

ON Service

The Availon journal for multibrand wind energy service | **September 2011**



Focus on

*Where is the energy
turnabout leading us?*

The German Federal Government is setting such a rapid pace for the energy turnabout that they may lose sight of valuable opportunities. To find out what consequences a single-minded focus on offshore wind energy may have on the further development of onshore wind energy, and why even wind energy advocates are asking for a change of approach, read more on [page 4](#)



Occupational safety management: Certified pioneers. [Page 9](#)



Crane system: Internal solutions instead of external problems. [Page 14](#)



Availon Inc.: Growth american style. [Page 16](#)





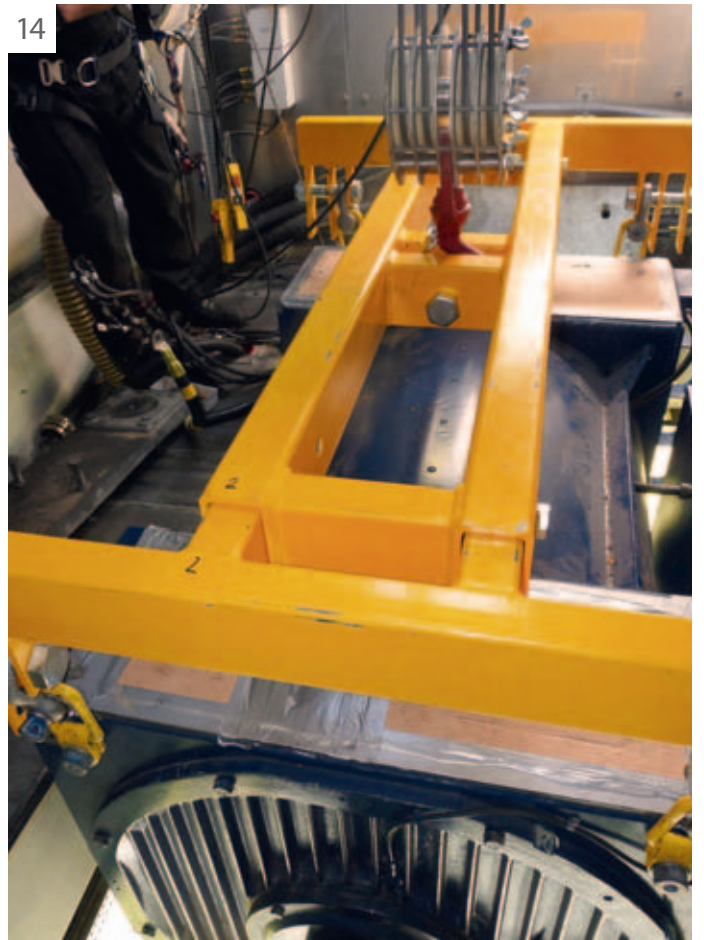
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IMPRINT

Published by: Availon GmbH · Jacksonring 2 · 48429 Rheine · Germany

Fon +49 5971 8025-0 · Fax +49 5971 8025-109 · www.availon.eu

Edited and designed by: EXPECT MORE Kommunikation GmbH · Breite Straße 4
48431 Rheine · Germany · Fon +49 5971 80409-0 · Fax +49 5971 80409-100 · www.expect-more.de

Responsible according to German press law: Availon GmbH

Photos: German Wind Energy Association (p. 6), GLS Beteiligungs AG (pp. 7–8),

Ulrich Wozniak (pp. 9, 11, 12, 13, 14, 17), Fokus Werbefotografie GmbH (pp. 12–13)

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Number of copies: 1000

Heading in the wrong direction.

Is the turnabout of energy policy a one-way street?

“Haste makes waste ...” This old English proverb definitely applies to the impetuous turnabout of the energy policy of the Federal Government of Germany.

► Perhaps, the expeditious manner of making political decisions should be, for once, welcomed. But even the German Wind Energy Association (BWE) were surprised by the speed, with which the coalition of German Christian Conservative Party and German Liberal Party initiated the phasing-out of nuclear energy, while simultaneously announcing a new age of regenerative energy.

“Last fall, we pointed out that extending the operating life of nuclear power stations was a mistake. The decision of the German Government to do so refueled a social conflict that was presumed settled a long time ago. Apart from being unsafe, nuclear energy effectively slowed down the progress of the renewable energy production. As a member of the wind energy sector, we nevertheless, were surprised by the speed, with which the German Government renewed its efforts to phase out nuclear energy,” commented President of BWE Hermann Albers in an interview with ON Service.

Preventing the worst

It is questionable whether the energy policy's turnabout is heading in the right direction with the accelerated development of renewable energies. It becomes apparent when considering the onshore wind energy sector. The notion that the original drafts for the EEG (Renewable Energy Act) 2012 would have been worse, offers little comfort. Albers explained: “The Government's draft of the EEG would have resulted in massive cuts of feed-in



tariffs for onshore wind energy. However, the Bundestag and Bundesrat of the German Parliament prevented the worse from occurring and introduced critical policy changes. For instance, the SDL Bonus (System Service Bonus) has been saved."

Cuts and concessions

As compared to the EEG 2009, the onshore wind energy suffered some cuts. For example, as a result of the EEG amendment 2012, the annual degression was increased from 1% to

1.5%. BWE also criticized the "Transformation of the Repowering Bonus from a flexible to a static instrument."

