QUIET AND EFFICIENT

ENERCON’s new specialists for inland sites

TRIAL RUNS OF EP4 MACHINE  ENERCON commissions generator testing facility
CHARGING POLES INSTALLED  Innovation centre equipped with fuelling stations for e-cars
LONG-DISTANCE TRANSPORTATION  19,600 km to the first ENERCON wind farm in Bolivia
Dear clients, business partners and employees,

for more than thirty years, ENERCON has been a leader in the field of wind energy technology. Our company is recognised as an innovative pioneer, and enjoys an outstanding reputation for its technical expertise. We owe this to the culture of innovation which characterises our company, to our consistent focus on research and development, and to our steady programme of investment, which is directed towards increasing our innovative capacity even further. We are constantly working to improve our existing products and to develop new ones – always with a weather eye on the needs of our clients, and on market conditions and trends. As a result, we are constantly raising the bar in the wind energy sector.

This is also true of the two latest products we have developed for low-wind sites, which will complement ENERCON’s product range from 2017 and which we are announcing in this edition: the E-141 EP4/4.2 MW and the E-103 EP2/2.35 MW. Both of these impressive turbines for Wind Class IIIA are highly efficient and feature low noise emissions. With its 141 m diameter, the rotor blade of the E-141 is the longest to be found working onshore to date. At the same time, it is the low-wind converter with the highest available yield, generating more than 13,000 MWh of energy per annum, even at relatively low-wind sites. The E-103 EP2 will achieve an annual yield about ten percent higher than that of the E-92.

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We hope you will enjoy reading more!

Nicole Fritsch-Nehring
Managing Director, ENERCON
Wind energy converters in Germany have beaten their previous record for the amount of electricity they produce. According to figures from the German Association of Energy and Water Industries (BDEW), a total of 59 billion kilowatt hours of electricity was generated by wind power up to the end of September 2015. That is almost 2 billion kilowatt hours more than in the entire previous year, when 57.4 billion kilowatt hours were generated by 31 December.

The BDEW attributes this rise to the steady increase in the number of wind energy converters being built. The new record high was also due in part to the above-average wind levels in 2015. The Association believes that the increasing amount of electricity generated by wind power and the growing number of converters is making an “important contribution” towards achieving the goals of the energy turnaround.

Photo: Construction of an ENERCON E-82 wind energy converter.
foundry centre in East Frisia commissions new casting crane

ENERCON’s in-house foundry in East Frisia (the GZO) has begun operating a new casting crane. The double girder bridge crane can lift up to 70 t of molten material, which makes it considerably more efficient than the crane it replaced, whose maximum load capacity for casting was a mere 40 t.

The installation of the new, higher performance crane technology had become a matter of necessity, because from the spring of 2016, the GZO will also be casting components for larger series of ENERCON wind energy converters. These are heavier than the components used to be cast for the E-82, E-92 and E-101 series at the GZO. The new technology supplied by Konwcranes is also more fail-safe. For instance, all of the drive components are duplicated, which means that the crane can still continue to operate securely even if a fault occurs, and casting processes which have already commenced can be completed.

Another safety feature is that all of the control electrics for the crane are housed in an air-conditioned excess-pressure container under practically clean room conditions. This protects the sensitive electrical systems from heat and dust. The crane also has a special sway damping system to prevent molten material from spilling out of the moving ladle during casting.

The old casting crane has by no means been discarded: in future, it is to be used in the cooling area at the GZO as a logistics crane.

Assembly of the new casting crane at the GZO in Georgsheil, East Frisia.

e.g.o.o. handles freight for ENERCON construction sites

ENERCON Bahn e.g.o.o. mbH will in future be handling more materials to supply ENERCON wind farm sites. Over the last few weeks, the first block trains have been transporting components for wind energy converters from the e.g.o.o. hub in Emden, East Frisia, to the port of Brunsbüttel in Schleswig-Holstein. The parts destined for wind farm sites in the region are stored there temporarily before being taken the last part of the way to the construction sites by HGV.

“We expect that transporting material by train for some of the way will be very beneficial in terms of our project logistics”, says Thijs Schless, Head of Procurement Logistics at ENERCON Logistic GmbH. “By switching to rail, we will be less affected by road conditions and will be able to ensure the demand-driven supply of our construction sites at optimum effect. We will also be reducing our environmental footprint – which is absolutely in the spirit of our guiding principle of green logistics.”

This means that in future, e.g.o.o. will be integrated more closely in the project logistics of ENERCON, as well as transporting goods to construction sites in other regions. Additional block trains are already at the planning stage; these will head to temporary storage depots for construction materials in central and southern Germany. The first block trains heading for Brunsbüttel included among their loads generator and rotor blade components as well as complete rotor blades for ENERCON wind energy converters. The 18-wagon trains with lengths of 430 m were assembled at the e.g.o.o. hub in Emden.

Abseiling practice at the inauguration ceremony: ENERCON Managing Director Hans-Dieter Kettwig (f. r.), Thuringia’s Prime Minister Bodo Ramelow, and other guests watch a demonstration by service staff.

