UPDATE

The Phoenix Contact innovation magazine



Regeneration

Climbing higher

Wind farms get social

The Alchemists of the Bosporus

#balance #recondition #process #revitalization #energy #reactivation #progress #recycling

#recology #regeneration #recuperation #material #power #treatment #restoration #medicine #recirculation #redevelopment #reformation



Kevin Zak, Vice President and General Manager

Infrastructure – renewing and renewables.

Greetings from Harrisburg, PA!

I am honored to be communicating to you in my first correspondence as Vice President and General Manager of Phoenix Contact USA. I have had the distinct pleasure of being part of the Phoenix Contact story for 25 years, and you have my commitment that I will continue to build upon our cornerstones of product and service innovation, coupled with friendly and open collaboration, to provide an excellent customer experience.

In this edition of our customer magazine, Update, we highlight stories that focus on the building blocks of our economy – Infrastructure. From protecting and upgrading our legacy electrical grid (pg. 20) and water treatment facilities (pg. 22), or harnessing the power and creating greater efficiencies from renewable energy sources like wind and solar (pg. 10), Phoenix Contact understands the vital role we play with you in creating a robust infrastructure that we can have confidence in today, and for decades to come.

Speaking of confidence, did you know that Phoenix Contact USA offers a limited Lifetime Warranty on the vast majority of our industrial automation portfolio? The LLW is our commitment to you, our customers, that you can have complete peace of mind that you have chosen a reliable, quality product, and we will stand behind that product. You can read more on page 32.

To highlight our company's commitment to alternative and renewable energy, one can look at the many examples in service at our Pennsylvania headquarters. For many years, we have used alternative clean energy provided by a Capstone 1 MW, natural gas fueled, CCHP System (Combined Cooling, Heating, and Power) that can provide the majority of our campus power. If the near future, we will augment this system with a .9 MW rooftop solar system. Lastly, to support the growing number of EV vehicles owned by our employees, we provide nine EV charging stations, free of charge, including off-grid (solar-powered) and grid-connected variants.

I hope you enjoy reading the enclosed articles and I wish you all the best. Until next time...



The cover of the new UPDATE represents the renewable energies covered in this edition, as well as the renewed look and feel to the magazine.



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Integration of IIoT in manufacturing platforms

Over the past years, the Internet of Things, or IoT, has greatly advanced and incorporated into the industrial world. The Industrial Internet of Things, or IIoT, collects large amounts of data to be analyzed so actions can be taken to get the desirable results. IIoT has helped to increase productivity and efficiency as well as enhanced quality, system integrity, inventory control, and higher yields.

https://www.cioreview.com/news/integration-of-iiot-inmanufacturing-platforms-nid-28754-cid-133.html



IIoT questions, answered

An estimated 30 percent of manufacturers struggle to understand the IoT. The failure to not fully understand does not stop an estimated half of all manufacturers from planning to prioritize IoT technologies including connected machinery, software, systems, and sensors. IoT will help improve decision-making and efficiency and even help catch equipment breakdowns before they even happen. ■

https://www.industryweek.com/technology-and-iiot/ your-iiot-questions-answered

Digital twins versus simulation: three key differences

Digital Twins and simulations share similar characteristics, but are two completely different ideas. Digital Twins can analyze an exact scenario and copy it to a 3D digital form. Simulations may help see what may happen, but digital twins help to show and analyze what exactly will happen in the future or at the very moment. ■

https://www.entrepreneur.com/ article/333645



Amid climate crisis, renewable energy poised for rapid growth

The climate is changing and there is not much time to solve the problem. To help prevent further extreme weather events, renewable energy must be used by more people. Luckily, the population has begun to make the switch to the environmentally friendly energy sources. Solar energy and wind production have experienced massive growth, and many job openings are now available for renewable energy. Renewable energy will not only save money for those who use it, but also save the planet.

https://thehill.com/blogs/congressblog/energy-environment/444997amid-climate-crisis-renewable-energypoised-for-rapid



Renewable energy costs take a tumble

The cost of renewable energy continues to fall to its lowest ever point. Following the recent trend, renewable energy's cost can now compete head to head with other energy sources such as oil, coal, and gas-fired power plants. Onshore wind and Solar PV renewable energy sources are the most attractive from a price perspective, both helping the prediction that renewable energy would be consistently cheaper than fossil fuels by 2020. The downward cost trends are expected to continue as many people make the switch for cheaper energy as well as being environmentally friendly.

https://www.forbes.com/sites/ dominicdudley/2019/05/29/renewableenergy-costs-tumble/









Climbing higher

Wind turbines present unusual challenges. On-site workers must meet strict training requirements before climbing the turbine.

typical wind turbine tower can be more than 200 feet high, with blades that can extend another hundred feet into the sky. These turbines are usually located in remote sites, often an hour or more from the nearest hospital. If an injury occurs at the top of the tower, workers cannot afford to wait until the local paramedics arrive on the scene.

Because of these extreme conditions, the wind industry requires anybody who visits a turbine site to complete a rigorous safety and first aid certification process. As Phoenix Contact does more business in the U.S. wind industry, it is important to have an employee who can work at customer sites to install and troubleshoot our wind solutions. (See sidebar.)

Ron Wilkes, senior field service engineer in the IMA–VMM Engineering Services group, volunteered to take on this role. Ron completed his initial training in fall 2016. His certifications include:

- OSHA Hazard Recognition Training for the Construction Industry
- OSHA Confined Space Supervisor Training
- Honeywell/Miller Fall Prevention & Protection Wind Energy Competent Climber/Rescuer Training
- American Red Cross Adult First Aid/CPR/AED

"You cannot even go out to the turbine site without showing your certifications," Ron said. The training includes safe climbing practices, but the majority of the time focuses on what to \rightarrow



The view from the top of a turbine in the fall is beautiful.



Ron Wilkes prepares to climb a wind tower

do if there's a medical emergency while in the tower. "You work through different scenarios of how to get a person down from the tower if they have a broken limb, are unconscious, etc." Most of the training requires recertification every other year.

