

# Pranav Vikas Achieves 17% Material Savings with Light Weight and Optimised Product Designs using Altair HyperWorks™ Solutions

## Overview

With over 2 decades of experience in manufacturing Aluminum Heat-exchangers such as Condensers, Evaporators, Heaters, Radiators, Oil Coolers, IHX and Roof AC units, Pranav Vikas (India) Private Limited (PVL) today is one of the largest and most diversified Heat-exchanger manufacturers in India. PVL's strong Design and Development team, along with their Testing and Validation facilities, has enabled the company to come up with latest products for various applications and market segments. PVL currently operates out of three locations in India: Faridabad (Haryana), Palwal (Haryana), and Ranjangaon (Pune, Maharashtra). Each of these facilities focuses on specific product lines and market segments and hence works towards excellence in their respective areas. The company currently is the only fully integrated Condenser manufacturer in India with their own state-of-the-art Micro-tube facility at Ranjangaon, Pune. PVL serves leading global and Indian Original Equipment Manufacturers (OEMs) in the Passenger, Commercial, and Off-road vehicle segments. Some of their major customers are Mahindra and Mahindra, Bajaj Auto Ltd., Tata Motors, Sanden Vikas/Maruti Suzuki, General Motors, Hindustan Motors, Honda, Kawasaki, Hero MotoCorp, VE Commercial Vehicles Ltd., Escorts, Haier, Videocon, Kohler, and Bergstrom.



“With Altair OptiStruct™ we were able to address some of the most pressing challenges we faced in product design optimization, light weighting and material saving. We were not only able to derive impressive results of about 16-17% material savings through Altair HyperWorks suite of solutions, but were also able to achieve enhanced product quality without having to worry about design or warranty failures. DesignTech (Partner of Altair) team has been instrumental in training and supporting us which helped us use Altair HyperWorks solutions to their maximum potential thus augmenting our productivity”

Hemanshu Yadav  
Asst. Manager R&D FEA

Nipun Vashishth  
Sr. Engineer R&D FEA, Pranav Vikas (India) Pvt. Ltd.

## Resolve Warranty Failure, Save Raw Material

The ever-changing vehicle market scene forces PVL to face various challenges. The rapid pace of change and customer requirements necessitates PVL to look out for lightweight materials for components that can help them in maintaining compact product sizes. The team also needs to thoroughly test and implement every new material for product optimization. This pushes the team to innovate and come up with newer manufacturing processes and process engineering techniques. Apart from these challenges, the PVL team also needs to address warranty issues in the existing products. The PVL team faced two such distinct challenges in their recent projects:

a) Oil Cooler Simulation: one of their esteemed customers faced the challenge of oil cooler failure on the Pad-Plate joint. This was a unique issue because the oil cooler model was in operation for five years and always yielded desired results.

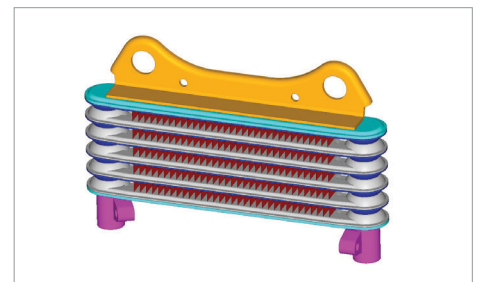
b) Pipe Bend Simulation: In another such scenario, the inlet/outlet pipes of one of PVL's heat exchanger products required design overhaul that called for weight reduction without bringing forth warranty failure issues.



3 Bend Pipe Sample



Oil Cooler

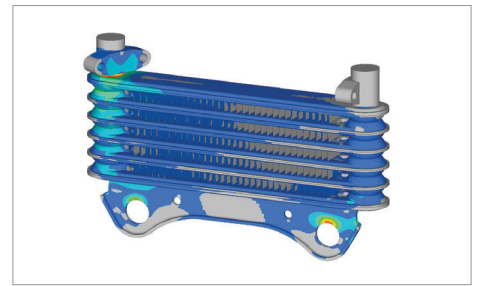


Oil Cooler FE Model

## Using Altair HyperWorks for Assembly Load Simulation

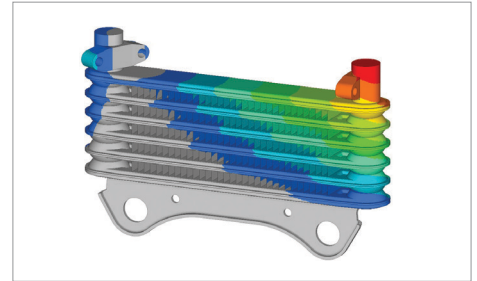
The PVL team's culture of innovation and spirit of facing challenges helped them in choosing Altair HyperWorks as a credible partner in fulfilling all their design and simulation requirements.

a) Oil Cooler Simulation: In the first case, the team impeccably simulated the oil cooler in Altair HyperWorks for Road Load and Engine Vibration Load conditions. Under both conditions, the team found the oil cooler functions on expected lines. The team then probed about the oil cooler assembly process with the customer and simulated the Assembly Load in Altair HyperWorks. This round of simulation revealed that the customer's assembly process required removal of one fixture. The fixture in question was responsible for pre-stressing the oil cooler during its assembly on the vehicles. Using Altair HyperWorks, the team could precisely conclude that the fixture was the root cause of the Pad-Plate joint failure.