Gotha

official opening of Gotha training centre

ENERCON officially opened its new ENERCON Training Centre (ETC) in Gotha at the end of October in the presence of Thuringia’s Prime Minister Bodo Ramelow [Die Link]. Mr. Ramelow welcomed ENERCON’s decision to build the ETC in Gotha three and a half years ago. “We are delighted to have you here”, said the Prime Minister. Gotha’s Mayor Knut Krueck also praised the successful choice of location and the creation of new jobs: “We were convinced that it would take a while for things to change at the site in the north of the town. But then this company from East Frisia came along and told us they had some expertise in the wind sector, and that they had the energy for many more, very high-quality projects. So we welcomed them in.”

Here, employees of wind energy converter service companies attend classes in health & safety, First Aid and wind turbine technology, among other things. The roughly 1,800 m² training centre is designed for a capacity of 278 trainees per day. It comprises ten classrooms and conference rooms, as well as offices and a fully-equipped canteen catering for about 100 people. It compliments the existing training halls where advanced practical training is already being provided.

Children’s Day at ENERCON Training Centre, Gotha

The ENERCON Training Centre (ETC) in Gotha invited several of the town’s nurseries to a children’s day at the beginning of September. The children and staff had an opportunity to look around the Thuringian service site, and to learn about the topic of wind energy from ETC employees. From the perspective of the ETC, the event was an unqualified success.

Highlights included a look inside an original E-40 machine house, a demonstration of abseiling in the training hall by service engineers, and trips on a fork-lift truck, with an opportunity for children to acquire an “ENERCON fork-lift truck certificate”.

There was also a bouncy castle, an arts and crafts corner where they could make miniature windmills, and face-painting, followed by a restorative lunch. As a result of the unanimously positive feedback, the event is to be repeated next year.
The design of the tendering model for renewable energies proposed by the federal government was the main topic of conversation during a visit to ENERCON in Magdeburg this October by Federal Minister of Economic Affairs Sigmar Gabriel (SPD). ENERCON Managing Director Hans-Dieter Kettwig explained the industry’s concerns that there would be a negative impact on the wind energy sector and on the energy turnaround if the plans proposed by the Economic Ministry were implemented in their current form. Kettwig called for improvements to ensure that the plurality of stakeholders was maintained once tendering was introduced.

Kettwig stressed that it must remain possible for small and medium-sized operators, such as community-owned energy companies, energy cooperatives and public utilities, to participate in the decentralised expansion of onshore wind energy. ENERCON believed that the proposals for a tendering design published by the Economic Ministry were unlikely to secure a guarantee of public support: something which will be essential if the energy turnaround is to prove a success. “We believe that the energy turnaround requires a high level of public acceptance. It will only succeed if as many people as possible can be stakeholders in the process,” added Kettwig.

But under the new conditions being proposed, it would be almost impossible for local residents and the general public at a regional level to participate in wind energy projects. The financial risks alone would drive out of the renewables market. “We must prevent that from happening. The energy turnaround must not become the playground of corporations and major investors,” he stressed.

ENERCON believes that the design of the tendering process needs to incorporate reasonable exemptions for small projects – such as the de minimis rule proposed by the industry – so that small and medium-sized stakeholders can continue to implement renewable energy projects in the future. The federal government plans to present an initial draft bill for a Renewable Energy Act based on a tendering process by the end of the year, and a legislative proposal in the spring of 2016, following a hearing of relevant associations.

ENERCON Managing Director and Chairman of the Board of the Aloys Webben Foundation Hans-Dieter Kettwig (2nd from left), Federal Economics Minister Sigmar Gabriel, Volker Ziem, Manager of Rothenseer Rotorblattverarbeitung GmbH, and Simon Webben, Managing Director of ENERCON Production GmbH and Member of the Board of the Aloys Webben Foundation, on a tour of the plant at Magdeburg Rothensee.

ENERCON is pleased with the outcome of HUSUM Wind 2015. The traditional industry event had a new focus this year when it was held in mid-September in the small coastal town in Schleswig-Holstein. “Our stand was always well attended, and great interest was shown in our new product: the ENERCON E-126 EP4,” according to ENERCON Sales Director Stefan Lütkemeyer.

ENERCON presented its new 4 MW platform at HUSUM with the help of a 3D model, which attracted plenty of attention from visitors to the main stand. Meanwhile, recruiters from ENERCON were kept very busy at the career stand in the NordseeCongressCentrum, where the Windcareer jobs fair was held on the final day. “The fair is definitely worth attending. What you notice about Husum is the very specialised audience,” reports ENERCON’s personnel officer Florian Rathkamp.

According to the organisers, more than 20,000 trade visitors attended the fair in Husum between 15 and 19 September, together with some 200 journalists. A total of 451 exhibitors from 25 countries showcased their new products and their services. As agreed with the organisers of WindEnergy Hamburg, the fair in Husum focuses on the core market of Germany, while the leading international fair in Hamburg devotes itself to the global wind energy market. The next WindEnergy fair will be held in Hamburg from 27 to 30 September 2016, while the next HUSUM Wind event is scheduled for 12 to 15 September 2017. The trade fair organisers believes that the new concept is catching on. “The industry is enthusiastic about our new concept”, says Peter Becker, Managing Director of Messe Husum & Congress. And ENERCON agrees. According to Sales Director Stefan Lütkemeyer, “Our expectations of the trade fair were met in full; so much so that we are looking forward to returning to Husum again in two years’ time.”

