CUSTOMER STORY

DESIGNING A CARBON ABSORBER

SUNLUX UTILIZES ADVANCED SIMULATION FOR INDUSTRIAL AND ENVIRONMENTAL INNOVATION

> Altair simulation technology enabled us to launch our products faster and more efficiently.
>
> Ram Kerur
> chief executive officer and director, Sunlux

About the Customer

Sunlux Technovations, based in Bengaluru, India, specializes in solutions for industrial automation, aerospace, and defense. At the forefront of innovation, Sunlux designs smart sensors and controllers that deliver exceptional performance. Their mission is to create intelligent solutions to foster industrial automation, no matter the industry or application, and their products excel in sensing, control, and integration – ensuring reliability and efficiency, even in the harshest industry environments.

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Their Challenge

Sunlux wanted to design a carbon absorber: a device or material used to capture carbon dioxide (CO_2) from the air and industrial emissions and store it for later use.

When designing their carbon absorber, one of Sunlux's most significant challenges was understanding airflow and thermal distribution across the absorber's operational modes. The system comprises over 300 components, including heat exchangers, three-way valves, fins, fan blades, heaters, absorbers, and more. As such, developing a finite element (FE) model for the entire system, capturing all its features, and analyzing transient conditions proved to be complex and computationally intensive.

To solve their design challenges, Sunlux used an array of tools within the Altair® HyperWorks® design and simulation platform, spanning computational fluid dynamics (CFD), thermal, and structural analysis tools.

Our Solution

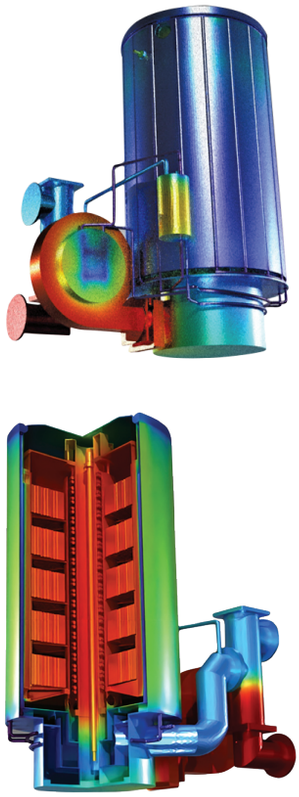
The carbon absorber unit operates in three distinct modes during each cycle: absorption, regeneration, and cooling; a full cycle lasts five hours. The primary objective of Sunlux's simulation was to analyze these modes and evaluate the system's thermal and flow characteristics.

The simulation process encompassed geometry preparation, surface meshing, volume meshing, and setting up the flow physics using Altair® HyperMesh® CFD. The team also used Altair® AcuSolve® to investigate thermal distribution under both steady-state and transient conditions. To minimize simulation time, the team also utilized high-performance computing (HPC) to maximize each solver's parallelization capabilities. Overall, this allowed Sunlux to thoroughly analyze thermal and flow behavior at various locations inside the absorber. The analysis included velocity contours and vectors, pressure contours, and temperature distribution across air and chilled water volumes.

Results

Altair HyperWorks proved to be comprehensive and accurate, boasting an accuracy of over 90% compared to test data. This approach also minimized the need for physical prototypes and ensured a "first-time-right" design. Thanks to Altair technology, Sunlux developed a robust design early in the process, minimizing design iterations and significantly reducing time to market.

To learn more, please visit **altair-hyperworks**.



TOP: Temperature contour for absorption mode configuration.
BOTTOM: Temperature distribution inside the absorber column.

"We partnered with Messen Labs, a leading engineering solutions provider, and leveraged Altair's cutting-edge design, simulation, and data analytics software. This collaboration has significantly improved the product development efficiency, enabling us to simulate complex product physics and drive innovation in our offerings.

Ram Kerur
chief executive officer and director, Sunlux

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To learn more about Altair's software partnership with Messen Labs, please visit us at: **messenlabs.com**