Planners and operators of the offshore wind energy projects should have been pleased with the "Sprinter Bonus" (15 Eurocent per kWh over a period of 12 years) included in the initial feed-in tariff. A 1% higher degression (formerly 5% as of 2015) will only come into effect as of January 1, 2018. However, this may not happen, since further EEG amendments are likely to be adopted before this comes into

effect. The intentions are clear: The promotion of a massive expansion of offshore wind energy at the expense of a slower development of onshore wind energy, among other things.

Unattainable goals?

A heavy focus on one renewable energy source is not rational due to the existing time restraints. BWE comments: "In our opinion, it is wrong to solely focus on offshore wind energy, the expansion of which is already behind the schedule. It is difficult to predict how





*Hermann Albers,
President of the German Wind Energy
Association (BWE).*

the sector would develop over the years in regards to its growth and costs. I don't believe that the planned expansion of offshore wind energy up to 10 GW by 2020 can be achieved. I would predict a more realistic amount of 7 GW. Onshore wind energy still offers great potentials and is the most cost-effective of all renewable energies."

Considerable investments in onshore wind energy

This view is likely to be shared by many large, medium-sized and small operators of onshore wind turbines and wind farms. Especially as they have invested heavily in the sector during recent years. Their commitment has made wind energy in Germany a unique success story that has been emulated throughout the world. But it is not just a matter of the initial investments. Wind turbines (WTGs) need to be serviced, maintained and optimized to become a worthwhile investment in the long term. Many multibrand service providers made considerable contributions to profitability of the onshore wind energy sector with

advanced technology, optimized maintenance processes and new service concepts.

A long-term strategy is necessary

The latest EEG amendment increased the sense of uncertainty. The BWE requested a change of approach. "First of all, it is important to extend from three to four years the interval, at which the EEG is amended. This creates a reliable basis for planning, as the planning of WTG projects can take up to several years," stated Albers.

Planning security must extend to maintenance

Planning security must be extended for the long-term maintenance services for onshore WTGs. Regardless of the expected EEG cuts it is advisable to map the course early to ensure the future of onshore wind energy as a renewable energy source. A high degree of planning security means committing to a sustained investment in maintenance, servicing and the upgrading of WTGs. A high level of operational availability and reduced risk of breakdown can

only be achieved with the aid of long-term service concepts that would focus on preserving the initial investment's value.

Finally, the question remains whether current developments will be regretted in the future, especially due to the numerous challenges that are facing the planned expansion of the offshore wind energy sector. Albers emphasized: "German offshore wind farms will have to overcome massive challenges due to considerable water depths and the distance from the coastline. This applies, in particular, to the construction of turbines and to the maintenance and services. New concepts must be developed and thoroughly tested. All these factors will influence the financing of wind farms." ■

The renewable energy financing pioneer manages wind farms.

GLS Beteiligungs AG prefers brand-specific services.

It takes a lot of courage for any business to be a pioneer in its field – just ask GLS Bank – the world’s first social and ecological universal bank. Originally founded in 1974 in Bochum as “Gemeinschaft für Leihen und Schenken” (Society for Loans and Donations), the bank now successfully combines professional banking with a high degree of social responsibility.

► GLS Bank is the only bank that offers a full range of traditional services like investment banking, finance, equity capital, foundations and donations, all while maintaining a high level of transparency and strong focus on socially and ecologically responsible projects and investments. The GLS Beteiligungs AG – as it is known today – was founded in 1995 to assist customers with equity funding. ON Service spoke to Thilo Gabor, Senior Project Manager at GLS Beteiligungs AG, who is responsible for managing the bank’s closed-end funds. In addition to other topics, Mr. Gabor answered questions about the important role played by multibrand service providers in wind turbines (WTGs) maintenance.



*Thilo Gabor, Senior Project Manager
GLS Bank in the area of Executive
Closed End Funds.*

Mr. Gabor, can you give us a brief overview of how GLS Bank is structured?

Thilo Gabor: The GLS Bank is headquartered in Bochum, and has two subsidiaries, the GLS Energie AG and the GLS Beteiligungs AG. The GLS Energie AG was founded in 2003 for the purpose of servicing the renewable energy sector. GLS Beteiligungs AG, which has focused on financing renewable energy projects, was established 16 years ago and now offers customers closed-end investment funds.

This is not the only function of your company, however?

Correct. We did not want to limit our business to banking services alone, so we also offer our clients full support through the entire life-cycle of our funds, which are managed by GLS Beteiligungsgesellschaft.

What is the duration of your involvement in the financial management of a typical renewable energy project?

20 years, which is roughly equivalent to the expected life span of a WTG.

How many wind farms are currently under your financial management?

Currently, six wind farms throughout Germany, with a total of about 80 turbines generating approximately 106 MW of energy.

When did you set up the first wind farm fund?

In 1991. We were, by the way, the first bank in Germany to launch such a fund - we are a true pioneer in this sector.



GLS Bank Headquarters in Bochum, Germany.



Serviced by Availon since mid-2008: The Littorf Wind Farm.

Who provides the maintenance services for these wind farms?

As commercial managers, we select the contractual partner for maintenance, repair and technical services of the WTGs. When the first large wind farm funds were set up in 2000, it was almost exclusively the WTG manufacturers who provided maintenance and repair and basically enjoyed a monopoly position.