**Successful wind fair in Husum**

ENERCON stands at HUSUM Wind 2015.

An original rotor blade from ENERCON’s current E-101 series is now complementing the permanent exhibition at the Energy, Education and Experience Centre (EEZ) in Aurich. The outdoors exhibit provided by ENERCON presents visitors with yet another aspect of modern onshore wind energy technology to admire. It has been mounted in the grounds of the EEZ on an original rotor hub, and rises up at an angle of 30 degrees towards the building.

Visitors can already see a machine house from ENERCON’s modern E-115 series in the inner courtyard of the EEZ. Immediately adjacent to it is the machine house of a historic E-16, the first wind energy converter to be erected in Aurich by ENERCON. A concrete tower segment from a contemporary E-126 can also be seen in the grounds of the EEZ. The exhibits give visitors an idea of what it was like in the early days of wind energy in the region roughly thirty years ago, while at the same time illustrating the rapid development which the industry has undergone in the interim.

The outdoor exhibits can be seen by visitors to both the EEZ and the ENERCON visitor centre which occupies the same building. They are freely accessible, even outside normal opening hours.

The EEZ was launched in the summer of 2015 by the municipality of Aurich, and enables visitors to experience topics such as electricity generation and conversion in an interactive exhibition. Renewable energies, in particular wind power, are an important focal point of the displays. The EEZ also functions as an extra-curricular learning facility, and is used by the state as a training centre where teachers can learn new skills. In addition to its visitor centre, ENERCON has its own modern training workshops at the EEZ.

**New outdoors exhibit at the EEZ gives visitors a closer look at wind energy technology**

HUSUM

E-101 rotor blade at the EEZ.

**Windtage conference considers basic conditions**

The basics for the expansion of onshore wind energy came under scrutiny at the Windtage conference organised by ENERCON in Tübingen, Baden-Württemberg, towards the end of October. Local politicians as well as representatives of authorities, public utility companies and community-owned energy cooperatives came together with project managers and operators of wind energy projects from various regions of the federal state at the two day information and discussion event in the “Casino am Neckar”.

“From our perspective, the conference was an unqualified success”, says Joachim Keuerleber, Regional Manager for the south of Germany in ENERCON’s sales division. “We were able to demonstrate the extensive support and reliability which ENERCON can provide across the planning, approval, construction, operation and marketing of onshore wind energy projects.” There were also discussions about the framework conditions which apply to the wind sector. Those attending the conference agreed that the most serious issue they currently faced was the federal government’s intention to replace the remuneration system for renewable energies with a tendering process, which will have grave repercussions for the wind energy sector in Baden-Württemberg as elsewhere, unless the proposed reforms can be modified.

**TÜBINGEN**

**CanWea 2016**

AllEnergy UK

(Blagoevgrad/UK)

4 - 5 May 2016

www.all-energy.co.uk/

**CanWea 2016**

WindEnergy

(Hamburg/Germany)

27 - 30 September 2016

www.windenergyhamburg.com/

**CanWea 2016**

ICCI

(Istanbul/Turkey)

27 - 29 April 2016

www.icco.com/tr/en

**CanWea 2016**

AllEnergy UK

(Telford/UK)

1 - 3 November 2016

windenergyevent.ca/canwea-2016/
W
ith the increased expansion of offshore wind energy, onshore sites with lower wind strengths are attracting increasing attention. Once the traditional power stations in Germany have been decommissioned by the end of 2021, the energy industry will be reliant on onshore wind farms. It is in southern Germany that the most significant sites will have to be realised, and it is here that large economic hubs and industrial sites are located, which are easily accessible for the onshore wind energy converters. So, in order to ensure that project planners are working in a growing industry in sites with week prevailing winds.

In order for it to be financially viable to develop low-wind onshore sites, the technology of existing wind energy converters has to be adapted. Larger rotors for higher annual yields, high hub heights and low noise emission readings are required, according to Michael Strobel, Director of Technology & Innovation at WRD, ENERCON’s research and development division. Consequently, ENERCON is launching two new converters in the market which have been specifically designed for Wind Class II sites and which meet these conditions. The E-141 EP4/4.2 MW and E-103 EP2/2.35 MW. With these efficient wind turbines, ENERCON is once again setting new standards in the field of onshore wind energy technology, and responding to the changing requirements of the market.

The largest onshore rotor blade currently available, the E-141 EP4/4.2 MW is based on ENERCON’s new EP4 platform, and has a rotor diameter of 141 m. “This increase will help us to realise the largest onshore turbines on the market”, according to Joachim Stilla, Program Manager for the EP4 platform at WRD. The E-141 EP4 comes with windproof hub heights of 129 m or 159 m. At sites with relatively low wind speeds averaging 6.5 m/s, the annual yield will exceed 13 million kilowatt hours.

