VAISALA NEWS

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Vaisala in Brief

Vaisala is a global leader in environmental and industrial measurement. Building on 75 years of experience, Vaisala contributes to a better quality of life by providing a comprehensive range of innovative observation and measurement products and services for chosen weather-related and industrial markets. Headquartered in Finland, Vaisala employs approximately 1,400 professionals worldwide and is listed on the NASDAQ OMX Helsinki stock exchange.

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Sustainable Solutions Drive Technology Leadership

At Vaisala, we know the weather business, our capabilities in measuring the atmosphere span nearly eight decades. We provide products and services that help increase efficiencies in a wide range of industries, from aviation to pharmaceuticals and to mitigating the impacts of severe weather phenomena.

Compared to its size, Vaisala has an essential role in today's society through its technologies that keep people safe every day. We are ambitious not only in our technological advances, but also in taking action in ensuring a sustainable future for our customers and other stakeholders, and simultaneously creating a more sustainable business model for our industry. Vaisala is taking steps today, so that we can be competitive tomorrow.

Sustainability is an integral part of building weather-ready nations. At Vaisala, over 97% of our turnover comes from international customers. A significant portion of this comes from developing countries. Often delivering world-class solutions to locations around the world requires creativity and thinking outside of the box. Working together with our local partners, we take pride in the role that we have in safeguarding lives and property, bringing products and services where they are needed the most. Often we see that information is really the key: having the data to back up decision making, be it harvesting of your crop, preparing for lightning events, or knowing where and when extreme weather conditions will emerge next.

As the world is slowly but surely turning towards renewable energy sources to power future development, Vaisala is among the innovators of how the renewable energy industry will apply technology and weather prediction to power the wind and solar sites. Investors looking to drop fossil fuel companies altogether from their portfolio, accelerate the transition to non-fossil fuels. Companies like Google, Apple, Ikea and many others have bold multibillion dollar investment programs into their own wind and solar farms. Although Vaisala's investments are miniscule compared to the big players, we have the same ambition, of powering companies with renewable energy.

Vaisala recently announced its commitment to becoming a 100% renewable energy powered company by 2020. I am confident that this commitment will encourage other companies to follow suit.

Vaisala acknowledges that renewable energy is critical to the transition to a low-carbon economy. Not only do we see that the private sector should show leadership, we want to be in the forefront of developing technologies that makes it possible for industries to transition into efficient renewable energy sources.

Kjell Forsén
President and CEO

AUTOSONDE
Installation in Antarctica

Vaisala Field Engineer Kalle Rieppola working together with our partners, installed an AUTOSONDE at Korean Antarctic Jang Bogo station, Terra Nova Bay, Antarctica late last year. Korea Polar Research Institute (KOPRI), the operator of Jang Bogo station, will use the AUTOSONDE to measure prevailing conditions in this remote and challenging environment.

The scale and scope of Vaisala's capabilities are often highlighted. And these proven capabilities are based on facts. From harsh Arctic environments to tropical regions, even in outer space, Vaisala products can be found collecting and analyzing valuable data for our customers. These harsh environments put Vaisala's products to the ultimate test, every day. The AUTOSONDE installed in Antarctica is no exception.

Kalle Rieppola, Field Service Engineer, who completed the installation explains, "a typical day started at 7:00 am, with breakfast at 7:30. Then we went to work," Kalle says. Showers and cafeteria times were regulated to accommodate the large amount of staff on site. In addition to researchers, there were plenty of construction people on location as well." He explains that, "lunch was served around 12:00-13:00 and dinner was at 17:00-18:00. In the evenings the cafeteria served a late snack as well. Due to the tight schedule the installation was continued after dinner. The actual installation started at midnight on the second day as the crane was not available until then."

For Kalle, the AUTOSONDE installation in Antarctica was truly a unique experience, which he will always remember. "As the rooms were quite small, I was given a small desk in the lab." Kalle explains that the room had space for four staff with two small tables. "The rooms were just slightly larger than those on the ferry between Helsinki and Stockholm."