Since becoming certified, Ron has worked with customers in Maine, Colorado, and Maryland to install the ice detection systems before the winter hits. The installation is not an easy task. "Sometimes there are big lifts, or sometimes installation contractors are hanging on ropes to epoxy the sensors right onto the blades," Ron said.

Going up into the tower requires typical personal protective equipment (PPE) – a climbing helmet, fall arrest harness, steel-toed shoes, and safety glasses. "When you visit a tower to complete work, the blades are not operating, but the towers are always moving with the wind. After being up in the tower for a while, at night you still feel the swaying," he explained.

The sites are generally very remote. For example, at the Maine site, the closest fire department is about 20 minutes away, but the hospital is an hour's drive. Each tower has a helipad, and the local medical helicopters have the GPS coordinates for each turbine plugged into their system. With these constraints, on-site workers need to take fast action if somebody is injured.

Ron's training included learning how to rappel down the tower while transporting an injured person. "You need to bundle them and give them cushioning, so they don't break something on the way down. If injured, most people prefer to go down on the inside of the tower, rather than rappel down the outside.



Ice detection needs to be installed before winter hits

There are several sections within the tower – usually about three 90-foot sections – each with a platform in between." He said you could take the person down inside one level at a time, but the confined space presents a challenge.

Fortunately, Ron has not experienced any emergencies on his visits to the wind turbines. He said he's been impressed with the overall safety of the industry. "You learn from the guys who do it every day. They put so much time and effort into safety. Usually if there is an emergency, it's because a person made a mistake and did not follow the specified operating procedure. It's just an incredibly safe industry."

577,0000 wind turbines operating in 41 states, Guam and Puerto Rico (American Wind Energy Association)

Blade intelligence

Over the past few years, the Vertical Market Management (VMM) team has developed several solutions for the wind industry, such as:

 → An automated ice-detection system for turbine blades. Ice buildup can increase the turbine's noise, or it can fall off and injure people or damage property. The automated ice detection system uses sensors attached to the turbine blades. Built-in solar cells with radio transmitters send data about the ice level to a controller located in the nacelle, which is at the top of the turbine.
 → A load monitoring system for blades, developed with one of our partner compa-

nies, WindESCo. This system can help reduce operating expense by lowering failure rate of major components like blades and drivetrain. (See page 16 for more on this solution)

The goal of these new products is to increase both safety and efficiency of the turbines themselves. During the fall of 2018, Ron worked very closely on several installations with Heinrich Dyck, who is on special assignment from Germany in the VMM group. Heinrich is the Business Development Manager for wind solutions and has also earned the necessary certifications to work at turbine locations



Turbine locations are typically remote and difficult to access

"After being up in the tower for a while, at night you still feel the swaying."

The Phoenix Contact Power Team

Phoenix Contact's Energy Team has expertise in many areas. The experts bring decades of experience in developing consistent solutions for reliable automation in power generation and distribution, as well as renewable energies.



Ron Wilkes Senior Field Service Engineer

Craig Zavadil Project Sales Engineer Lance Miller Project Sales Engineer

Abilash Appanvel Lead Solutions Engineer **Dan Sylawa** Senior Business Development Manager – Solar Energy

 Deralee Bowlin

 Vertical Market

 Jason Reed
 Manager –

 Project Sales
 Energy

Engineer



Miguel Flores Project Sales Engineer **Heinrich Dyck** Business Development Manager – Wind Energy

Jim Potter Senior Project Sales Engineer Ananth Benedict Project Sales Engineer **Ben Prier** Senior Business Development Manager – Electric Power



Mohit Dua, CEO of WindESCo

Wind farms get social

Can wind turbines learn from each other? WindESCo says yes, and wind farms can use this data to increase output and reduce operating costs.

"In a society, we learn from one another and learn to live with one another. You're not in isolation, so you're happier," says Mo Dua, founder and CEO of WindESCo, a Boston-based startup in the wind industry. "In the forest, even the trees communicate with one another. There's intelligence built into that, so that aspect inspired me to get into the Social Wind Farms."

oday, Dua and WindESCo are bringing the Industrial Internet of Things (IIoT) to life in the wind industry.

Making wind competitive

After earning his master's degree in renewable energy from the University of Massachusetts at Amherst, Mo Dua began his career at a startup in the Boston area called First Wind. First Wind was an independent power producer, originally focusing on wind energy, although it later expanded into solar. During his time at First Wind, Dua noticed some common problems recurring in wind energy applications.

"The energy production was less than expected, and the operating expense was also higher than expected, so you have lower revenue due to less production, high operating expense due to higher component repair costs. We couldn't really find comprehensive solutions in the market to address those challenges," he said. "So, I felt there's a need to address those two big issues to make wind power more competitive in general. That's why I decided to start WindESCo." WindESCo is a wind asset performance optimization company. The company currently offers three solutions to help wind farms leverage data to maximize profit and performance: **1. WE Boost Basic:** This solution helps wind farms use and leverage existing data to find inefficiencies. More importantly, they can use that data to improve the operating efficiency of wind farms and get more output from them. Dua explained, "That helps our customers increase their revenues...because the plants are producing more."

2. WE Protect: WindESCo developed their blade-sensing system in cooperation with Phoenix Contact. The sensors monitor the movement of the blades. "We use the movement of the blades to determine what the wind conditions are.... The wind conditions affect the loading on the turbine, and different wind conditions affect different components of the turbine."

Dua likened the system to driving on the highway at 60 or 70 miles per hour. "If there's construction going on or the road gets rough, there's a feedback loop that the driver should slow down. Once the driver goes through the rough patch, he or she can speed back up again," he explained. "That kind of mechanism is not there in wind farms, and we're building that kind of intelligence into wind turbines. WE Protect can detect the wind field across the rotor, which you cannot really see, but which our sensing system can sense, and we allow the turbines to modify their behavior to protect themselves."