Obviously the situation has changed over time ...

I have worked in the commercial management of wind farms for the past 10 years, and have built good relationships with many wind farm operators. Together we have always been committed to increasing the presence of independent WTG service providers by removing their barriers to entry to the WTG service sector.

Why did you commit to this?

Competition is good for business. Having a choice of companies offering WTG services drives competitive prices and better services. At first, competition was lacking because spare parts for turbines were only available from the original turbine manufacturers, who took considerable advantage of the situation.

When did you first commission a multibrand service provider?

In mid-2008, when we hired Availon to maintain the Littdorf wind farm.

Why did you choose Availon at that time?

We believed then and still believe today that Availon is one of the most competent providers of maintenance services for 1.5 MW-class turbines. This is mainly due to the knowledge of its service technicians, who have extensive expertise and experience. We were also impressed by the company's focus on customer service.

What other factors were important when deciding in favor of Availon?

We were impressed by Availon's organizational structure and the company's strong and diverse presence in multiple regions. We also looked at the geographical proximity of the service provider to wind farm sites to ensure fast response times.

How many wind farms are currently maintained by Availon?

The Littdorf, Schleiden and Zodel wind farms with a total of 27 1.5 MW turbines.

Any other wind farms?

They are still under the service contracts with the original turbine manufacturers.

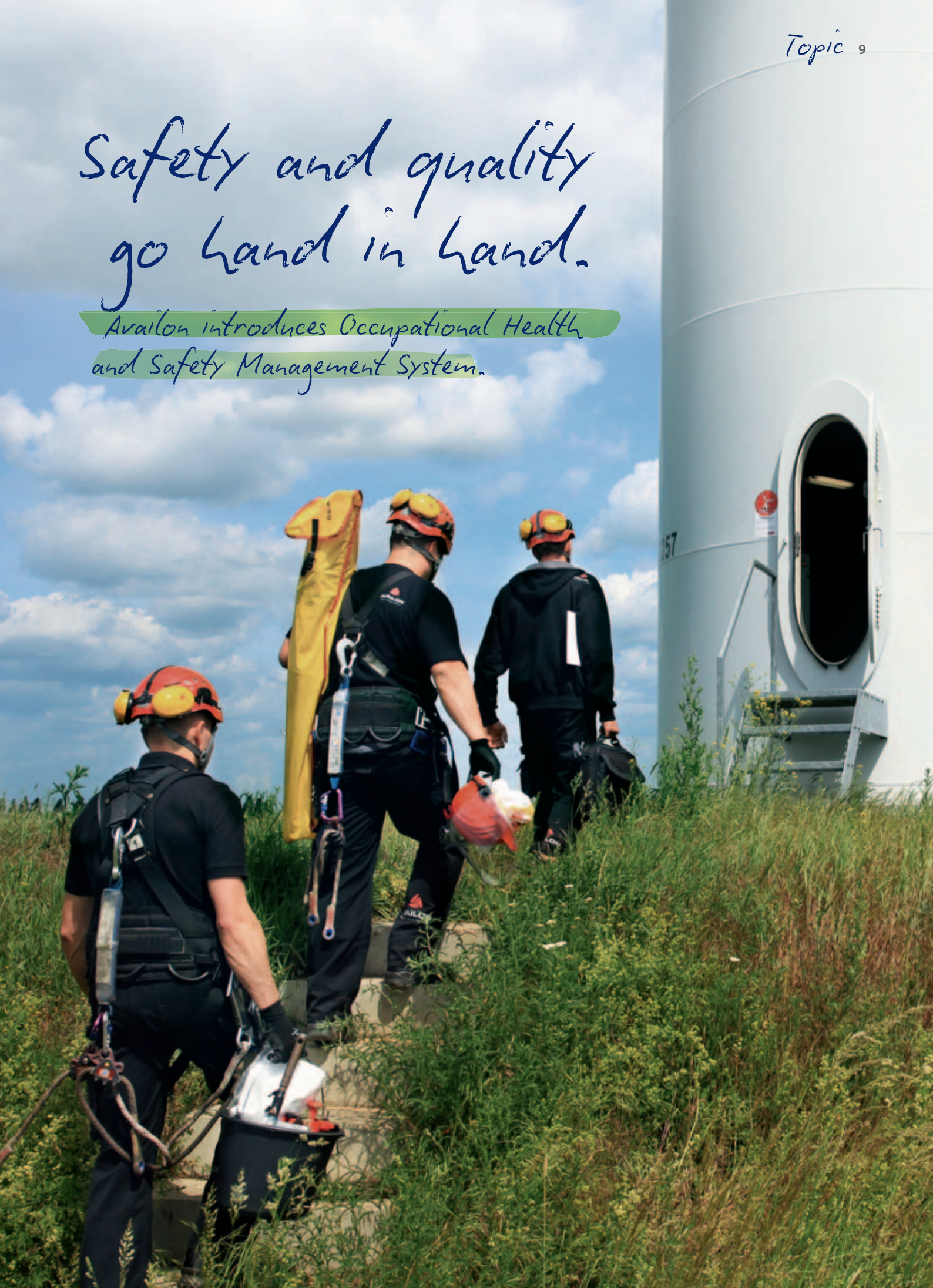
Your portfolio not only includes 1.5 MW turbines of a single manufacturer, but also many turbines from different manufacturers. How important to you is the competence of a potential partner with regards to specific turbine types?

