L&T Construction – Verifying Designs, Evaluating Thermal Comfort and Life Safety with Autodesk Simulation CFD

L&T Construction, the construction arm of L&T, is India’s largest construction organization and ranked among the world’s top 30 contractors, has been over the past seven decades transforming cityscapes and landscapes with structures of immense size and grandeur. The company’s capabilities span the entire gamut of construction - civil, mechanical, electrical and instrumentation engineering - and its services extend to all core sector industries and infrastructure projects.

"Construction has come a long way! From drawing boards to 2D, 3D to now Simulation. Gone are the days when engineers used to spend hours on drawing boards to detail out a construction project. With advancements in technology and use of software, precise calculations, design and Simulation are now possible in very quick time. Use of software tools has given designers the flexibility to evaluate and identify options quickly with minimal effort."

— Dr. M. Munirajulu, Chief Engineering Manager, HVAC – CFD, EDRC, Commercial Buildings & Airports, L&T Construction

Challenges:

The construction industry has been re-energized with the introduction of several new technologies that have in turn triggered several innovations in the field of construction. Modern construction methods are therefore significantly different from the old ones. There have been several enhancements in methodologies one of which is the emphasis on designing buildings virtually before actually constructing them. These new techniques have paved the way for the development of strong, robust and long lasting infrastructure.
Autodesk Simulation CFD analysis provides a very accurate approximation of smoke development and movement that has helped L&T Construction to resolve a number of issues.

“When you are working on large projects there’s simply no room or time for error, if you want to change the future and dominate the marketplace, you need to replace traditional design tools with something that is different, predictive and represent the real world. Simulation tools like Autodesk Simulation CFD enable and set the pace for engineering innovations,” explains Dr. M. Munirajulu

An ever-increasing number of projects are seeking to reduce energy demand and consumption in buildings. As such, more modern and progressive HVAC systems are being applied, particularly to commercial buildings. L&T Construction uses design validation tools to validate concepts, optimize details, troubleshoot at existing sites and recommend to clients to meet industry standards of ventilation, thermal comfort and safe design while providing the expected energy savings. Initially, simulation work used to be outsourced to consultants that had its own share of challenges: limited control over design, confidentiality issues, and lack of proper communication that resulted in delay in projects. Other challenges included verification of designs, evaluation of thermal comfort and safety right from the concept stage and quickly study design options to understand where and how trade-offs could be made as needed.

**Solution:**

L&T Construction offers in-project cost savings through optimization of building design that allows for smaller HVAC equipment sizes, better control to evaluate the energy performance of buildings and elimination of unnecessary components. Further, the reduced cost, and design verification afforded by clients, results in reduced change orders, greater owner/client satisfaction, and lesser potential for damages that could arise from any litigation.

Recently, L&T Construction used Autodesk Simulation CFD to predict the fire dynamics in a shopping mall in Navi Mumbai. Important aspects of fire dynamics such as smoke propagation and temperature distribution were investigated. The study has contributed to reduce the risks of fires by early prediction of expected scenarios of fires and associated smoke movement.

Autodesk Simulation CFD enabled team L&T to examine smoke movements in far greater detail than what was possible through zone models and semi-empirical programs. Additionally, it also helped to study the impact of irregular shapes and unusual air movements that could not be otherwise addressed.

The most important aspect of Autodesk Simulation CFD is the quantitative component of design that will ultimately be used to meet goal of life safety. For example, smoke exhaust systems can be designed to maintain a prescribed smoke layer height. Software programs can help determine the volume of smoke required to be exhausted in order to meet this life-safety goal in a shopping mall.

“Based on the study, interesting conclusions were drawn and valuable recommendations introduced. A simple smoke control scheme was recommended to minimize smoke hazards. Autodesk Simulation CFD analysis provided a very accurate approximation of smoke development and movement that helped us to resolve a number of issues; from a smoke-free escape distance to developing an escape strategy for an entire shopping mall in terms of proper fire zoning,” said Dr. M. Munirajulu

**Results:**

It is possible to create a high-performance, efficient building by using the right tools and technologies available today though it will call for extra effort and time at the design stage. The accruing benefits, however, can be great spread throughout the project cycle. Just as people regularly upgrade to new phones due to advancements, there is a need to upgrade design and construction processes as well to be more efficient and smart.

Overall, the operating efficiency of HVAC systems depends as much on proper design as on installation. With Autodesk Simulation CFD, team L&T were able to provide smoke control systems designed to contain smoke in a reservoir on the roof allowing occupants to escape to clear air below. The software supported understanding the spread of smoke and heat, predicting the distribution of suppression agents. A range of different fire scenarios were analyzed to validate a smoke control strategy that was designed in accordance to international best practices.

With a strategy that emphasizes customer service, L&T Construction has measurably improved its ability to make smarter decisions and deliver better products, and thereby is well-placed and well-poised to grow globally.

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HVAC – CFD,
EDRC,
Commercial Buildings & Airports,
L&T Construction

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