3.WE Boost Advanced: "The third, and most exciting solution we have, is what we call WE Boost Advanced or 'Social Wind Farms.' Presently, turbines operate individually, but we have developed a platform where the turbines talk to one another and learn from one another.

"If you're on a lake in your paddle boat, and a large motorboat passes through, a wake is created. That makes your small canoe bumpy, so there are some places they don't allow motorboats to go. It's similar in wind. One turbine affects another turbine, because a similar wake is created just like in the lake. By enabling turbines to learn from one another and operate cooperatively, the output of the whole wind farm can be increased, and the operating expenses reduced. We are pioneering this technology."

Dua believes The Social Wind Farm concept is just one factor that sets WindESCo apart from other companies in the wind industry. "There's no company our size that's working on this," he said.

He also points to WindESCo's analytics as another differentiator. While many companies are building dashboards to visualize turbine data, WindESCo builds intelligence from that



The future is strong for the wind industry.

Life in the downwind section of the farm is a lot better now that upwind neighbors are sharing their data.

Images copyright WindESCo. Used with permission.

data. He asked: "How can we extract the maximum value out of the data? We are actually combining engineering-based analytics with machine learning to increase the output of the wind farm. With analytics, we're able to do more than other companies that use hardware to increased output."

And while many companies are helping wind farms predict component failures, WindESCo goes a step beyond that. "We are pioneers in actually preventing failures using our sensing system," Dua stated. "So, rather than look at when a gearbox is going to fail, we're actually focusing on preventing that failure itself. The value is much more to our customers."

Dua said that WindESCo has helped wind farms increase their output by 1 to 4 percent. "This is considered pretty high in the wind industry. Payback periods are less than six months. We've got products actively working on wind farms in eight countries on three continents." WindESCo has also successfully helped customers pinpoint component failure causes. "Some of these wind farms have been in operation for years, and no one has found the cause of some of the problems, like blades cracking or gearboxes failing." WindESCo was able to detect the cause of these problems in six months.

Mutually beneficial partnership

Dua was familiar with Phoenix Contact and approached the company about working together. It took about a year to fully establish the partnership, but the relationship has expanded from there.

"Phoenix Contact has a really great reputation in the market," Dua said. When he tells his customers that WindESCo's hardware is developed and manufactured according to Phoenix Contact standards, they know they can trust the quality of the hardware," Dua said. "And on the technical front, we're constantly developing new hardware, and we source it all from Phoenix Contact. Our team can then use all the pieces as needed when we have different requirements."

"WindESCo is a high valuable technology partner for Phoenix Contact in the wind industry. Both companies work close together on new innovative technologies and their refinement in the field," said Heinrich Dyck, Phoenix Contact Business Development Manager for Wind Energy. "Our work towards enhancing the efficiency of wind turbines is a perfect example of what a fruitful relationship is all about. Together with WindESCo, we have leveraged the expertise from many disciplines to offer

WE Boost WE Protect an innovative and unique technology platform to the wind industry. We will expand this technology platform together to cover the challenges from tomorrow and take wind into 2020 and beyond."

Dua added, "When we jointly go to wind power shows, we put our names together. Customers see that WindESCo is associated with Phoenix Contact, and Phoenix Contact is associated with WindESCo," he said. "I really enjoy working with Phoenix Contact as a company – really solid product, good people. I really appreciate Phoenix Contact's support over all these years."

Future of the wind industry

Dua said the biggest challenge in the wind industry right now is the rolling back of incentives – both in the U.S. and in other parts of the world. He said, "This puts downward pressure on price, which is forcing wind power to get more efficient."

On the other hand, "There is a lot of potential. We are finding that, yes, you can go and get more energy from wind for existing wind farms. Yes, you can reduce failures, and both of those contribute to lower cost of energy, which makes wind more competitive with conventional fossil fuels."

Dua believes the future is strong for the wind industry. He concluded, "Windpower continues to get more efficient. We are happy to be part of that change along with Phoenix Contact." ■.

The SpotterRF Compact Radar systems ensure that security personnel have 100 percent coverage in all weather conditions.

"Using Phoenix Contact's world-class manufacturing resources, we can offer the highest standard of protection for SpotterRF solutions at very competitive prices"

Jon Amack, IndustrialENET's President

Keeping the power grid safe from attack

Surveillance systems guarding critical infrastructure cannot afford to lose power or communications. SpotterRF partnered with IndustrialENET and Phoenix Contact to improve the reliability of its new compact surveillance radar system.

P rotecting critical infrastructure from physical attacks is a growing concern in nearly every industry – transportation, electric power, water/wastewater, oil and gas, and more.

Video cameras around the perimeter are an important step, but the utility must make sure the system is always available and transmitting the required data. The panels controlling these systems are generally located in sealed enclosures and are exposed to wide temperature ranges depending on the geographic location. Many locations also experience high EMI, which can lead to signal disruption or failure.

The improved reliability of the new interface panel gives utility operators peace of mind.

To comply with NERC-CIP-014-1, utilities must make sure their security systems can transmit important data even in rugged conditions.

Security requires the highest reliability

SpotterRF provides perimeter protection beyond fences for critical substations with its patented Compact Surveillance Radar (CSR) systems. The CSR is a radar small enough to hold in your hand. The SpotterRF Compact Radar system ensures that security personnel have 100 percent coverage in all weather conditions, both day and night. Additionally, the system provides integration to PTZ camera systems, providing visual threat identification and tracking.

Working together, IndustrialENET and Phoenix Contact partnered with SpotterRF to create an improved, extended-temperature interface panel that was flexible, small, and OEMpriced.

Originally, SpotterRF created the panels in a more conventional way: by ordering the individual components, building the panels in-house, and conducting the factory acceptance testing and quality assurance testing itself. Panel manufacturing, however, was not SpotterRF's area of expertise. The time and effort required to build the panels distracted the team from its core business of focusing on radar.