Oil Cooler Stress Plot

b) Pipe Bend Simulation: In the second case, the team tried simulating the heat exchanger inlet/outlet pipes by using Altair HyperMesh™ and Altair OptiStruct and reduced the product weight by a significant margin. But, the team was still concerned about warranty failures. This was because the inlet/outlet pipes have several bends and during the bending process, the bends tend to experience thinning and thickening. The team felt that this undesirable thinning and thickening could lead to warranty failures in the future. To get rid of this issue, the team tried Altair HyperForm™ for bending of the Inlet/outlet pipes and measured the thinning and thickening percentages. The PVL team then did the required structural analysis on the pipes. The process yielded positive results and led the team to lighter inlet/outlet pipes laying aside the concerns of warranty failures.



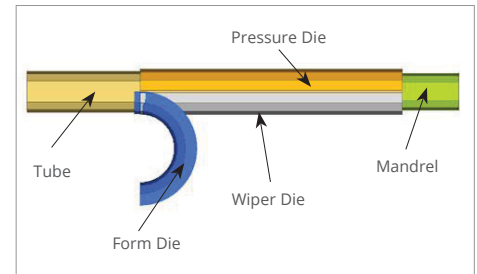
Oil Cooler Displacement Plot

## Resolved Warranty Issue, Saved Input Cost

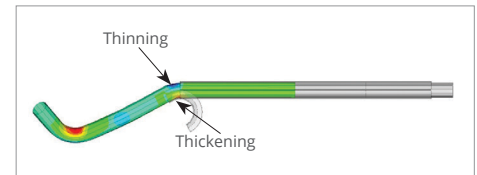
The PVL team is always ready to face challenges because they believe such issues provide them with great opportunities to better the quality of their products. In both the cases, the team ended up with great results.

a) Oil Cooler Simulation: In the first case, the team used Altair HyperWorks to solve a warranty failure issue and cemented the customer's faith in them.

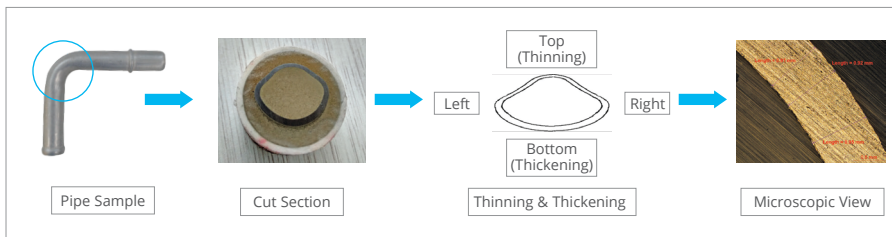
b) Pipe Bend Simulation: In the second case, the team again used Altair HyperWorks and devised a new way of saving raw material to the tune of 16 to 17%. PVL has a wide range of product portfolio for each type of heat exchanger and the required simulation software's adaptability to minor changes is of utmost importance. As Altair HyperWorks fulfills this requirement, the PVL team now uses Altair HyperWorks for all their product lines as it helps them in reducing their prototyping time and cost. Also, with Altair HyperWorks, the team is able to minimize warranty failure instances as they now provide optimized designs to all their customers.



HyperForm Model

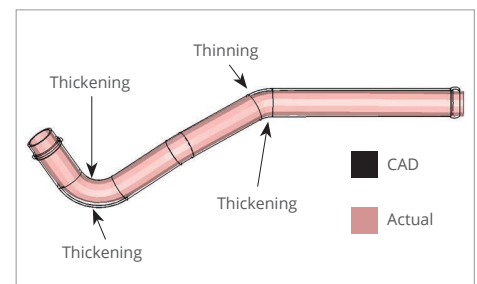


Simulation Output Plot Showing Thinning and Thickening



Testing Work Flow

Prototype vs CAE Result Comparison						
Bend No.	Prototype Study Results		CAE Results		% Error	
	Top (Thinning)	Bottom (Thickening)	Top (Thinning)	Bottom (Thickening)	Top (Thinning)	Bottom (Thickening)
Bend1	0.905	1.605	0.983	1.551	Error is within 10%	
Bend2	1.175	1.46	1.082	1.368		
Bend3	0.915	1.61	0.916	1.489		



Sample v/s Simulation Comparison

Model	Nominal Wall Thickness (mm)	Reduced Wall Thickness (mm)	% Raw Material Saving
Typical Inlet - Outlet Pipe	1.2	1	16.67%
Typical AC Line Pipe	1.75	1.4	17%

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