Program Manager for the EP4 platform at WRD, Joachim Stilla, explains: “Like the E-126 EP4 and the E-115, the rotor blade of the E-141 EP4 comes in two parts, which has much to recommend it in terms of manufacturing and logistics. It is manufactured by the classic half-shell method, on the construction site. The inner part is manufactured in an automated winding process. It is screwed to the outer part, which is manufactured by an automated winding process as well. An extensive suitability testing. These measures aim to increase the longevity of the components, because like the E-126 EP4, ENERCON expects the E-141 EP4 to continue in operation for the extended period of thirty years. The E-103 EP2 is certified to have a service life of 25 years, but expects the E-141 EP4 to continue in operation for the extended period of thirty years. The E-103 EP2/2.35 MW has a rotor diameter of 103 m. Its towers have hub heights of 98 m or 138 m. Its yields will be about 10 percent higher than those achieved by the E-92/2.35 MW when located in a comparable site.

The E-141 EP4/4.2 MW is based on ENERCON’s EP4 platform, and has rotor diameter of 141 m, its towers have hub heights of 129 m or 159 m. Its yields will be about 18 percent higher than those achieved by the E-92/2.35 MW when located in a comparable site. Static low-wind converters have rotor blade profiles from ENERCON’s former range. The main objective when designing the Wind Class II turbines with this family of profiles was not only to maximise wind and reduce structural load, but also to reduce low noise emission readings. “Because in low-wind regions, where the natural ambient noise level is lower, it is more important than ever for the converter to operate quietly if it is to be accepted”, explains Michael Strobel.

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"We have experienced very good results with the E-115 and the E-126 EP4 as a result of dividing the blade in this way," reports Michael Strobel. "That is why we decided to use it for the E-141 EP4 as well." A key feature in the so-called bayonet principle of the EP4 platforms, both the Wind Class II and the Wind Class III converters are supplied with eleven identical outer blades. At the construction site, it is merely a case of mounting outer blades of different lengths onto the flange joints. "This brings us production and cost benefits during manufacture, as many of the parts of the two converter types are identical," says Global.

Many parts are identical

A high proportion of identical parts is also used for the other components: the generator, turbine construction, cascade and E-module are almost the same as those found in the E-126 EP4. Meanwhile, ENERCON has designed a completely new tower concept for the EP4 platform. "This brings us production and cost benefits during manufacture," says Global.

"We will continue in the future to drive forward the development of technologies with a high innovation potential to cut electricity generation costs even further while at the same time increasing the efficiency of our converters." Nicole Fritsch-Nehring, Managing Director ENERCON

Like all versions of the EP4, the E-141 EP4 is equipped with FACTS 2.0 functions as standard, and consequently with grid linked technology which already complies with the technical conditions which are stuck to governing the connection and operation of customer systems to the high-voltage grid (TAB Hochspannung). "Thus the E-141 EP4 also has a LOP in the market conditions of grid characteristics," affirms Global.

Many of the new technologies to be found in the EP4 platform are also used in the E-103 EP2 converter. With a design optimised for transportation and with its lower tower options with 98 m and 103 m hub heights, the E-103 EP2 wind energy converter is extremely versatile, and predestined for new and existing target markets abroad.

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ENERCON has commissioned its new generator testing facility at the innovation centre on its Aurich site. October saw the launch of the first series of trials on a new evolutionary stage of the E-115 generator, which achieves significant improvements in terms of smoother running, greater efficiency and lower noise emissions in particular. This was followed by trials of the new E-126 EP4/4.2 MW generator. The generator of the E-126 EP4, ENERCON’s newest converter platform, is currently at the validation phase.

The generator testing facility in Hall 3 comprises two E-115 generators installed side by side, together with the actual component being tested. The E-115 generators are connected to one another to create a motor with a nominal power of 6 MW, which drives the equipment being tested via a mechanical coupling. The test stand is designed for a maximum generator diameter of 10 m and a maximum generator weight of 150 t. This makes it possible to conduct series of trials on all ENERCON ring generators up to and including the EP4 platform.

During the trials, which are integral to the validation phase at ENERCON, the generator parameters simulated and calculated by the designers are put to the test. Characteristics such as the power curve and degree of efficiency, as well as thermal and continuous load behaviour, are analysed. Particular attention is also paid to measuring electrical characteristics in the air gap between the rotor and the stator.

“The testing facility for large components at our innovation centre makes a huge contribution towards improving and speeding up the validation process in respect of the product characteristics we require, and enables us to guarantee our customers a product which is technologically mature”, explains ENERCON Managing Director Nicole Fritsch-Nehring.

ENERCON is to replace its E-115/3 MW with a higher-performance version. The rated output of the new E-115 E2 is 3.2 MW. Despite its improved performance, it is still to be designated a Wind Class IIA machine for sites with moderate winds.

Its higher rated output will, however, have an impact on yield: at favourable sites, the E-115 E2 will generate roughly three percent more kilowatt hours than the superseded version, the three megawatt E-115 E1. Installation of the prototype is scheduled for 2016.