To further improve the overall uptime of the full system and protect the SpotterRF radars from surge and power supply disruption, SpotterRF found the Phoenix Contact panel to be a good solution that significantly improved overall system reliability.

Custom panel with high availability

"Both the SpotterRF C20D and C40D models result from our constant quest for advancing perimeter security for partners and customers," stated Logan Harris, SpotterRF CEO. "The new interface panel developed by IndustrialENET allows clients to connect

SpotterRF provides perimeter protection beyond fences for our nation's critical electrical substations with its patented Compact Surveillance Radar systems.

quickly and better protect the SpotterRF systems from surges on power and communication lines during inclement weather."

The upgraded SpotterRF C20D and C40D radars include added short-circuit, over-voltage, and reverse-voltage protection to better streamline setup and installation. Phoenix Contact's expertise in power reliability ensures that the system operates even in extreme conditions.

The user simply has to mount the cabinet to the pole, terminate the power and the network, and the enclosure does the rest. "This new panel meets our high standard for providing critical system networking with high availability video surveillance," stated Jon Amack, IndustrialENET's President. "Using Phoenix Contact's world-class manufacturing resources, we can offer the highest standard of protection for SpotterRF solutions at very competitive prices."

SpotterRF radically reduces the risk of repeat attacks experienced across many industries. The improved reliability of the new interface panel gives utility operators more peace of mind that their surveillance systems will operate reliably through even the harshest conditions.

Ben Prier, Senior Business Development Manager – Electric Power

Wastewater treatment plant goes wireless

A public water and wastewater utility in Pennsylvania serves more than 150,000 residents. When it was time to upgrade the hard-wired data network, the authority decided a wireless SCADA solution was the best option.

3222 billions of gallons used in the U.S.

every day in 2015 (https://pubs.er.usgs.gov/publication/cir1441)

1,200,000 miles of distribution pipes that supply drinking water in the U.S.

(https://www.circleofblue.org/2016/world/infographic-the-age-of-u-sdrinking-water-pipes-from-civil-war-era-to-today)

> A total of 16,956 inhabitants were infected in a cholera outbreak in Hamburg; 8,605 of these people died. The cause: contaminated drinking water

he water/wastewater business is a hidden utility for many of its customers. It is common for people not to have a second thought about where their water goes, once it is down the drain. Despite the "out of sight, out of mind" mentality for many, wastewater operations are incredibly important and vital to public health. Many wastewater systems and lift stations are spread across several miles, which presents obstacles when monitoring and controlling these facilities.

Like most industries, the water and wastewater business has kept up with the trends and emerging technologies. Supervisory Control and Data Acquisition (SCADA) software is becoming the norm among municipal authorities, large and small, across the country. It has proven to be a critical part of treatment plant operations. SCADA enables centralized monitoring and control management, quicker alarm response times, reduced manpower, increased system reliability and cost-effectiveness, and a strong sense of security. Alarm data can be transferred easily to smart devices. \rightarrow

Time for an upgrade

Lehigh County Authority (LCA) is a public water and wastewater utility in Allentown, Pennsylvania. LCA serves more than 150,000 residents with their water and sewer services. The utility treats about 32 million gallons of wastewater each day before it is discharged to the Little Lehigh Creek prior to entering the Lehigh River.

Until recently, the Lehigh County Authority (LCA) wastewater treatment plant – nearly a century old –had relied on a hardwired Data Highway plus (DH+) network. The old system was unable to accommodate the increasing demands of their service. The original system required a large amount of manual labor to trench for conduit to get to the designated location. The DH+ protocol caused a great degree of inconsistency for the facility. With the long wire runs, communication was often severed and yielded frequent drop-outs.

"It was literally stretched to its limits," George Lill, LCA SCA-DA analyst, said. "Distance-wise, we really couldn't add anything to it."

In 1995, LCA had partnered with Kapsch TrafficCom USA, Inc., an international IT and telecommunications company. At that time, Kapsch provided a SCADA solution for the water filtration plant, and the company has continued to work with LCA on other upgrades during the past 20 years. When it was time for another facility upgrade, LCA returned to Kapsch to provide a similar solution.

Solution: Wireless provides advantages

LCA originally considered a fiber-optic or copper hard-wired solution before Kapsch performed a radio study. Receiving just a general objective from LCA to upgrade the communication infrastructure, Kapsch recommended a Wi-Fi radio solution.

Because the plant is not too dispersed and holds few obstructions, a Wi-Fi radio solution proved the best option, yielding the highest bandwidth for the geography and topology of the facility.

Having collaborated on several SCADA wireless communication solution projects with Phoenix Contact, Kapsch turned to them once again for products, support, and technical expertise.

Phoenix Contact's FL WLAN 5101 offers high-speed wireless Ethernet communications up to 300 Mbps. Its robust metal housing measures just 40 mm wide, so it saves valuable DIN rail space. It also has Class I, Division 2 approval, which is required in many wastewater facilities.

The radio was paired with Kapsch's DYNAC software to provide a plant-wide control system. DYNAC is a SCADA software designed to monitor and control numerous types of alarm conditions and other situations. Operators can remotely perform routine system diagnostics to ensure that the pumps are ready for operation at any time, all from a single HMI.

A Wi-Fi solution offered the highest bandwidth for the geography and topology of the facility

The FL WLAN 5101 offers high-speed wireless networking up to 300 Megabits per second

DYNAC software makes it easy to monitor and control pumps around the facility, and operators can view all system conditions at any given time through the HMI in the main pump house

"Making sure that our wastewater is treated effectively and provides environmental protection is really important."

Liesel Gross, CEO of LCA

With the new wireless Ethernet network, all existing programmable logic controllers (PLCs) were upgraded and linked to the redundant database server in the main pump house. The wireless system allowed for instantaneous access to necessary information, such as water levels.

Results: Community expansion and education

When designing and implementing a wireless system, cybersecurity is a big concern.

