequently further adding to delays in product development and delivery. In order to get rid of all such issues, the team wanted a simulation software product that was robust, quick, reliable, and user friendly.

Investment in Altair CAE Solutions

For Subros, the association with Altair started with their search for a robust CAE product that could save time and minimise errors. What began as a small association is now a full-fledged relationship. Subros has been using the Altair suite of products for more than 10 years now.

Initially, the Subros team used Altair's pre-processor tool HyperMesh coupled with other industry solvers. Later, as the team learned more about the capabilities of the Altair suite, they moved completely towards RADIOSS and OptiStruct solver for structural analysis. Currently, Subros uses Altair HyperWorks 14.0 extensively, which includes HyperMesh, HyperView, HyperGraph, RADIOSS, OptiStruct, MotionView, MotionSolve and solidThinking Inspire. The team also uses Altair AcuSolve, SimLab, and HyperStudy intermittently, as required.

The Subros team has used Altair solutions to fulfill various requirements, some of which are: HyperMesh – To set up the FE model for simulation (structural/MBD); HyperView – To visualise structural/MBD animation results; HyperGraph – To visualise structural/MBDpPlot results; MotionView – To set up a model for MBD (Pre-Processing); MotionSolve – To simulate MBD Analysis (HVAC Cam-Lever Kinematic Mechanism); RADIOSS/OptiStruct –

The following table gives a quick view of the various benefits that the Subros team drew by using the Altair Suite.

Parameter	Task	% Change	Benefit
Time	Simulation	70	Saved time drastically, by applying SPC at RBE2 independent nodes, rather than at components base nodes (as suggested by Altair team).
	Pre-processing	20	Saved time by creating master HM files (HM file includes in-house material properties details, load collectors and load cases, control cards, beam sections and component names.
		60	Saved time drastically by using smart features (like auto mesh, quick tetra mesh, automatic mid-surface, assign variable thickness etc.).
	Setup	30	Saved time by using capabilities of in-built solvers i.e. RADIOSS and OptiStruct (in earlier method, they had to export Mesh for other solver and then again import it into another software to set up the model for simulation).
Cost	Solver Use	50	Saved cost by replacing earlier solver with OptiStruct solver.
	Prototyping	40	Saved cost in prototype making and testing by using Altair's Optimization tool.
Weight	Metal Use	59	Reduced assembly weight in a project by replacing Sheet Metal plates with Aluminum plates by using OptiStruct solver.
Accuracy	Frequency Validation	95	Increased accuracy by validating the FE model frequency with testing frequency by using the Altair Suite.
		90	Achieved increased accuracy with Altair Suite (as compared to another solver available in the market).

To simulate structural analysis (AC Products); AcuSolve – To solve air flow analysis for HVAC; solidThinking Inspire – To perform modal analysis and optimisation.

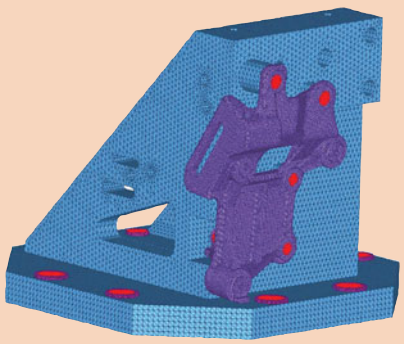
Why Altair Solutions?

The Subros team started exploring Altair solutions in their quest to save time and deliver quality AC units to their clients. Earlier, the team used to apply constraints on the assembly through nodes, which took more time to simulate the analysis and also required more disk space to run it. They discussed this problem with Altair and solicited remedies. The Altair team suggested Subros use the RBE2 elements to constraint the model and also to apply the excitation load through them. This method resulted in drastic reduction in simulation time and usage of disk space for simulation.

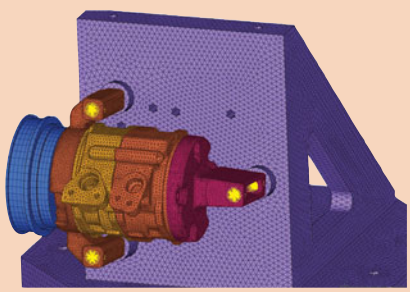
The software suite has enabled them to perform structural and multi-body dynamic analysis being concerned about errors. This has directly impacted the product development cycle time, along with a positive bearing on cost of prototypes and samples.

Benefits Derived

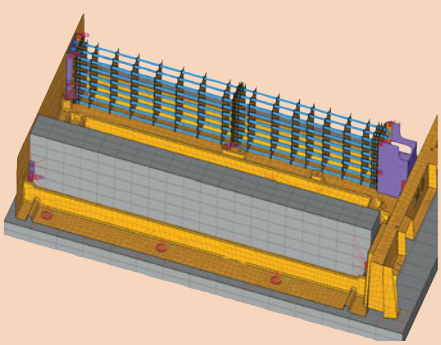
The Subros team has derived multitudinous benefits from Altair solutions. The team recently completed a project named 'Design Optimisation and Weight Reduction of Heat Exchanger using OptiStruct Solver'. They used the Altair suite throughout the lifecycle of the project, from pre-processing to solver and post-processing, thereby successfully completing it within time. Altair solutions enabled the team to drastically reduce the weight of the total assembly by replacing the higher grade material with a lower grade material. This change also reduced the cost of the assembly because of the use of low cost material.



Fixture with compressor mounting bracket



Fixture with compressor assembly



Evaporator assembly (midsurface with variable thickness of baseplate

The contentment

The team also conducted a weight optimisation study that turned out to be very beneficial to the business. The team feels very confident about their projects after a sustained use of Altair solutions. The software suite always provides resolutions to real-time problems and validates them with experimental results. IPF

Courtesy: DesignTech Systems

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