Competence plays a very important role. We are closely watching the growth of the independent service provider market in terms of specialization and experience with various types of turbines from different manufacturers.

Thank you for your time, Mr. Gabor. ■

Safety and quality
go hand in hand.

Availon introduces Occupational Health
and Safety Management System.



The ISO 9001 certification is a “must” factor in the wind energy market for multibrand service providers. The lack of an ISO 9001 certification often weighs negatively on an operator’s decision to hire a wind turbine service provider who does not possess the certification. The desire to offer only the highest quality services to its customers drove Availon to become the first multibrand service provider to obtain the Occupational Health and Safety Management certification and implement an integrated management system for Quality and Occupational Health and Safety Management.

In the best interests of customers

“The ISO 9001 certification is an assurance that a company maintains an effective Quality Management System (QM) for products and services. Customers expect that the products and services offered to them are of consistently high quality, especially when a company enters into long-term service relationship with a multibrand wind turbine (WTG) service provider as Availon. The ISO 9001 certification adds to customers’ peace of mind when the viability of provider’s quality management system (including clear definitions of the continuous improvement measures) is confirmed by an independent certifying body,” explained Andreas Meyer, Manager of EHS (Environment, Health and Safety) and Quality Management at Availon.

Occupational health and safety are gaining momentum

Meyer states that the importance of an Occupational Health and Safety Management System (OHS) should not be underestimated because of the undeniable benefits to the certified company and its employees. Statistics show that workplace accidents are predominantly caused by improper conduct with regards to safety or a lack of organization. These deficiencies are better addressed by well-designed and adaptable OHS. One of the standards of OHS is OHSAS 18001 (Occupational Health and Safety Assessment Series). It is based on the principles of ISO 9001 and ISO 14001 (International Environmental Management Standard). Although the OHSAS has been recognized as a national standard in Poland and the UK, it is not an ISO standard that is accepted worldwide.

Two standards, one direction

“OHSAS is the most commonly used standard and is particularly well known in the wind energy sector. The basic structures of ISO 9001 and OHSAS 18001 are almost identical. The difference is that while the QM primarily focuses on customer requirements, the OHSAS generally addresses the employees of a company,” commented Meyer. “As a multibrand service provider Availon strives to attain the highest customer satisfaction levels. This can only be done by maintaining and advancing a flexible management system that is adaptable to changing customer requirements. Compliance with statutory regulations, ordinances and guidelines in occupational health

and safety is a vital part of this strategy. That’s exactly why we have become the first multibrand service company to earn OHSAS 18001 certification from the reputable ‘Germanischer Lloyd!’”

Better performance in the interest of the operator

Workplace safety provides an environment in which employees can perform their jobs in the most efficient way. Health and safety targets must be checked regularly and require the creation and maintenance of the appropriate working environment by analyzing potential workplace hazards and taking steps to avoid them. Meyer added, “We determine which statutory regulations apply to occupational health and safety within the EU and then check for additional requirements we need to comply with in Germany before including these in our OHS.”

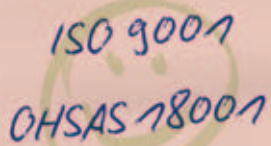
Implementation is not an easy task

Implementing and maintaining OHS that is OHSAS-compliant is not an easy task. Constantly changing requirements, new regulations and additions to numerous areas relevant to occupational health and safety must be taken into consideration. Such dynamic developments require an agile OHS as well as established reporting procedures to ensure that managers of all departments are well-versed on the latest regulatory changes.

Training is essential

“Our certified training system is an important part of the OHS. In addition to individual training, employees also receive web-based training. All important information and recommendations regarding occupational health and safety must be conveyed to employees as quickly as possible. Sometimes organizational and time constraints do not allow for individual or classroom training. Our web-based training is structured in such a way that employees not only receive the latest information and instructions but are also required to confirm that they understand the information or indicate that they have unresolved outstanding questions,” explained Meyer.

Such quality control tools as internal audits, quality samplings, and quality management analyses are used to check that OHS measures are properly and effectively in place.



ISO 9001
OHSAS 18001

In focus – wind turbine operators

There is no doubt that both employees and customers benefit from an increased level of safety. Meyer cited a practical example: “Suppose a major accident occurs during work on a WTG. The focus of the accident investigation would be on the operator of the WTG. However, if a service provider that is performing maintenance on a WTG follows a certified OHS, the investigation will probably not view the accident as a result of WTG operator negligence. The accident may be considered as one of the unavoidable risks of WTG maintenance. But the worst case scenario aside poorly trained employees who do not follow OHS are not capable of doing high quality work for customers.”

with a fully certified service provider: “With ISO 9001 and our current OHSAS 18001 certification we are implementing an integrated management system in Quality and Occupational Health and Safety Management, which incorporates methods and tools for fulfilling the requirements from various areas within a uniform structure.”

By merging the two systems, synergies and resources can be combined to enable a lean and efficient management of even the most complex issues. All employees are part of this dynamic system which monitors the compliance of statutory minimum standards and contributes to a process of continuous improvement in all areas of a company. ■

Quality and safety go hand in hand

According to Meyer, the efficiency of a quality management system is strongly linked to OHS. Operators of WTGs or wind farms have a vested interest in working together

WTG operators also profit from certified Occupational Safety Management.