ENERCON erected the prototype of the E-115 E1 in December 2013, and began serial production in mid-2014. This high-yield converter was the first to use ENERCON’s innovative divided blade concept. This manufacturing and transportation solution for optimum manufacturing and project logistics is also used in the new “EP4 platform” series of wind energy converters from ENERCON.
Exclusionary rule must be used to mitigate the impact of the tendering process

THE BUNDES RAT CALLS FOR GREATER USE OF THE DE MINIMIS RULE TO HELP STAKEHOLDERS AT THREAT FROM THE TENDERING PROCESS – BUT SO FAR, THE MINISTRY OF ECONOMIC AFFAIRS SEEMS RELUCTANT TO GRANT EXEMPTIONS

Although every political camp pays lip service to the energy turnaround and the crucial role to be played init by the medium-sized sector, recent developments do not appear to bear this out: the federal government has not only resolved to move over to a tendering process, which in other countries has brought the wind sector to total disarray, but on top of that, a new regulation is now being introduced to the system of Renewable Energy Act (EEG) remuneration which will put small project planners and those with insufficient capital under renewed pressure. Wind energy converters of 3 MW output and above which are commissioned from 1 January 2016 will no longer receive retrospective remuneration if the electricity price is negative for more than six hours in succession on the power exchange. Something which occurs only infrequently today will, in just a few years’ time, result in a serious loss in revenue when the further growth of the wind and solar energy sector results in an increase in the proportion of renewable energy producers supplying fluctuating levels of electricity.

A study commissioned by Bundesverband WindEnergie examined in closer detail the threats facing wind turbine operators if no amendment is made to the ruling. It found that if current trends continue and more turbines are built without a simultaneous dramatic rise in storage system capacity, the proportion of kilowatt hours for which no remuneration is paid will increase significantly every year. Suppliers entering the market from 2020 will face a potential loss of more than a fifth of their revenue over the lifetime of their plant. And what is especially damaging is that, even if storage capacity doubles in Germany and, as anticipated, there are many more flexible power consumers in the market with the ability to increase consumption in periods of strong wind, this will still not be anything like enough to resolve the problem.

The Bundesrat calls for improvements. The federal states have shown themselves to be more clear sighted than the government when it comes to the issue of the plurality of stakeholders: at its last session, the Bundesrat called for the tendering process to include a de minimis rule in its design. It is true that not all of the federal states voted for the maximum concession of six MW converters (3 MW each), but the 1 MW option which had been proposed was universally agreed to be inadequate. Even members of the Bundesrat admitted in discussions that they were content for the de minimis rule to go further. So it would appear that Parliament will respond in its new traditional way when it comes to promoting renewable energies, by introducing considerable improvements to the draft legislation apropos the current EEG amendment. The wind sector sorely needs the German Bundesrat to take such a stand.

Operators threatened by financial shortfalls if trading price remains negative for extended periods

ENERCON AND BWE DEMAND COMPENSATION FOR LOSSES IN REVENUE. THE FEDERAL GOVERNMENT APPEARS READY TO TALK.

Risk to grid stability

After ENERCON addressed the matter with the Economics Ministry on a number of occasions, the federal government has at least acknowledged that the problem as such does exist. An initial approach would be to define the trading price of electricity as negative only if it is applied to both the intraday and the day-ahead markets. These are the two marketing channels for wind-generated electricity; in the day-ahead market, volumes of energy are offered for sale on the following day. If one also took account of the market on which renewable energy was offered for sale on the next day, then direct marketers would be aware of price movements with a day’s notice, and would have the opportunity to bypass the power exchange and try to sell any excess renewable energy directly to flexible consumers. For the grid operators, this would put an end to the six-hour rule not only in Germany but also to the stability of the system per se. That is because, faced with a retrospective loss of revenue after six hours of negative trading prices, operators will have a powerful incentive to shut down their wind energy converters abruptly just short of the six-hour period in order to encourage prices to rise again. This sudden switch-off would cause many thousands of megawatts to be bypassed, with the most cost-effective wind turbines being to blame, it would all be the fault of a self-defeating political measure.

POLITICS_
The Black Forest area is just one of those working towards the decentralised energy turnaround. The regional energy supplier E-Werk Mittelbaden AG & Co. KG has set itself the objective of supplying every household in the region with energy from renewable sources. As a result, the company operates its own hydroelectric and photovoltaic plants, is involved in offshore projects in the North Sea and the Baltic, and has very recently commissioned its first onshore wind farm in the district of Ortenaukreis. ENERCON supplied and installed three E-101 energy converters for the "Prechtaler Schanze I" project, which were connected to the grid at the end of October.

The converters were erected on hybrid towers with hub heights of 149 m on Prechtaler Schanze, a roughly 800 m high ridge. The site's difficult topography called for special solutions to be deployed to transport the components and construct the converters. The valley lay a challenging 450 m below the construction site, and the ascent involved hairpin bends and gradients of up to 15 percent. As a result, all of the components were loaded onto special vehicles in the valley before being driven up to the construction site.