"You always hear about someone hacking into a system and opening valves, at least in our industry," Lill emphasized. "The Phoenix Contact radios have a lot of security; they have passkeys, and after we installed them and we saw the security on them, we were very happy with them."

The implementation of the wireless solution has proven much more reliable than the dated existing DH+ communications network. It maintains a strong connection, even through heavy rain and wind. It also has reduced labor costs. "Going wireless saved us all that time and money of actually having to run conduit and the fiber or the copper to the locations. It was very cost-effective and much easier," Lill said.

LCA strives to serve its customers with a high level of professionalism, quality, and flexibility. With the implementation of a wireless solution, these goals are met in a much more secure, efficient, and reliable way.

Liesel Gross, CEO of LCA, stated, "Making sure that our wastewater is treated effectively and provides environmental protection, is really important. For us to undertake a project to automate our controls and operate the system through automated controls is important for our operators. It has increased efficiency, security, timeliness of response, and really optimized the overall plant operations."

Dave Eifert, Industry Manager - Water/Wastewater

REGENERATION | **RECYCLING**

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The Alchemists of the Bosporus

Although it has not quite been possible to turn water into wine or lead into gold in Istanbul, the Turkish energy producer Ortadoğu Enerji has mastered the production of energy from waste. Phoenix Contact provides support in a sensitive environment.

Energy from waste – this has become reality at the second largest waste dump in the world

he city on the Bosporus is an international metropolis with a history stretching back over millennia. The huge Turkish city on the north shore of the Marmara Sea has more than 15 million inhabitants. Numerous superlatives are attributed to Istanbul. Among other things, the airport, which has been open in parts since October 2018 and is set to be the largest international airport in the world. On the other hand, the fact that Istanbul operates the second largest landfill site in the world is less well known.

The plant, named Odayeri, opened in 1996 and was decommissioned at the end of 2017. After 21 years of operation, 50 million tons of waste is now stored over an area of 100 hectares – or one million square meters.

Methane - the high-risk patient

After the end of active operation, the landfill was covered with a layer of earth and landscaped. After all, it would not be pleasant for passengers flying into the brand-new super airport, the approach path to which leads directly over Odayeri, to be greeted by the rather unwholesome sight of waste mountains. However, the covering is not there purely for cosmetic reasons.

It seals the waste from above, thus ensuring that rotting takes place within the garbage mountains practically without an oxygen supply. In this process, the organic components of the garbage will decompose over the years, not least thanks to the active involvement of microorganisms. This releases water, as well as the so-called landfill gas, which is made up of between 50 to 55 percent methane.

Methane has a whole range of remarkable properties. On the one hand, it is considered to be an extreme climate killer because the reactive gas damages the ozone layer. It is considered to be 28 times more harmful to the atmosphere than carbon dioxide. Furthermore, it is toxic, meaning that large trees on a landfill, for example, have little chance of survival, because their roots die when they come into contact with methane gas. Methane gas is also highly explosive, meaning that handling the energy-rich waste product is not without danger.

But wherever there are shadows, there is light: methane gas is rich in energy. Energy that can be used to create electricity, provided the gas is collected rather than burned off. And these are precisely the two alternatives facing the landfill operator: burn the gas off or use it to generate electricity.

In accordance with Turkey's current regulations and environmental protection legislation, methane gas that is generated in municipal landfills must be

The gas pressure and condensation water levels must be monitored permanently

"For us, the decisive advantages of Radioline are the easy commissioning and the intuitive, user-oriented configuration software."

Murat Çetindemir, Project Manager

burned off or converted to electricity, providing the necessary preconditions can be met. It was against this background that the bid by private energy provider Ortadoğu Enerji won an invitation to tender issued in 2007 by İSTAÇ, a subsidiary company of the city of Istanbul.

Electricity for the next 25 years

Ortadoğu Enerji is active in particular in the renewable energy sector, generating electricity from landfill gas, wind, solar, and geothermal energy. Electricity generation began in Odayeri at the end of 2008. Electricity will be able to be produced from the 50 million tons of waste for the next 25 years.

There are currently 32 gas turbines in use, generating 33 megawatts per hour. Once some new areas \rightarrow

The project managers Serkan Cakmak (left) and Murat Cetindemir of Ortadoğu Enerji inspect a Radioline station

maximum distance to be bridged in Odayeri.

have been opened up, this figure will increase to 45 megawatts per hour. With a few hardware and software alterations, the gas turbines located there can later be converted to operate on natural gas after the landfill gas runs out. In addition to Odayeri, Ortadoğu Enerji operates three other facilities for generating electricity from landfill gas.

With 437 boreholes, the Odayeri landfill is thoroughly riddled with holes. These holes, which are around 28 meters deep, are used to extract the gas using negative pressure. It is then transported via pipes to 63 collection points. The seepage water is also collected and pumped to the biological wastewater treatment plant. The landfill gas is transported to the processing plant, where the condensation water is removed from it. It is then cooled and compressed before it enters special gas turbines that generate electricity. If too much gas is delivered, it is burned off in the so-called flare.

Monitoring without sparks

The operators must permanently monitor the condensation water level and the gas pressure. In the past, this task was performed on a daily basis by service employees. Due to the size of the plant, however, some collection points were not being maintained regularly. This resulted in blocked pipes caused by excessively high water levels, high maintenance and repair costs, and ultimately to production downtimes.

The distance between the control room and the furthest collection point is 2.7 kilometers, which passes right through the potentially explosive area. This ruled out a cable-supported solution. And this is where the Radioline system comes into play. Wireless data transmission consumes just a small amount of electricity, which can be generated directly via solar cells. The Radioline modules can be deployed in potentially explosive areas, and have a wide voltage range of 19 to 30 volts. The 2.4 GHz version can also span large distances of up to five kilometers. Moreover, this wireless system transmits both I/O signals and serial data, making it very versatile. The underlying Trusted Wireless technology ensures reliable communication, even in harsh industrial environments.