Kalle Rieppola, Field Service Engineer, took an unforgettable trip to our planet's southernmost continent to install the AUTOSONDE for the Korean Polar Research Institute.

Following flights from Finland to New Zealand, travelling to the actual installation site location took 10 days by ship from Christchurch.

Year-Round Research

Some 1000 to 5000 people are living at various research stations on Antarctica throughout the year. The AUTOSONDE installation took place during the Antarctic summer, when the conditions are mild enough to support key activities in preparation for the coming year. The summer period allows organizations and research institutes the opportunity to stock up on supplies. Also, new teams arrive to replace people that have been on the continent for the previous year.

During his time with scientists, engineers and researchers on the KOPRI base, Kalle highlighted that the vast open space can be misleading, "for example, when you see a mountain in the distance, it looks to be just a few kilometers away. And then you learn it is actually over 30 kilometers away."

Kalle says that during his time on the continent the timing was actually quite tight to complete the installation. He states that it was truly an unforgettable trip and with a smile notes that eventually the AUTOSONDE will need to be updated to use the new Vaisala Radiosonde RS41.

Mr. **Chanseok Park**, Vaisala Sales Manager for Korea states, "KOPRI is conducting regular soundings from mid-February to late October and ozone sounding is due around the period of 'ozone hole occurrence' (mid-August to mid-October) once a week. The KOPRI staff in Antarctica is very satisfied with the performance of the AUTOSONDE in such a demanding environment."

In collaboration with the Korea Meteorological Administration (KMA), a researcher has been dispatched from KMA headquarters to Jang Bogo station to operate the AUTOSONDE and analyze sounding data. Once internal data evaluation has been completed, the AUTOSONDE will produce data to the WMO's Global Telecommunication System. In addition to the AUTOSONDE, a complete Vaisala AWS system and optical sensor such as ceilometer and present weather sensor are supporting the operational research activity.

According to KOPRI, "We were looking for truly reliable automated sounding system which can operate in extremely demanding condition and there's no doubt that we have made right choice." Korea is the 10th country which has more than two research bases in Antarctica.
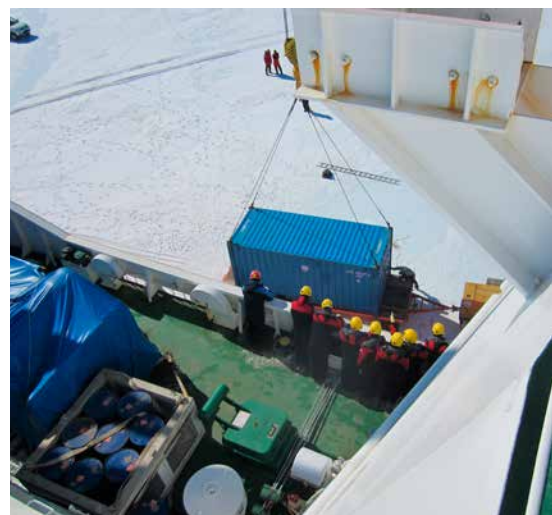
Vaisala AUTOSONDE arrived with the installation team, first by ship and then by tractor.

The installation was completed between 7th and 18th of December, 2014.

The Vaisala DigiCORA® Unmanned Sounding System AUTOSONDE is an important tool in the drive for meteorological data availability. With AUTOSONDE, national weather services can extend the coverage of their upper-air networks to geographically remote, hard-to-reach locations and thus develop a more comprehensive synoptic upper-air program. Vaisala's AUTOSONDE has proved itself over the years in a wide range of climates. It is an integral part of many national upper-air networks.

Successful launch of Vaisala radiosonde from AUTOSONDE installed at KOPRI Jang Bogo station

Mitigating the Risks of Climate Change

Climate change is already beginning to transform life on Earth. This is a critical development for us all as individuals and it also affects Vaisala as a company. We believe it is our duty to provide means for accurate measurement of the environment. Our industrial products and solutions provide customers with the means to improve their operational performance and lower their environmental impacts, while our weather measurement systems increase safety and predictability in weather critical operations.