Safety is the best policy.

Avilon introduces three new upgrades for Vestas® turbines.

Avilon, the leading multibrand service provider, introduces three new upgrades for Vestas® V80 VCS®, V90 2.0 MW and V66 turbines: An additional arc sensor for medium-voltage switch gears, a slip ring suction system, and an improved design for transformer brackets.



*Reduces the risk of long turbine downtimes:
The additional arc sensor.*

► These upgrades greatly increase the reliability and availability of wind turbines (WTGs) by preventing critical component failures. The new upgrades lead to trouble-free operation, reduced downtime, and greater profitability to WTGs owners and operators.

All good things come in threes

If the transformer compartment fails, two arc sensors ensure that the WTG is shut down safely. But there are other potential hazards that can be triggered by switch sparks, for example if electricity continues to flow through the spark or if the arc discharges have already been opened after an electrical contact. An unwanted flashover voltage and risk of a catastrophic fire can also occur in the circuit breaker's control cabinet, which may be caused by overcurrent release delays in the medium-voltage switch gear during arcing.

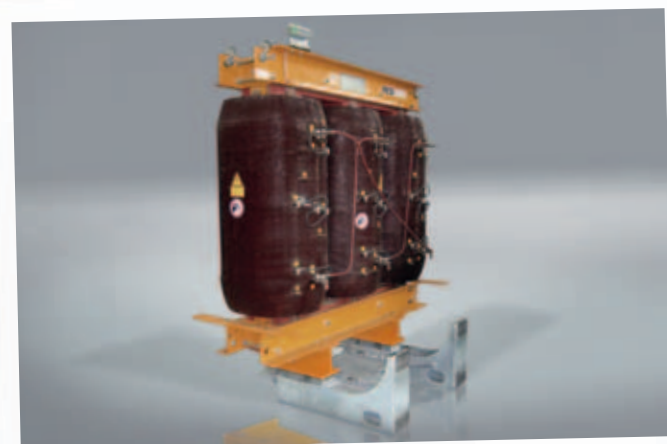
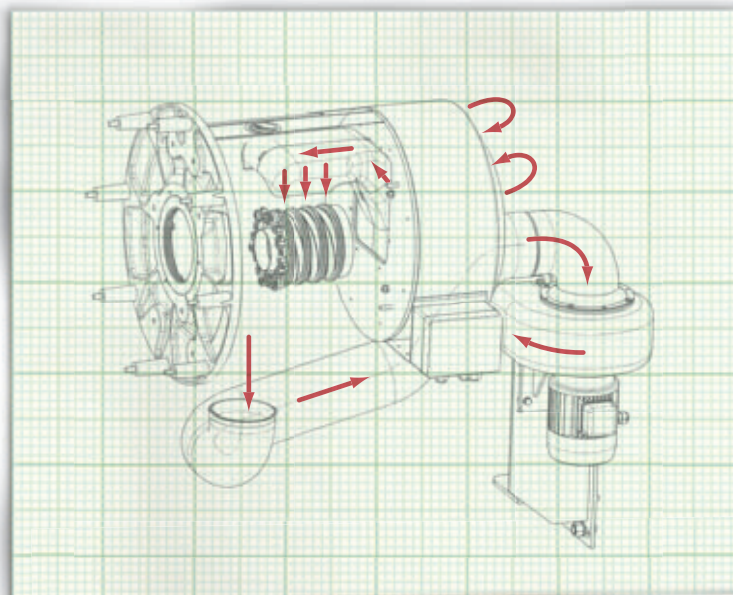
Availon now offers an additional arc sensor as an upgrade. The sensor monitors the main distribution copper rail to help prevent turbine damage from common hazards, which lead to arcing. The arc sensor is installed in close proximity of the control cabinet circuit breaker. When arcing occurs, the additional sensor disconnects the WTG from the grid within milliseconds. This prevents fires and the possible loss of the main distribution copper rail, while reducing the risk of high WTG repair costs and prolonged turbine downtimes.

Preventing damage caused by graphite dust

The operational integrity of a WTG can often be compromised by small yet destructive events like arcing. Such an event can originate from the presence of graphite dust in the slip ring room due to carbon brush wear, but also presents a risk of sparking and flashovers, which may cause generator failure. Availon's new slip ring suction system efficiently removes graphite dust from the slip ring compartment, effectively preventing damage to the generator. The slip ring suction system upgrade reduces maintenance costs by minimizing the need for manual cleaning of the slip ring compartment.

Increased stability for the transformer bracket

Availon's third upgrade for Vestas® turbines provides potential for significant savings. The transformer bracket stability upgrade prevents expensive transformer bracket repairs and the possible replacement of the entire transformer. Due to its location at the rear of the nacelle, the transformer is exposed to considerable vibrations that cause excessive stress to the transformer bracket. If the transformer bracket breaks, the five-ton transformer can tilt on its side. Availon's new highly reinforced transformer



bracket design not only makes the transformer more stable, but also leverages the previously unused supporting capacity of the nacelle's crane runway. The transformer bracket is strapped to the crane runway with steel rods, increasing the load capacity of the transformer bracket and providing permanent stabilization of the transformer, minimizing vibration.

Safety in double-pack: Slip ring suction (top) reduces the danger of sparking, the reinforced transformer console (below) increases stability.