Radioline was installed at five collection points initially. The gas pressure is measured with pressure transmitters and the water level is measured with a float. The three recorded analog signals are transmitted from the collection points to the control room via the Radioline system. A dashboard installed in the control room shows a live graphic display of the signals. These are monitored and logged. If a critical value is reached, an alarm signal is issued to the service employees. They know immediately where to look for the error, and are therefore able to prevent any escalations.

33 megawatts of electricity is generated continuously every hour. Phoenix Contact is therefore really helping modern alchemists to generate energy from waste and to protect the environment. ■

phoenixcontact.com/radioline

REGENERATION | RECYCLING

The wireless fixed link

AAAAA

H₂O

CH₄

Odayeri relies on the Phoenix Contact Radioline system. Wireless modules installed in the control cabinets of the individual pump stations transmit the measured data to the supervisory control room. With Radioline, I/O modules can be connected wirelessly to the controller directly via the integrated interfaces. The data has to be transmitted over distances of up to 2.7 kilometers. This is no problem in fact – data can be transmitted up to a maximum of 32 kilometers (depending on frequency band). The power is supplied via a small solar panel, which ensures autonomy – an important factor in these kinds of potentially explosive environments.

CH₄

H₂O

What is methane exactly?

There's nothing complex about methane: one carbon atom surrounded by four hydrogen atoms (CH₄), which makes it the simplest of all organic compounds. What makes this colorless and odorless molecule, which only becomes liquid at below -162°C, special is its tendency to exchange one or two hydrogen atoms with carbon atoms to form chains. These are then called ethane (C_2H_6), propane (C_3H_8), and butane (C_4H_{10}), and burn or explode very easily, thanks to their energy-rich bonding.

meters; the depth of the boreholes used to extract the gas.

CH

CH.

H20

CH

H₂O

 H_2O

CH4

H₂O CH₄ H₂O CH₄ H₂O CH₄ H₂O

CH4

Can do without oxygen: methane

In nature, methane is produced by the anaerobic decomposition of organic matter. This can occur, for example, in the stomach of a cow, in the mud of a swamp, in biogas plants, or, as is the case here, in a landfill.

bore holes extract the gas.

IN DEMAND

"We can offer an extended commitment to stand by our customers"

Greg Dixson

A lifetime of trust

Phoenix Contact's Limited Lifetime Warranty is a promise that our customers can rely on Phoenix Contact's commitment to our products. Greg Dixson, Vice President of Industrial Components and Electronics, explains how Phoenix Contact gives engineers confidence in their control cabinets.

G reg Dixson recently stepped into the role of Vice President of Industrial Components and Electronics for the U.S. Sales Subsidiary. Greg joined Phoenix Contact in 2005 as the product manager for Automation and assumed the role of Vice President, ICE and IMA Product Management in 2016. Greg is one of the driving forces behind Phoenix Contact's "Cabinet Confidence" approach that resulted in the automation industry's most comprehensive Limited Lifetime Warranty (LLW).

→ Tell us about the idea behind "Cabinet Confidence."

To some extent, the answer to that lies in your question. After all, most of our customers are building an electrical control cabinet. It is important for them to be confident that it can be constructed economically, with up-to-date technology, and that it will perform reliably for many years to come. While we've always talked about how we inspire with our innovations, and that obviously remains true, it is equally important that our customers can fully Design approach would address the cabinet's overall need for Power Reliability. We consider the surge and circuit protection requirements, need for UPS backup in case of a power outage, monitoring of output current – either by separate components or integral to the power supply – along with the manner for distributing the DC power, perhaps with a power distribution block. If you simply have a power supply conversation, these topics often aren't addressed, when in fact, some of these needs could strongly affect which power supply would be best.

→ How did the Limited Lifetime Warranty grow out of that idea?

We have always been known for making high-quality products with high reliability. The great thing about Cabinet Confidence as a design approach is that when the need for surge and power is addressed in the original design of a panel, a customer can expect even higher reliability across the full breadth of Phoenix Contact

trust the reliability of our products for their most critical applications. With "Cabinet Confidence," we've formalized our commitment to allow for this confidence in our products and solutions.

→ Phoenix Contact has more than 60,000 products, comprising dozens of product families. How did you approach organizing them into the Areas of Functional Design?

In some ways, the byproduct of almost 100 years of innovation is we now have a catalog of products that broad. In fact, we offer a variety of different products that are essentially performing the same tasks in slightly different ways. For example, we have many different options for a 5 A power supply, a relay, or a terminal block. Determining the right one for a particular application is based on the small details of what matters most in each situation. The simple truth is that while having many small detailed product conversations, we can sometimes lose sight of the bigger tasks that need to be addressed for a truly optimum panel design. The Areas of Functional design are inspired by our experiences with machine builders and other customers. By grouping products into larger functional collections, we can more fully address the customer's needs than by just helping them to select a single product.

For example, rather than just picking a power supply for the voltage and amperage of an application, an Area of Functional

electronics, connectivity, and automation products that make up the rest of the application. Once we know those power and surge needs are properly addressed, we can offer an extended commitment to stand by our customers with this additional warranty.

➔ What type of feedback from customers have you received about the LLW?

Aside from some customers thinking it's too good to be true, the feedback has been quite positive. Obviously, some items are excluded from the LLW: HMI or IPC products with displays, normal wear and tear on electromechanical relays, etc.

However, when customers realize that by following our recommendations, they can now rely on Phoenix Contact to repair or replace any of the covered items that are later determined to be defective, they get pretty excited about the program. And that's our goal.

➔ How would you define trust?

For us, it means that our customers can have complete peace of mind that they have chosen a reliable, quality product. Perhaps even more importantly, they can have peace of mind that if something ever seems like it's not working right, we are committed to fixing it. ■

Will 5G live up to the hype?

Since 2010, 4G LTE has been the de facto standard for cellular communication technology. 4G LTE provides the ability for consumers to video chat with friends, work remotely, stream movies, and connect billions of smart devices to the Internet all over the cellular network. The demand for cellular Internet connectivity has grown so much that a fifth generation of cellular technology, known as 5G, has been developed and is starting to make a lot of headlines lately.