In 2014, Vaisala was recognized for its performance and transparency in regards to reducing carbon emissions and mitigating the risks of climate change. Vaisala was included in the Nordic Climate Disclosure Leadership Index (CDLI) and on the A List of the Global Climate Performance Leadership Index (Global CPLI), a global index of companies demonstrating a commendable approach to climate change mitigation.

Energy Consumption at Vaisala

Consumption of energy, including electricity and heat, for the Group in 2014 amounted to 16.7 GWh (60,120 GJ), a rise of 0.2% from the previous year. Heating at Vaisala's Head Office totaled 4.92 GWh, an increase of 2.5%. The main building's geothermal power system produced all the required heating in the winter and cooling in the summer, without the need to purchase any additional district heating. Solar panels at our Vantaa and Boulder sites generated a total of 0.21 GWh of solar energy.

During 2015, Vaisala's headquarters and main production facility in Vantaa, Finland moved to utilize 100% renewable energy in all the site's operations. The site has its own solar electricity and geothermal heat production. The remaining electricity is acquired from a local wind farm through our electricity provider and the remaining heat is provided by a state-of-the-art waste incineration plant.

Reduction of Energy Consumption and Emissions

Although Vaisala is not part of an energy-intensive industry, we continuously strive to do better in terms of energy efficiency, both for electricity and heat, in our offices and production facilities. In 2013 we achieved and exceeded our 9% energy efficiency target three years ahead of schedule, which resulted

in a 10% efficiency gain at our Head Office. However, we did not stop at this, as we were able to squeeze an additional 1% improvement in energy efficiency last year by investing in our production facilities. Altogether energy efficiency has improved by 1,770 MWh (6,372 GJ) from the 2008 base year in the Head Office. This has cumulatively reduced carbon emissions by 2,145 tonnes CO_2e since 2008. In 2014, energy efficiency was improved by 150 MWh (540 GJ), which reduced our emissions by 38.85 tons CO_2e.

All savings from energy efficiency actions are also reported to Finnish authorities who monitor the energy efficiency of companies. We are committed to continue carrying out actions to optimize our energy consumption in everything we do, although this may become more challenging each year as we make positive progress.

Even though our business has been growing and the headcount has increased steadily over the past five years, we have been able to maintain a flat energy consumption trend. This is due to the successful energy efficiency actions and improved utilization of existing building space. Last year, for example, one of our factories increased production capacity simply by switching to two working shifts.

All investments in our facilities should also have an environmental dimension. Our Head Office has LEED gold level certification and utilizes geothermal energy extensively for heating and cooling as well as solar power to generate carbon free electricity. Vaisala's second largest site, at Boulder, Colorado, also uses solar power, with its own array of solar panels on site providing roughly 7% of the energy consumed.

Our Carbon Footprint

Vaisala's actions and transparency in mitigating climate change impacts and risks were recognized last year

in the CDP (formerly Carbon Disclosure Project) climate change survey. Our performance was awarded the highest A rating and our transparency was among the best in the world, scoring us 99/100 points.

Our carbon footprint contains a range of upstream and downstream components, of which purchased energy, business travel, and logistics appear to be the most significant. In 2014 we also turned our attention to greener employee commuting and started to look at indirect emissions from energy used in products, starting with our weather radars, consuming a total of 4,238 GJ per year.

Over the years we have continually improved our greenhouse gas accounting. Accuracy has also improved and the scope of calculations is now more comprehensive than ever before. Vaisala calculates the carbon footprint of its operations using well-known methods such as the Greenhouse Gas Protocol. The components of the footprint include direct emissions from facilities and the service fleet, electricity and heat, shipping of finished goods, and business travel. Emissions accounting covers all offices with more than 15 members of staff. Shipped goods, inbound logistics and waste, however, are only included in the accounting for Finland. We have calculated the carbon footprint retroactively in order to maintain comparability over the reporting periods. Since 2013 our carbon footprint figures have been assured by a third party assurance provider.