These innovative upgrades – available immediately – demonstrate Availon's commitment and capability in improving turbine technology across different manufacturers, to the benefit of WTG operators. ■

David vs. Goliath

Availon's new internal crane system allows replacement of large components without a heavy duty crane.

The replacement of a failed generator or transformer is one of the most dreadful situations faced by a wind turbine (WTG) owner or operator and it is always accompanied by a unique set of challenges. One of the challenges is that both generators and transformers can weigh up to 8 tons, and can be taken down or lifted up the tower only by a special heavy duty crane. Even if a crane is available, another challenge is that the access road needs to be suitably sturdy for a crane to be brought to the turbine's site. After a crane has arrived on-site, adverse weather conditions may prevent service personnel from replacing a part in a timely manner leaving the very expensive crane idling for days, and the turbine's downtime eating away at the owner's profits.

► Availon, a leading multibrand service provider to the wind industry, offers a clever solution to this problem: A new advanced internal crane system developed by company specialists. The implementation of this system allows for the replacement of large components in Vestas® V80 VCS®, V90 2.0 MW and V66 turbines easily and cost-effectively without the need for a heavy duty crane.

Moving large components up to eight tons in weight

Availon makes use of the crane runway that is factory-installed in Vestas® turbines. The crane trolley is already designed to support

weight of up to eight tons, and a special lifting beam is secured to a winch in the crane trolley that is strong enough to lift large payloads. The lifting beam is adjustable to accommodate components of various sizes and different types of generators weighing up to 8 tons.

A race against time is over

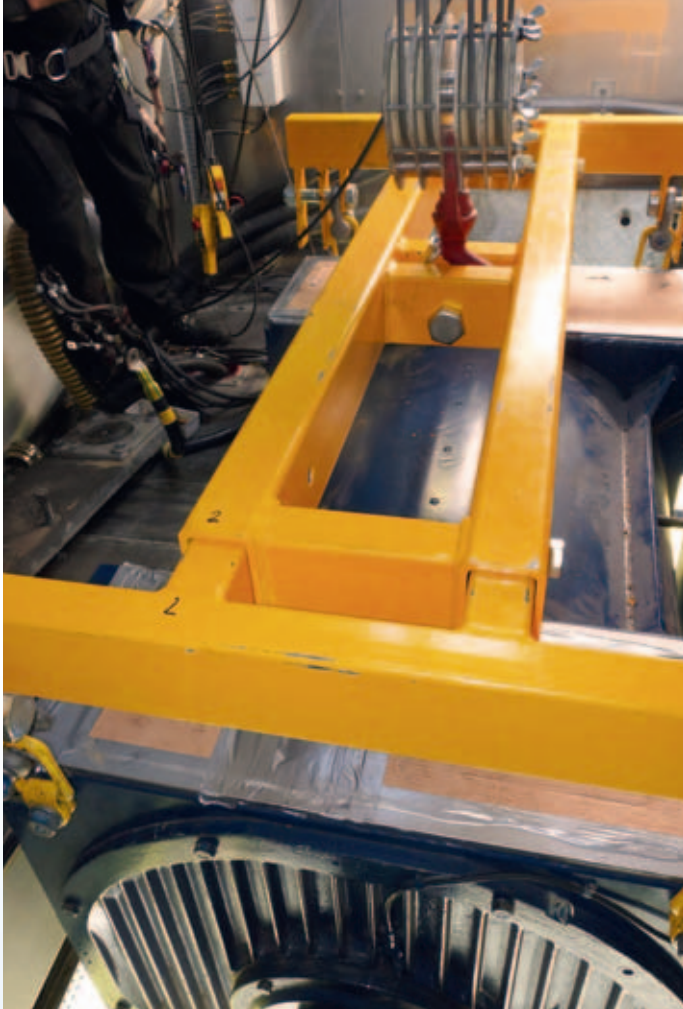
Availon's Upgrades Development Engineer Lorenz-Theo Feddersen describes the outdated process of replacing failed generators or transformers: "When a turbine generator or transformer failed, the customer first would require a replacement quote. The staff would verify the component's availability. Then the turbine's hub height would be determined in order to select the appropriate heavy-duty crane, and the crane suppliers would be contacted regarding crane availability and price estimates. The first question from suppliers has always been whether the roads leading to the failed turbine can withstand the weight and the dimensions of both a heavy duty crane and the truck that transports it. In many cases, access roads would require reinforcement. If the customer accepted the proposal, the crane company would handle all further logistics, securing the route for the heavy duty crane and complying with all regulations. During this lengthy process the turbine is obviously not producing energy."

Unscheduled delays drive cost up

Typical installation of a heavy duty crane may take up to two days depending on the location and hub height. Adverse weather and wind conditions can cause further costly delays. Feddersen commented: "We once found ourselves in a situation where a large component should have been replaced on Friday, but the wind was so strong we could not lift the nacelle cover. The cover is not particularly heavy, but it is large in size and can easily be caught by the wind. As a result, we had to halt the maintenance process until the next working day. The crane just stood idle at the foot of the turbine for the entire weekend resulting in extra expenses."



*Lorenz-Theo Feddersen,
Development Engineer Upgrades
at Availon.*



Heavy-load cranes require solid ground under their feet. Access roads often need to be reinforced.

