



CASE STUDY /

Ansys + Liftra

“Thanks to Ansys Cloud we can solve more complex models faster than ever. Delivering on time is very important, but delivering an improved, safer, optimized design is even better. Thanks to Ansys Cloud we can achieve more complex designs and simulate more complete models up to 5 times faster.”

Miguel Hoffmann

Senior Engineer Specialist / Liftra

Liftra Designs ‘Climbing Crane’ for Wind Turbine Installation 5X faster Using Ansys Cloud and Ansys Mechanical

Liftra has revolutionized the installation of wind turbines by creating the LT1500 crane that “climbs” the wind turbine tower as it is being assembled instead of sitting beside it. The bottom of the crane grabs onto a flange of one tower section and lifts the next section into place. Then, a “hoist block” travels up and attaches to the higher section and pulls the crane up the tower to attach to the higher flange. In a sequence of such grabbing and hoisting moves, an entire wind turbine, including the tower, nacelle, rotor, and blades, can be constructed.

With 50 engineers working primarily in Spain and Denmark, Liftra is developing this crane for wind turbine OEMs and also for end users of wind turbines to maintain wind farms.

/ Challenges

Traditional cranes are large and expensive, requiring a fleet of trucks to move the crane to the site and between installation areas on a wind farm. In designing a smaller “climbing” crane that would take up less ground space and require just one truck to move to the next installation site, Liftra engineers needed to be able to ensure that the tower elements would not be crushed by the applied climbing forces, including the load on the tower and flanges, and the gripping forces.

/ Ansys Solutions Used

- Ansys Cloud
- Ansys Mechanical

/ Engineering Solution

Liftra engineers ran finite element structural simulations both in Ansys Cloud and on their own workstations to perform static simulations of the loads involved when a crane is attached to and climbs up the long tower of a wind turbine as it is being assembled. They ran both linear material models and nonlinear material models for elastic/plastic analysis of the towers to determine whether the crane would cause any permanent deformation to the tower, and, if so, how much.

The linear material model was run in Ansys Cloud on an HC Virtual Machine of Microsoft Azure featuring 44 Intel Xeon Platinum 8168 processor cores. This model includes 1.8 million nodes with many nonlinear contacts (more than 100 frictional contacts). Using Ansys Cloud, the simulation was completed in 1 hour versus 5 hours on company workstations – a speed-up of 5X.

/ Benefits

- Finite element simulations confirmed that the LT1500 crane climbing the tower would not cause any deformation of the wind turbine tower.
- Being able to set up these large models to run as a single simulation on Ansys Cloud made for a better and safer design. Instead of splitting the analysis up into multiple simulations and calculating the interface forces, Liftra engineers were able to do everything in the same simulation.
- The best simulation setup was a combination of Ansys Cloud, Ansys Elastic Licensing and Liftra’s own licenses. With design offices in Spain and in Denmark, it’s very useful to be able to borrow licenses and avoid waiting until someone finishes a simulation before starting something new.

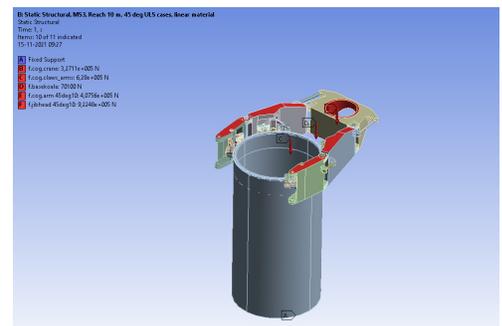


Figure 1. Example of design where Liftra use simulation for validation.

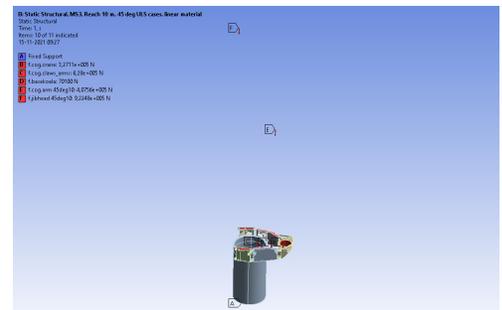


Figure 2. Design validated thanks to Simulation on Ansys Mechanical.

“Previously we were forced to do more simplification and isolate parts to perform calculations on each separate part; now we can simulate the global assembly.”

Miguel Hoffmann
Senior Engineer Specialist / Liftra

- A cost analysis revealed many barriers to Liftra maintaining its own on-premises cluster. These included maintenance costs, paying employees to manage the cluster, and the need for extra licenses. Using Ansys Cloud is less expensive while delivering higher computing power; they can run many parallel jobs with almost unlimited power.

/ Company Description

Liftra is recognized by the international wind turbine industry as a professional specialist in lifting and transportation solutions. We guarantee excellent engineering services in this field, and all projects developed in cooperation with Liftra take into account the practical context for their application.

Starting out in 2003, Liftra has undergone rapid growth as a contributor and trusted partner in the wind turbine industry. Today, we have locations in Denmark, the USA, Spain, China and Poland.

<p>Installation</p> <p>▪ When tower section are in the correct position, it is lowered down and connected to the pre-installed tower sections.</p> 	<p>Turbine completed</p> 
<p>Climbing to next position</p> <p>▪ Lift the Hoist Block to the Outside flange of the top section.</p> 	<p>Relocation of the crane</p> <p>▪ Crane is ready to relocate</p> 

Figure 3. Pictures showing the final product that Liftra commercialized for wind turbine customers.

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