Ansys

CASE STUDY /

Ansys + CSIR – Central Mechanical Engineering Research Institute

"Ansys AIM helped us to analyze the effects of wind speed on a solar artifact in a very short time, leading our conceptual design to reality in a few months."

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CASE STUDY

With India's large and growing population, the challenge of generating enough power to supply the people's needs is great. Increasing the number of renewable energy sources can solve this problem. Aesthetically pleasing designs of solar cells (called "solar artifacts") in the form of umbrellas (Attapatram) or trees (Surya Banaspati) can be placed in commercial or public spaces while maintaining the space underneath for productive or recreational uses.

Fluid-Structure Interaction Simulations Prove Ability of Solar Artifacts to Withstand Wind Gusts

/ Challenges

The solar artifacts developed by researchers at CSIR-CMERI had to fit into the available space and be able to withstand a range of wind speeds depending on the location (beaches, parks, river banks, roadsides, lawns of bungalows, etc.). The researchers needed to ensure that their artifacts would be strong enough to resist damage over a range of wind speeds without sacrificing their aesthetic design.

/ Technology Used

- Ansys AIM

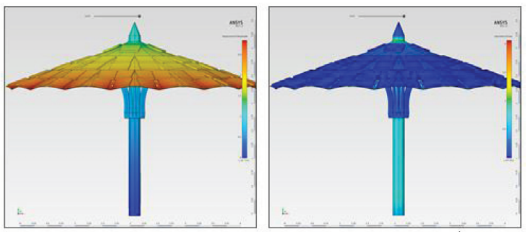
/ Engineering Solution

CSIR-CMERI researchers chose Ansys solutions to run fluid-structure interaction (FSI) simulations to determine the effects of wind gusts on their solar artifacts. They used Ansys SpaceClaim and Ansys AIM for pre-processing, meshing, solving and post-processing in a single-window environment. With these tools, they:

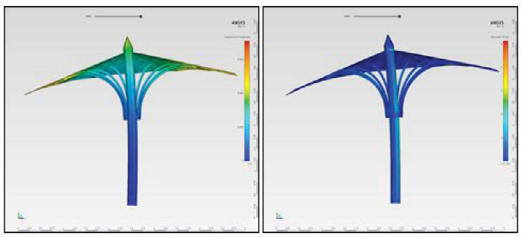
- Set up a complete FSI workflow in AIM for steady-state turbulent wind flow conditions, with total force mapping on solar panel structures for stress and displacement studies.
- Simulated a solar artifact model under different structural load and wind flow conditions (80, 100 and 120 km/hr). The simulation results showed that the umbrella design can withstand all these wind conditions.

/ Benefits

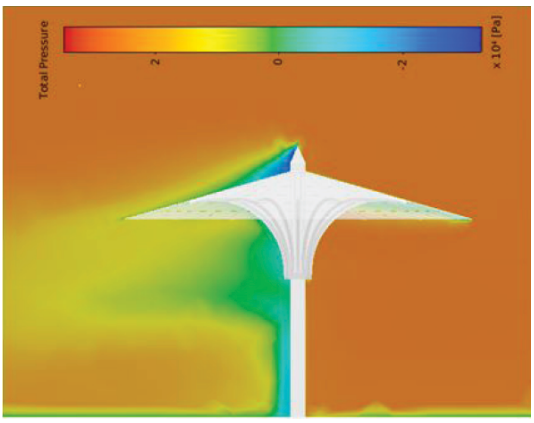
- Ansys AIM software provided a new immersive simulation environment that lowers the barrier to entry for engineering simulation analysis of solar artifacts.
- AIM's single platform, combined with its guided and customizable simulation processes, made multiphysics FSI simulation accessible to the entire engineering organization.
- AIM's ease of use and quick turnaround time enabled rapid completion of the FSI project.
- CSIR-CMERI was able to offer this technology for licensing based on the simulation results.



Displacement plot at static condition, and stress plot at static condition.



Displacement and stress plots after applying wind Speed at 80km/hr.



/ Company Description

CSIR-Central Mechanical Engineering Research Institute (CSIR-CMERI), established in 1958, is the apex R&D institute for mechanical engineering under the aegis of the Council of Scientific and Industrial Research (CSIR), which is an Autonomous Body under the Department of Science & Technology, Government of India. The Institute has been engaged in R&D for more than 59 years with the mandate of serving the nation to acquire self-reliance, strategic sectors and societal applications. Major research areas are Robotics and mechatronics, micro-system technology, rapid prototyping and modeling, advanced mechanical design, simulation and modeling, and advanced manufacturing technology and its allied areas.

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