Semi-trailers were used for the steel sections of the towers; the rear axles could also be steered by remote control. The haulier Spedition Bender was contracted to transport the rotor blades, for which it used self-propelled vehicles with rotor blade adapters which have been used successfully in previous Alpine projects. The special chassis allows the 48.6 m long rotor blades of the E-101 to be transported almost vertically around the tight bends, enabling the vehicles to negotiate narrow sections without! the need to widen the road considerably or to clear large areas of woodland. "When planning and executing the project, one of our principal concerns was to minimise our impact on the sensitive environment of the Black Forest", explains ENERCON project leader Robert Rampp.

Such considerations were also important when it came to preparing the construction site. As a result, the footprints of the structures were optimised ecologically and adapted to the local topographical conditions. The areas which had to be cleared and the necessary earthworks were kept to a minimum. The steep terrain was also problematic when it came to assembling the large crane: there was a negative gradient of up to 12 percent around the crane site. This meant supporting the jib of the Terex SL 3800 with 6 m high bearing blocks; then bolting it down so as to be free-floating with the help of an auxiliary crane. Eventually however, it proved possible to overcome all of the challenges without major problems. "This considerable experience we have gained with projects in low mountain ranges and at Alpine sites stood us in good stead", says Robert Rampp.

Forecast to generate an annual yield of some 19 million kilowatt hours, the operators believe that the "Prechtaler Schanze I" wind farm will be able to supply some 7,000 local households with green energy. "The wind farm flags up our clear commitment to the energy turnaround and to the generation of renewable energy in the region", says Dr. Ulrich Kleine, a board member at E-Werk Mittelbaden. Follow-up projects in the region are already at the preparatory stage. That is why the substation built in the vicinity of the wind farm has been designed in such a way as to allow other wind energy converters to be connected up there and feed into the regional grid. ENERCON will also be supplying the converters for the upcoming project next year, when three E-115/3 MW converters with 149 m hub heights will be installed during the second construction stage at the Prechtaler Schanze wind farm.

PRACTICE__

Using specialist equipment on Prechtaler Schanze

ENERCON HAS INSTALLED THREE E-101/3 MW CONVERTERS IN THE DISTRICT OF ORTENAU-KREIS FOR THE ENERGY SUPPLIER E-WERK MITTELBADEN. THE CHALLENGING BLACK FOREST SITE CALLED FOR SPECIAL TRANSPORTATION AND CONSTRUCTION SOLUTIONS.

Components for the E-101s on Prechtaler Schanze are transported using specialist equipment.
Innovation centre equipped with charging poles for electric cars

VISITORS TO ENERCON’S INNOVATION CENTRE CAN NOW TOP UP THEIR E-CARS FOR FREE WITH 100 % GREEN ELECTRICITY AT THE COMPANY’S CHARGING STATIONS. THE POLES ARE ALSO USED AS RECHARGING POINTS FOR THE COMPANY’S OWN E-VEHICLES.

When setting out on a longish journey, drivers of electric cars have to plan their route meticulously to avoid finding themselves marooned with a drained battery. Because in Germany, the network of charging stations where they can top up their batteries is far less developed than one finds with conventional filling stations. According to figures from the National Platform for Electric Mobility, the country has only 5,553 public charging points for normal charging and 102 high-speed charging stations (as per December 2014) compared with the figure of 14,209 conventional filling stations quoted by the German Oil Industry Association (MWV); in other words, the latter outnumber charging poles by nearly three to one.

But visitors travelling to ENERCON’s innovation centre in Aurich by e-car no longer have to think twice about where to charge their vehicle. ENERCON has installed free charging poles for its visitors at its premises at the Borsigstrasse. The electricity they dispense is 100 % green, with 85 percent coming from hydroelectric power stations in Germany, and 15 percent from ENERCON wind energy converters. This is the same electricity mix which is already supplied by ENERCON to its production plants in East Frisia, and which has formed the basis for the electricity tariff offered to its employees since the summer of 2014.

The charging poles were designed by ENERCON and supplied by the energy technology company ABB. “They have three different plug systems and charging modes, making them compatible with all typical e-vehicle charging systems”, explains Christian Strafiel, charging station project leader at the innovation centre of ENERCON’s research and development division WRD. It is possible to charge vehicles with either AC or DC current. The maximum output capacity is 50 kW DC or 43 kW AC, and the CCS Combo 2, CHAdeMo (both DC) and CCS Type 2 (AC) standard options are all catered for.

Lining up all two-dimensional profiles along the radius of the blade creates the external, aerodynamically effective design of a rotor blade – known as strake. An important characteristic of an aerodynamic profile is relative thickness, which describes the relationship between the thickness and depth of a cross-section. If relative thickness is greater than about 30%, then a thick profile is said to be used within the rotor blade. As relative thickness increases, the strake extends from a profile with a thin trailing edge to a section with the new, high-lift flat-back profile which, characteristically for ENERCON, provides fully-contoured cover for the round blade flange. This area is of crucial importance, especially when it comes to strength and stability.

Thinner profiles at the ends of the blades are desirable in that they help to reduce noise emissions and increase aerodynamic efficiency. Although the area in question accounts for only about one third of the entire length of the rotor blade, it covers more than half of the entire swept area. This makes it critical for the converter’s performance and – because of the high flow velocity – also for aeroacoustics.