Access through the floor, not through the roof

Availon's new system will eliminate the scenarios described above. When replacing a generator, both the heat exchanger and generator can be attached to the internal crane before lowering them through the floor of the nacelle. The replacement component is then hoisted into the nacelle. The transformer can also be replaced in this way. Considerably smaller and lighter cranes are now sufficient for lifting large components from the foundations and loading them on a truck. These cranes are readily available, and their cost is significantly lower than that of their heavy duty counterparts.

Heavy duty cranes are not the only things becoming obsolete

Martin Bergmann, Development Engineer of 'Upgrades for Mechanical Components', and the 'father' of the new internal crane system says, "Availon is confident that our system is a solution with several advantages. With this upgrade, heavy duty cranes and the headache-causing efforts of planning and executing the logistics will no longer be required." Access roads to failed turbines no longer need to be designed to withstand the weight of heavy duty cranes and their transports. "We don't need to reconstruct the crane pad that were created for the initial installation of the turbine in order to accommodate cranes," explained Martin Bergmann. "Another advantage of Availon's new cost-saving upgrade is that it can be utilized even during unfavorable weather conditions."

Suitable for nearly all wind and weather conditions

Availon's system can be used regardless of wind speed which would prohibit use of a heavy duty crane for safety reasons. The internal crane system does not require the removal of the nacelle's cover to replace a component because it is now lowered through the floor instead of the nacelle's roof. The work can be completed in wet conditions or even during light precipitation. Previously, replacement of transformers in these conditions was impossible. Availon's new internal crane system offers better handling, flexibility and faster replacement of components compared to the traditional process.

Mobile, flexible, lightweight

"A heavy duty crane weighing approximately 200 tons is traditionally deployed to replace large components. Availon's internal crane is much lighter, weighing only about 200 kg, a true 'David and Goliath' situation," explains Bergmann.

Availon's system allows components to be replaced more quickly after a turbine is shut down by utilizing the turbine's existing crane which lifts components into the nacelle.

Bergmann continues, "We recently tested the internal crane for the first time while replacing a generator. The time saved by our new system was very impressive. Its implementation will drastically reduce the costs of replacing generators and transformers. The waiting time between the shutdown and the replacement of components will be minimized or eliminated, and the unproductive turbine's downtime due to adverse weather conditions or a heavy duty crane's unavailability will be avoided." ■



A growing interest.

Availon positions itself as a reliable partner.

The recent AWEA Windpower 2011 Conference in California has confirmed that the interest in Availon and the demand for multibrand wind turbine (WTG) maintenance services is on the rise. Within only two years of its establishment, Availon Inc., based in Iowa's capital Des Moines, is firmly positioned in the North American wind power market.

► "We have experienced considerable growth since opening our offices in Des Moines two years ago with only three employees," commented Marcel Bruins, International Business Support Manager of Availon. As the leading multibrand service provider, Availon currently employs a dedicated staff of 20 wind energy professionals. It has also quadrupled its office space, and plans to hire additional 10 employees by the end of 2011.

The right decision

Availon made the right choice when it decided to base its North American operations headquarters in Des Moines, Iowa. Marcel Bruins: "Considering the rapid development of the wind energy sector in the US's Midwest region, the decision to set up a service branch in Iowa, the second largest 'wind state' in the USA, was the undeniably right one." Presently, wind energy is responsible for over 20% of the state's power. The currently installed output of 3.7 GW is planned to reach 10 GW by 2020 and 20 GW by 2030. This presents a special challenge for wind turbine operators who demand high availability and reliability of their turbines over their service life through superior quality maintenance and services.

Services that exceed customer expectations

With its many years of experience, Availon is definitely up to the challenge. The leading multibrand service provider ensures a high level of availability for turbines under its service agreements by offering expert inspections, a wide range of spare parts for various turbine types, maintenance and repair along with the comprehensive technical support. Availon leads the industry in the development of aftermarket upgrades that optimize and enhance turbines to the latest technical and reliability standards. "We recently introduced our own remote monitoring service, further extending our service portfolio with another key offering, and providing our clients with a high degree of safety as well as increased profitability of their turbines. The first cooperation agreement will also be signed shortly. We are

well on our way to establishing ourselves as a very reliable partner for the wind energy sector in the USA," explained Marcel Bruins.

Expanding our activities throughout North America

Availon's expansion plans go beyond Iowa as its only North American service branch. The company is looking to extend its services across North America including Canada. Canadian turbine operators are showing an increased interest in the range of services offered by the leading multibrand service provider for wind turbines. "If we continue to see positive growth of our business in Canada, we plan to set up a dedicated spare parts depot in the country," commented Marcel Bruins.

New service office to open in Texas

Availon's future expansion plans have already been set in motion. In February, the company opened a new service office in Sweetwater, Texas. Local Availon representatives will also be available to clients at a new service office opening soon in California.

Distinguishing ourselves with upgrades

"During the last two years we have gained the trust of many turbine owners and operators. The positive reaction of hundreds of visitors to our stand during the AWEA Windpower Conference clearly showed that we have successfully distinguished ourselves as a contender, especially by our upgrades for the 60 Hz market segment. While we are still a relative newcomer in the American wind energy market, our vast experience with turbines from a wide variety of manufacturers has secured our position in this area and a high level of customer satisfaction continues to fuel our growth," said Marcel Bruins. ■



*Marcel Bruins,
International Business Support
Manager at Availon.*

Oil quality at a glance.

