

TimberTower GmbH

Customer Success Story

Autodesk Clean Tech
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—Carlo Schröder
Engineer
TimberTower

The Autodesk Clean Tech Partner Program supports early-stage clean technology companies with design and engineering software they can use to accelerate their development of solutions to the world's most pressing environmental challenges. For more information visit [autodesk.com/cleantech](https://www.autodesk.com/cleantech).

Touch wood.

TimberTower GmbH designs and builds wind turbine towers made from laminated wood and is revolutionising the industry in the process. The company is supported by the Autodesk Clean Tech Partner Programme.



Pilot tower 1: Tower scaffold.

Wind power is one of the cleanest forms of energy available. In Germany, turbines are becoming a common sight in the landscape – from isolated wind turbines to large-scale wind farms – but in order to increase yields, larger turbines with taller towers are needed, and this brings its own set of problems. Wind turbines with conventional steel towers cease to be financially viable at hub heights greater than 85 metres, largely owing 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, impact on development. If vehicles carrying the towers are to be able pass under bridges, the diameter of the base – which determines the maximum height – is restricted to 4.2 metres. 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, which makes towers out of wood.

Proven material with numerous advantages

Wood has always been a key building material and for many years was widely used in wind turbine construction. However, in the first half of the 20th century, it was gradually replaced by steel and now hardly figures at all. Why is that the case? One person who asked himself this was Holger Giebel, co-founder and director of TimberTower. Giebel used to work for an engineering firm specialising in static problems on wind turbines and, along with a colleague, realised that eventually it would 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 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 metres. Furthermore, timber is not susceptible to corrosion in the way that steel is,

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plus it can also be used offshore. Added to that is the affordability of timber and the fact that it is an eco-friendly, carbon-neutral material. "Using a timber alternative for a 100-metre tower saves around 300 tonnes of sheet steel, which requires an enormous amount of energy to produce. Another problem with steel production is the amount of CO₂ it produces. A single TimberTower captures around 400 tonnes of CO₂, 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 realise that they were working on a breakthrough 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, became aware of the Autodesk Clean Tech Partner Programme.

This initiative provides Autodesk software licences to clean technology companies as a way of helping them to develop their concepts and bring their products to market faster and at lower cost. Companies that qualify for the Clean Tech Partner Programme receive software worth up to €120,000. "Environmental protection is very important to Autodesk, which is why we created this programme to help start-up companies bring their ideas to life and in the process protect

our environment," says Erwin Burth, Head of Clean Tech Business Development at Autodesk. TimberTower were extremely interested in the programme and took the opportunity to apply. "I think the Autodesk Clean Tech Partner Programme is something unique and very positive indeed. It has enabled us to use powerful, industry-standard software which, as a small start-up company, we could not otherwise have afforded. Autodesk are actively helping us to make this idea a success," says Holger Giebel.

Intelligent design

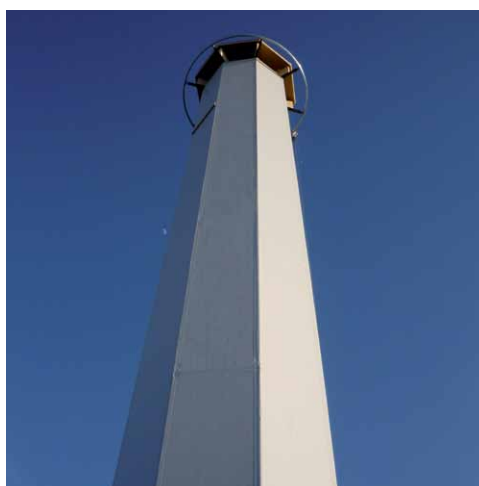
The Clean Tech Partner Programme provided TimberTower with a range of software products, including Autodesk Inventor, which fulfilled all of the company's CAD requirements and proved extremely useful in practice. "We used Inventor to remake the design as a 3D model. In the process, we were able to make some useful improvements that we only realised were possible as a result of having the functionality the software offers," 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 formed by stacking sheets of spruce at right angles to each other and gluing them under pressure. When selecting timber suppliers, the company insists on 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-metre TimberTower, approximately 10 container vehicles are required. Assembly takes no more than 48 hours to complete.

The first stage in the assembly process is to erect the central scaffold directly on the foundation and

install a range of components, including lights, ladder system, electrical connections and work platforms. The wood 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 bonded inside the tower. The finished TimberTower meets all statutory requirements and is DIN (Deutsches Institut für Normung) approved, i.e. it is a fully fledged alternative to conventional steel towers. "Our TimberTower is inexpensive to maintain due to its bonded construction, which means that there are no bolts or other fixings 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.

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 turbines types 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 Timber Tower 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!"



Pilot tower 3: TimberTower nearing completion.

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—Holger Giebel
Managing Director
TimberTower