The development of the new family of profiles, using an iterative process and the latest simulation tools, has been costly and challenging. Wind tunnel measurements have been used for the laborious validation process.
Half-way around the world and across the Andes

ENERCON ORGANISED ONE OF ITS MOST AMBITIOUS SHIPMENTS EVER BY LAND AND SEA FOR THE QOLLPANA II PROJECT IN BOLIVIA (8 x E-82 E4). THE CONVERTER COMPONENTS TRAVELLED 19,600 KM AROUND THE GLOBE FROM THEIR POINT OF DEPARTURE IN EMDEN.

When ENERCON begins installing eight E-82 E4 converters for the Qollpana II wind energy project in Bolivia from next January, the components will have reached the end of a spectacular journey. They will have covered 19,600 km by land and sea - from the plant where they were constructed to their installation site in South America, shipped half-way around the world before crossing the Andes, the highest mountain range outside Asia. "That is the longest distance ENERCON has ever had to travel for a project with the 'E-Ship 1'”, says Christoph Drieling, the responsible project manager at ENERCON Logistic GmbH.

So a lot of preparation had to go into preparing the shipment: as long ago as in August, all of the machine components were delivered to the port of Emden, before being loaded onto the "E-Ship 1" early in September along with all of the equipment required for installation. In the Portuguese port of Leixões, the ENERCON cargo ship – which is powered by four Flettner rotors – picked up the steel tower sections before heading off across the Atlantic towards South America. The sea route followed by the vessel led through the Straits of Magellan past Tierra del Fuego and around the tip of the South American continent to its final destination at the port of Arica in northern Chile. “Bolivia is land-locked, so we had to deliver the components via a third country”, explains Christoph Drieling. This was also the first time that the "E-Ship 1" had ever called at a Pacific port.

The vessel unloaded its cargo after berthing in Arica in mid-October. Since then, a start has been made on bringing the E-82 components to the construction site in Bolivia by road. The distance to be covered is 816 km, but the length of the route is not the only challenge to be faced. The vast majority of all sea-borne freight destined for Bolivia is handled in the port of Arica. Consequently, the port is always working to full capacity, and there is invariably lots of traffic on the roads between it and the border. Not exactly ideal conditions for handling and transporting wind energy components.

"In addition, the route crosses two ridges of the Andes", adds Christoph Drieling. The total of 156 heavy haulage vehicles must therefore tackle ascents of up to 5,080 m in altitude from their starting-point at sea level in Arica. The road later climbs again to 4,000 m and again to 4,500 m before finally dropping to 2,800 m at the installation site. Hairpin bends of up to 340 degrees have to be negotiated in the mountain pass sections. As a result, ENERCON conducted a thorough evaluation of the route in advance, and arranged for the trailer sets commissioned from a Bolivian logistics company to be specially equipped. This allows the loaded components to be raised up on the trailers when traversing such narrow sections. The haulier also had critical road sections widened beforehand, to avoid any risk to the components.

"Logistical planning in Bolivia was all the more difficult because only two wind energy converters have ever been built there”, says Christoph Drieling. “So the country has very little experience of the specific logistics involved.” There is also a shortage of the type of equipment required for transportation and construction. As a result, some of the trailers had to be specially procured. There are only two construction cranes suitable for use in the assembly of wind energy converters in the entire country. ENERCON secured one of these for the construction phase.

The transportation convoys take three weeks to travel from Arica to the construction site and back again. Then they are reloaded in the port, and another round trip begins. To prevent the construction work from stalling, the erection teams did not begin work until the components for four complete converters had arrived at the construction site.

Progress is ongoing at the wind farm. The completion and commissioning dates for ENERCON’s first wind energy project in Bolivia are scheduled for the spring of 2016. Qollpana II will see an expansion of the first wind farm in the country, which comprises two Goldwind turbines. The site is located not far from the fourth-largest town in Bolivia: Cochabamba in the eastern Andes. It is operated by the energy supplier Corani S.A. //
For extreme climate
First E-101 erected in Finland

THE HAMINA SITE LIES ON THE COUNTRY’S SOUTHEAST COAST. ENERCON HAS INSTALLED TWO TURBINES FROM THE 3 MW SERIES WITH HUB HEIGHTS OF 135 M IN THE PORT AREA.

For the first time, ENERCON has now built wind energy converters from the E-101 series in Finland. The 3 MW machines were installed in the port area of Hamina on the country’s southeast coast. The handover to the customer – the energy supplier Haminan Energia Oy – came in late November.

The two E-101s were installed on hybrid towers with hub heights of 135 m. They were designed to cold climate specifications in view of the freezing temperatures experienced during Scandinavian winters, which can fall below -20 °C. The two machines were also equipped with ENERCON’s rotor blade de-icing system.

Hamina is located some 150 km to the east of the Finnish capital Helsinki, and enjoys favourable wind conditions. The average annual wind speed at hub height is 7 m/s.

