COMPANY
TimberTower GmbH
timbertower.de/en

LOCATION
Hanover, Germany

SOFTWARE
Autodesk® Inventor®

Touch wood

TimberTower GmbH is revolutionizing the industry of wind turbines by designing and building them from laminated wood

We used Autodesk® Inventor® to remake the design as a 3D model. In the process we were able to make some improvements that we only realized were possible after putting the Autodesk software to practice.

—**Carlo Schröder**
Engineer TimberTower

Tower scaffold - Image courtesy of TimberTower.

Wind power is one of the cleanest forms of energy available. When looking at the German landscape, turbines are becoming a common sight – from isolated wind turbines to large-scale wind farms – but in order to increase yields, larger turbines with taller towers are needed. This, however, brings with it a certain set of problems. Wind turbines with conventional steel towers cease to be financially viable at hub heights greater than 85 meters, largely due to the rising price of steel. In addition, logistical limitations, such as the fact that prefabricated steel towers have to be transported by road as abnormal loads, have an impact on development too. If vehicles carrying the towers have to be able to pass under bridges, the diameter of the base – which determines the maximum height – is restricted to 4.2 meters. In Germany, thanks to excellent transport infrastructure, this problem can be avoided, but in North America, the type of load required would cost roughly ten times as much to transport. There is one company out there, though, that has developed an alternative to steel: Hanover-based TimberTower. Instead of steel, they use wood.

Proven material with numerous advantages

Wood has always been a key building material, and has been used in the construction of wind turbines for many years.

However, in the first half of the 20th century, it was gradually replaced by steel and now hardly features at all. But what is the reason for this? One person who asked himself the same question, was Holger Giebel, co-founder and director of TimberTower. Giebel used to work

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for an engineering firm specializing in static problems on wind turbines and, along with a colleague, realized that it would eventually be necessary to find an alternative material to steel. After considering the problem, they arrived at the idea of using wood as the primary material. And with that, the TimberTower concept was born.

The TimberTower concept is an economical and innovative alternative to existing steel designs, which allows for an increase in the size of the base of the tower to achieve much higher, yet still viable, hub heights. The maximum height at present is 200 meters. Furthermore, timber is not susceptible to corrosion in the way that steel is, plus it can also be used offshore. What also plays a huge role is the affordability of timber and the fact that it is an eco-friendly, carbon- neutral material. "Using a timber alternative for a 100 meter tower saves around 300 tons of steel sheets, which requires an enormous amount of energy to produce. Another problem with steel production is the amount of CO_2 it produces. A single TimberTower saves around 400 tons of CO_2, thereby protecting the environment and our resources," says Giebel.

From idea to reality

The product engineers initially used freeware CAD software to investigate whether a wood-based tower could be built. As the project took shape, they began to realize that they were working on a cutting edge innovation. That was when they started looking for a 3D design package that was widely used within the industry and had all the functionality they required. "The ability to exchange files was the most important aspect for us as we anticipated working with a lot of other companies and partners. We also happen to be in a very competitive market, so it's extremely important to be able to put new ideas 'on paper' as quickly and as efficiently as possible," says Carlo Schröder, a TimberTower engineer. The company already knew about Autodesk products and through their local Autodesk reseller, B&L CAD Systemhaus GmbH in Hanover, they became aware of the Autodesk Clean Tech Partner Program.

TimberTower nearing completion - Image courtesy of TimberTower.

Intelligent design

The Clean Tech Partner Program provided TimberTower with a range of software products, including Autodesk® Inventor®, which fulfilled all of the company's CAD requirements and proved extremely useful in practice. "We used Inventor to remake the design as a 3D model. In the process we were able to make some improvements that we only realized were possible after putting the Autodesk software to practice," says Schröder. The TimberTower itself is produced as a multi-part kit consisting of cross-laminated timber panels and surface components. These are assembled on-site to form a closed, hollow structure with hexagonal, octagonal or dodecagonal cross sections. The cross-laminated panels are created by stacking sheets of spruce together at right angles, and gluing them under pressure. When selecting timber suppliers, the company insists on the PEFC certification to ensure that all of the timber has been produced in accordance with the highest environmental, economic and social standards. The entire TimberTower kit is transported using standard container vehicles: for a 100 meter TimberTower, approximately 10 container vehicles are required. Assembly takes no more than 48 hours to complete.

The first stage in the assembly process consists of erecting the central scaffold directly on the foundation and installing a range of components, including lights, ladder system, electrical connections and work platforms. The wooden panels are then installed around the scaffold and will ultimately carry the full weight of the turbine. Once the tower is complete, the horizontal and vertical joints between the panels are secured inside the tower. The finished TimberTower meets all statutory requirements and is DIN (German Institute for Standardization) approved, i.e. it is a fully fledged alternative to conventional steel towers. "Our TimberTower is inexpensive to maintain due to its secure construction, which means that there are no bolts or other fixtures that have to be tightened or replaced. "It is also as much as 20% lighter and also more affordable than equivalent tower designs," says Holger Giebel.

> The TimberTower is fully sustainable, almost entirely natural; it is carbon neutral and can easily be recycled at the end of its service life. It can therefore make an important contribution to the reduction in greenhouse gases. Without the support of companies such as Autodesk, it would be extremely difficult to achieve what we have in mind.
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> **—Holger Giebel**
> Managing Director TimberTower

Fair wind blowing

TimberTower is currently building the first tower with 100m hub height and a 1.5MW wind turbine in Hanover. For 2012 further projects with other hub heights and different types of turbines are planned. "We can adapt our towers to the specific characteristics of the respective turbine unit. With Autodesk Inventor, we can make the necessary modifications quickly and easily," says Carlo Schröder. The TimberTower combines a range of benefits that suggest fair winds ahead for the company. "Wind power is one of the cleanest forms of energy there is. By using a TimberTower, wind turbine operators can take the final step and create a truly eco-friendly system. The TimberTower is fully sustainable, almost entirely natural, it is carbon neutral and can easily be recycled at the end of its service life. It can therefore make an important contribution to the reduction in greenhouse gases. Without the support of companies such as Autodesk, it would be extremely difficult to achieve what we have in mind. I am extremely grateful for this opportunity and hope that we can repay the confidence of our investors with success... touch wood!"

For more information

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