The majority of the U.S. is currently covered by 4G LTE networks.

5G promises blazing fast speeds and negligible latency to enable connectivity in every industry from autonomous vehicles to smart factories, but will we really see a smart, connected world thanks to 5G? This article aims to discuss the major challenges with 5G and use those challenges as a basis to predict which markets will actually benefit from 5G in the near future.

Infrastructure cost is the biggest challenge with 5G

5G requires small-cell antennas to be placed approximately every 500 feet to provide the promised speeds and guaranteed availability.¹ 4G LTE antennas carry signal 100 times farther than 5G antennas, yet the United States still requires more than 320,000 cell sites to provide 4G LTE coverage to the majority of the country.² Building the necessary infrastructure to provide 5G to the entire United States would cost cellular providers a fortune and would take many years to deploy. As a result, cellular providers will initially only deploy 5G in areas where they expect an immediate return on their investment.

Immediate 5G users (0 to 5 years)

Cellular providers plan to target the largest possible population with 5G, so they can see the fastest return on

their infrastructure investment. As a result, 5G will first be made available to consumers living in major metropolitan areas over the next five years. The 5G in metropolitan areas will be specific for mobile devices and fixed wireless access for home Internet. Consumers already upgrade their smart devices every year to stay up-to-date with the latest technology. Cellular providers plan to take advantage of this trend and compete for market share by pushing 5G to consumers.

Short-term 5G users (five to 10 years)

The vision for a smart city is an urban area where vehicles, pedestrians, traffic lights, parking meters, Solar farms are often located in remote locations, which will probably not have 5G coverage for many years.

etc., are all communicating with each other over the Internet. Since 5G infrastructure will already be installed in large cities, 5G has the potential to turn this vision into a reality over the next five to 10 years. Cities, however, have two major obstacles to overcome before this dream becomes a reality.

Government will first need to mandate a smart city initiative and provide funding to upgrade all infrastructure to be compatible with 5G. This mandate will most likely be an effort to improve pedestrian safety or reduce congestion. In the meantime, third-party companies will need to develop software that connects all these devices together in a meaningful way. This software will need to be

thoroughly tested and validated to prevent any accidents.

If funding and software are available, smart cities could start to appear in the next five to 10 years; however safety concerns could also prevent this from happening. Fully autonomous vehicles, for example, have been around since the 1980s and have yet to become commercially available.³

Long-term 5G users (10 years to never)

The iPhone 4 was released in 2010 and created a widespread demand for fast, reliable 4G LTE connectivity anywhere in the country. The strong consumer demand for 4G LTE corresponded to an exponential increase in data plan revenue, which ultimately motivated cellular providers to spend the next 10 years building cell towers all over the country. 5G, on the other hand, currently lacks a powerful demand-driving use-case like the iPhone that rationalizes investing in infrastructure outside of major cities or suburbs.

Every article or press release about 5G will discuss the theoretical applications of 5G (smart manufacturing, connected healthcare, etc.); however industries with assets outside of major cities are not actively demanding the speeds of 5G. They have been operating just fine with traditional connectivity technology like WiFi and 4G LTE. Without a true demand for 5G, it does not make financial sense for cellular providers to invest in 5G infrastructure in remote areas. Industries with remote assets like agriculture, oil and gas, energy, manufacturing, logistics, water/ wastewater, etc., may not see 5G for at least 10 years if they ever see it at all. While true 5G might not be relevant for industries in remote areas, these industries will see new low-power, wide-area (LPWA) cellular technologies like NB-IoT and LTE-M. LPWA technologies leverage a subset of the LTE standard and are optimized for long-distance, machine-to-machine, indoor, low-cost, or battery-powered applications.

Conclusion

Consumers in major cities can expect to see 5G in the next five years. The cost of infrastructure, however, will prevent 5G from appearing in industries operating outside of major cities for at least five to 10 years or more. Industries outside of major cities will instead start to embrace new LPWA technologies such as LTE-M or NB-IOT.

David Hoysan – Lead product marketing specialist for cellular, IIoT, and cloud technologies

Additional resources:

- → For more information about the 3G network shutdown, read "Three reasons for the 3G sunset." https://www.linkedin.com/pulse/three-reasons-3gcellular-network-sunset-david-hoysan/?published=t
- → Are you concerned about 4G LTE going obsolete soon? Read "Will 5G live up to the hype?" https://www.linkedin.com/pulse/what-cost-upgrade-4g-lte-david-hoysan/?trackingId=9c5DcqsDwFh2C8DItPIEwg%3D%3D

References:

- https://www.celltowerleaseexperts.com/cell-tower-lease-news/5g-celltowers-are-they-safe-who-decides-where-they-go/
- 2. CTIA. (July 15, 2018). Number of mobile wireless cell sites in the United States from 2000 to 2017 [Graph]
- 3. https://en.wikipedia.org/wiki/Self-driving_car

New Vice President and **General Manager**

Kevin Zak is new leader of U.S. Sales Subsidiary

Phoenix Contact USA recently promoted Kevin Zak to the role of Vice President and General Manager. Kevin, who will celebrate his 25th year with Phoenix Contact later this year, will oversee the

company's U.S. Sales Subsidiary, including sales. marketing, channel operations, and service functions within the United States. "I am excited to announce Kevin's new

Kevin's exemplary performance throughout the years and solid development as a leader made him a perfect candidate to assume the VP & GM role for our subsidiary," said Jack Nehlig, President of Phoenix Contact USA.

Governor Wolf visit Phoenix Contact

Pennsylvania Governor discusses importance of apprenticeships and other job training programs

Pennsylvania Governor Tom Wolf visited Phoenix Contact USA headquarters on Tuesday. July 9. 2019, to discuss the importance of workforce development programs in the commonwealth. Jack Nehlig, President of Phoenix Contact USA, hosted the governor on a tour of Phoenix Contact's manufacturing and logistics facilities.