The E-101s in Hamina are the largest wind energy converters ever installed in Finland by ENERCON. Before that, the largest ENERCON series operating there was the E-92/2.35 MW, which was supplied to Kottkan Energia Oy. The latter’s wind farm at Musalo, which is only about 20 km from the Hamina site as the crow flies, increased its capacity to 7.05 MW this year with the installation of another E-92/2.35 MW machine, thus securing even further the strong foothold gained by ENERCON in the Hamina-Kotka region. //
ENERCON is the market leader in this East Asian country, where it accounts for around 70 percent of sales. The company’s branch office there is to be used as a base for further activities throughout the region of Asia.

Typhoon Soudelor was really something else: with wind speeds of up to 211 km/h and biblical levels of rainfall, it swept over Taiwan in early August, leaving a trail of destruction in its wake. Countless houses were damaged, trees uprooted, electricity pylons snapped and roads flooded. Six people lost their lives and 379 were injured, with thousands having to take sanctuary in emergency accommodation. Many parts of the country were affected by the most serious power blackout ever caused by a typhoon in Taiwan. More than 4.8 million people were without electricity. Before Soudelor struck land, meteorologists had recorded top wind speeds of 285 km/h, and categorised it as a “super typhoon”. This made it the most powerful such weather event of the year in the northern hemisphere.

But ENERCON’s wind energy converters in Taiwan proved a match for Soudelor. None of the turbines was found to have suffered any significant damage once the typhoon had subsided and the weather returned to normal. “This event demonstrates how robust our technology is, and how well suited our wind energy converters are to this region”, according to Steffen Brauns, ENERCON’s Regional Sales Manager for the Asia-Pacific region.

“Taiwan experiences some of the harshest weather conditions in Asia: high temperatures, high humidity, high wind speeds, and the occasional typhoon. The tough performance of our turbines under these extreme conditions has made us a market leader in Taiwan”, explains Brauns. ENERCON’s storm control also paid off, giving operators in the region an advantage over their competitors.

ENERCON’s market share in Taiwan stands at about 70 percent; the company has installed the equivalent of 428.9 MW to date. The 200th machine was recently erected – an E-70 for the Houlong Wind Farm on behalf of the InfraVest Wind Power Group.

The tried and tested E-70 series, designed specifically to cater for high winds, has proved very successful in Taiwan: ENERCON has already installed 180 such machines there. But the company is also doing well in Taiwan when it comes to larger converters. For instance, it recently won the latest contract put out to tender by the energy supplier the Taiwan Power Company (TPC) with its E-82 E4/3 MW. Eleven turbines from this high-wind series will soon be installed on Penghu Island under the terms of the tender agreement.

ENERCON’s service centre in Taichung currently employs a workforce of 50. They have all the qualifications they need not only to service the converters, but also to construct and commission the new machines. The Taichung site includes a training centre, whose two instructors are responsible for providing the service engineers with the training they need to work on ENERCON turbines.

“We believe there is considerably more untapped potential to be developed in Taiwan in the years ahead”, says Steffen Brauns. And this despite the fact that larger companies are showing an increasing interest in the country’s onshore wind energy projects. There is also an expectation that politicians will exhibit a greater commitment to supporting renewable energy in Taiwan in the run-up to the forthcoming elections.

ENERCON also regards Taiwan as an ideal base for its future activities throughout the region of Asia. “In terms of climatic conditions, Taiwan serves as a perfect reference for countries such as the Philippines, which are amongst the Asian markets ENERCON intends to develop in the future”, says Brauns. And its central location means that ENERCON’s branch office in Taiwan will be able to dispatch employees from the Project Management, Service and Installation divisions throughout the entire region without undue delay. As part of its plan to expand its activities in Asia, ENERCON will also open a new sales office in Taipei in 2016. //
Innovative ideas are the hallmark of our success moving us forward. We are passionate about realizing wind energy projects across the globe and meeting tomorrow’s energy technology challenges. Make your contribution of ideas to enforce the development of progressive and innovative technologies in our company.

For our R&D company, Innovation for ENERCON GmbH in Bremen, we are seeking to hire an expert in the field of corporate technology (m/f).

Key Expert Corporate Technology (m/f)

**Responsibilities**
- Develop innovative ideas and concepts to boost the efficiency of our WEC technology and to expand our product portfolio
- Generate ideas to fill the innovation and technology roadmaps
- Develop technology up to TRL 6 (ensure technical feasibility)
- Manage technology and innovation projects
- Advise the management regarding strategic technical issues
- Generate ideas for active, systematic development of the patent portfolio and analysis of competitors’ patent portfolios
- Fast-track development of ideas/concepts to address defined technology and innovation projects
- Anticipate and develop ideas/concepts to address changing customer requirements
- Further develop methodical competences and act as multiplier for passing on specialist knowledge to departments
- Scout technologies and analyze scientific progress in the relevant field of competence
- Create and analyze technological scenarios
- Build and develop networks with universities and research institutions as well as technology-relevant partners

**Qualifications**
- University degree in an engineering discipline
- At least 5 years of successful work experience in the wind energy technology sector
- Project management and leadership experience
- Demonstrable success in technical materialisation of innovation
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