In the recent issues of ON Service we discussed the “oil quality” topic. The readers’ feedback was very positive, just as we expected. The oil quality is, after all, a decisive factor for the “health” of a gearbox. Regular oil analyses are vital in preventing major damages. The questions remain, though, what lubricant needs to be used, and what available oil filtration options are the best for increasing the reliability of the gearbox. In response to numerous requests, we have compiled the key facts and information about these issues on the following pages.

Main task of gear oil

- Lubrication
- Dissipation of heat (cooling)
- Preservation (anti-corrosion protection)
- Removal of wear particles

Causes of oil contamination

- Oil refilled from barrel or can
- Maintenance and repairs carried out on open gearbox
- Wear particles from normal operation
- Oil aging products

Most frequent causes of damage to rolling bearings according to an Availon analysis

- Over 70 % due to lubricant problems, including:
 - Impurities in lubricant (25 %)
 - Lubricant too old (20 %)
 - Inadequate lubrication (20 %)
 - Deficient lubrication (14 %)

Determination of oil purity (purity class)

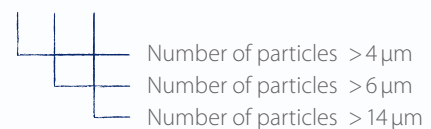
- According to ISO 4406 (1999) or SAE AS 4059
- Division in 3 categories ($> 4 \mu\text{m}$, $> 6 \mu\text{m}$, $> 14 \mu\text{m}$)
- Ordinal number is derived from number of particles per 100 ml
- Count is cumulative

Number of particles acc. to ISO 4406 (1999), per 100 ml oil

Purity class	23/20/16
$> 4 \mu\text{m}$	4394868
$> 6 \mu\text{m}$	656552
$> 14 \mu\text{m}$	33954
$> 21 \mu\text{m}$	12037
$> 38 \mu\text{m}$	1437
$> 70 \mu\text{m}$	180
Purity class SAE AS 4059	$> 12 \text{A}$

Example:

Purity class 23 / 20 / 16



Cumulative count:

Particles $> 6 \mu\text{m}$ are also counted in $> 4 \mu\text{m}$ count, also applies to $> 14 \mu\text{m}$, etc.

Ordinal table ISO 4406

Number of particles per 100 ml		Ordinal number
More than	Up to including	
250,000,000		> 28
130,000,000	250,000,000	28
64,000,000	130,000,000	27
32,000,000	64,000,000	26
16,000,000	32,000,000	25
8,000,000	16,000,000	24
4,000,000	8,000,000	23
2,000,000	4,000,000	22
1,000,000	2,000,000	21
500,000	1,000,000	20
250,000	500,000	19
130,000	250,000	18
64,000	130,000	17
32,000	64,000	16
16,000	32,000	15
8,000	16,000	14
4,000	8,000	13
2,000	4,000	12
1,000	2,000	11
500	1,000	10
250	500	9
130	250	8
64	130	7
32	64	6
16	32	5
8	16	4
4	8	3
2	4	2
1	2	1
0	1	0

Source: OELCHECK

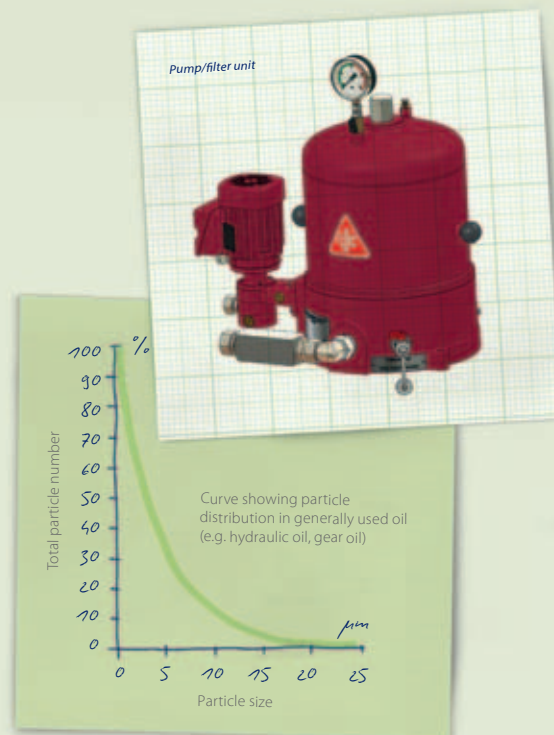


Kidney loop filtration makes frequent oil changes a thing of the past

Particle distribution

Particle distribution in an oil system with average contamination:

- Particle > 10 μm approx. 10 %
- Particle < 5 μm approx. 70%–80 %



Efficient oil filtration

Kidney loop filtration

- Oil is siphoned from the lowest point of the gearbox using a pump/filter unit
- Oil is cleaned in the unit and returned to the gearbox

Results

- Particles larger than 3 μm are removed
- Any moisture carried by the oil is absorbed
- Additives remain dissolved in the gear oil
- No unnecessary costs and system shutdowns due to early oil changes or frequent oil change intervals
- Oil filters do not have to be replaced during maintenance intervals due to "poor" condition of oil.
- Considerably decreases ageing of oil
 - Reliable and full binding of water
 - Binding of very long molecules and "free radicals"
 - Binding of additives that no longer contribute to the lubricant's performance
 - Condition-based oil change intervals of up to 60 months or more (see ON Service 09-2009)



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