During the tour, Governor Wolf met several graduates of Phoenix Contact's apprenticeship programs.

Afterwards, the Governor held a press conference to highlight his PAsmart initiative, which funds iob training programs like apprenticeships. Daniel Koprowski, a mechatronics technician at Phoenix Contact, shared how he not only earned a degree through the Phoenix Contact Apprenticeship program, but he also gained valuable work and life skills, without accruing student debt.

Security for smart buildings

Phoenix Contact hosted fourth annual 'Smart Community' conference

As buildings become more connected, engineers and building automation professionals need to ensure the highest level of data security and integrity to keep their systems running. To help address these issues, Phoenix Contact USA hosted its fourth annual Smart Communities conference on Tuesday, August 20, at the company's U.S. headquarters, 586 Fulling Mill

Road, Middletown, Pa. This year's theme was "Maintaining Data Integrity in Smart Buildings and Infrastructure." Learn more and watch the video of this year's conference at: www. phoenixcontact.com/ smartcommunity.

Expanded Logistics Center for the Americas

Expanded warehouse will improve customer service

After more than a year of construction, Phoenix Contact's expanded Logistics Center for the Americas (LCA) is now fully operational. The project added an additional 94,000 square feet to the original 75,000 square feet.

The additional square footage gives Phoenix Contact 36 percent more tote storage capacity, and the expansion should increase overall throughput capacity by 35 to 40 percent. Doug Ferguson, Vice President of Americas Operations Services, stated, "The big challenges have been tying in the physical parts of the logistics automation, while minimizing impact to our normal operations. We were already running at full capacity and even needed frequent overtime to meet the demand. Creating carve-outs to do some of the interfaces and connection from the new building to the old was tricky."

Color change

Gray is not just gray

"A consistent appearance is one of the indicators of a strong brand." Bearing this in mind, Project Manager Klaus Metzger and his colleagues have rebranded the products of the Business Areas ICE and IMA – more than 10,000 articles in around 100 product groups – even more clearly as Phoenix Contact products. This uniform appearance gives a control cabinet a neater look.

As part of this project, the team decided upon just two shades of gray for all DIN rail products. While the dark gray line represents the normal color of the terminal blocks, the light gray represents a function. All pluggable elements are easy to identify.

The new look was presented for the first time at Hannover Messe 2019. ■

U.S. Department of Commerce recognizes Phoenix Contact

Investment leads to job creation and economic growth in Pennsylvania

The U.S. Department of Commerce recognized Phoenix Contact for its positive investment in the United States, leading to job creation and economic growth. Ian Steff, Deputy Assistant Secretary for Manufacturing at the U.S. Department of Commerce, and Brian Lenihan, Executive Director for Select USA, presented a certificate to Phoenix Contact executives at the Hannover Messe in Hannover, Germany, on April 2.

Phoenix Contact is a leading manufacturer of automation, control, power, and connectivity products, with global headquarters in Blomberg, Germany. The company established a U.S. subsidiary in 1981. Today, the company employs more than 800 people in the U.S., including more than 600 at its U.S. headquarters, located just outside of Harrisburg, PA. The Pennsylvania site encompasses more than 360,000 square feet and includes development, manufacturing, sales, support services, and a logistics center serving North and South America.

Connect with Confidence

Confidence comes from knowing with absolute certainty that the choice you made is the right one.

We at Phoenix Contact understand the value of confidence, and for over 90 years we have taken great pride in producing extremely reliable, high-quality

connection products, coupled with first-class service and support.

We recently launched the "Connect with Confidence" campaign to show how customers can make power, control, and network connection choices with complete confidence. Over the coming months, look for print ads, brochures, videos, and other resources to help your customers ensure quality, reliability, and performance – every time.

Learn more at www.phoenixcontact.com/ connectconfidence

At the award ceremony (from left to right) Dirk Moseke, Developer HPC; Robert Ewendt, Project Manager HPC; and Michael Heinemann, CEO Phoenix Contact E-Mobility with Dr. Vladimir Klitschko, Honorary Laureate 2019, and Michael Oelmann, Managing Director German Economy. Photo: **Uwe Erensmann/@uepress**.

Innovator of the Year

DDW recognizes Phoenix Contact E-Mobility as "2019 Innovator of the Year"

Die Deutsche Wirtschaft (DDW), a German information portal, recently named Phoenix Contact E-Mobility as the "2019 Innovator of the Year." Michael Heinemann, CEO of Phoenix Contact E-Mobility, officially accepted the Business Award from DDW at a ceremony in Düsseldorf, Germany, in May. Phoenix Contact E-Mobility also won a People's Choice Award.

The innovative high-power charging (HPC) technology that Phoenix Contact E-Mobility developed for its quick-charging connector was decisive for the nomination. With HPC technology, electric vehicles can be charged for a range of 100 km in just three to five minutes. It is a key building block for the mobility of the future. The technology enables electric cars to charge in the time it takes to visit the gas station today.

The heart of this crucial advanced development in charging technology is an environmentally friendly, low-maintenance liquid cooling system integrated into the charging connector and cable. It enables charging powers of up to 500 kW. The system's cooling power is regulated based on demand via real-time temperature measurement that also safely prevents overheating. ■

The next issue will be published in November 2019

Mobility

Everything in motion, everything flowing. Mobility comprises much more than just traffic. Air and rail, ship and road, transportation routes and their navigation, the flow of goods and logistics – and the people at the center. An exciting subject that moves us all. The next issue of UPDATE included!

REPORT Metropolis examined

Guests in a European metropolis on the lookout for Phoenix Contact applications

PROJECT

Interview

Between big block and Tesla, how does the U.S. deal with the rapid technological shift in mobility?

TECHNOLOGY Cooled connectors

Everybody looks at the vehicles. We take a look at a detail without which electromobility wouldn't have a chance

LEGAL INFORMATION

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