CDP ™ CLIMATE DISCLOSURE LEADER 2014

CDP ™ CLIMATE PERFORMANCE LEADER 2014

IRIS Focus – Modern Weather Radar Software

Vaisala entered the weather radar business in 2006. Through its acquisition of Sigmet and the development of its own technology, Vaisala has quickly become the leading provider of C-band weather radars. Vaisala's technology can be found in most weather radars throughout the world.

This development project had four main goals:

- Improve usability to provide the same type of experience you, our customers, have come to expect from any number of the modern applications you use on a daily basis.
- Reduce complexity so the interface is simple and easy to understand.
- Speed up development time now and in the future by using common third-party open source modules, such as geographic information systems.
- Test and audit IRIS Focus using the latest information security standards via the use of third-party security firms.

As a result of the development work, better graphics display and data processing capabilities, and leading data quality and accuracy, the IRIS Focus Weather Radar Software raised the bar for analyzing weather radar data. IRIS Focus gives customers many new ways to experience and analyze their weather radar data for better understanding and quicker decision making.

Putting Customer Needs First

With the primary goal of removing the obstacles that make the system difficult to use, the development team devoted considerable time to learning how customers actually used the software so they could

Vaisala recently introduced the new IRIS Focus Weather Radar Software. With the goal of reducing complexities and delivering a user-friendly experience, the modern look of IRIS Focus and the rich set of tools it provides enable meteorologists to view and analyze

their weather radar data like never before.

In 2013, Vaisala began developing its third major modernization project of the IRIS Weather Radar Software. In recognition of the need to put powerful, easy-to-use analysis tools into the hands of meteorologists.

reduce complexity and provide meteorologists with an effective tool that requires little to no training.

Interactive tutorials provide users with information on how to use certain features. Also, context-sensitive help and tool tips provide additional assistance throughout the program. The user interface, including the help features, can be displayed in four languages: English, Russian, Spanish, and Portuguese.

Analyze Data Faster

Part of what makes IRIS Focus a step above current offerings in weather radar software is the display options and the opportunity for users to see more data from one screen. IRIS Focus allows customers the possibility to view and animate up to four different radar products within the same window. Multiple data points can be layered, such as radar reflectivity and radial velocity, on one map. Also, non-map data can be displayed side by side with mapped data. Using the zoom function will regenerate data at the highest resolution possible for the screen size, helping customers to see the finer details.

Understand Storms to Make Better Decisions

Weather radar data are critical components of weather forecasts, as well as accurate precipitation estimates and classification. Vaisala has been a pioneer in developing dual polarization C-band weather radar technology and the algorithms that produce higher quality and more reliable data. IRIS Focus enables meteorologists to dig deeper into their data in the least amount of time, with display and analysis tools that enable better understanding of storm movements and structures.

Using the storm tracking tool, users can mark the location of a storm at different points in time to help project its future movements. With this tool, users have the ability

to compute rate, time, and distance equations. To help understand the three-dimensional area of a storm and its evolution in time, the cross-section tool allows users to see data at different altitudes with respect to other data points, which is especially helpful when looking at curved phenomena such as frontal boundaries.

With IRIS Focus, observations can also be extended for better awareness of convective storms beyond the radar range. For example, weather data outside of the range of the radar, such as lightning data from Vaisala's Global Lightning Dataset GLD360 can be layered. Combining these tools into one easy-to-use system allows users to maximize the value of all their weather data and create better forecasts.

Built on a Common Web-Based Platform

One of the common expectations these days is that the tools, data, and applications needed for work can be accessed anywhere using just a web browser. With this convenience comes the inevitable need to protect the data, using the most up-to-date security protocols. IRIS Focus allows users to access their data from anywhere, and easily and securely share their data with colleagues in other departments or outside of the agency.

IRIS Focus shares a common technology platform with Vaisala's Thunderstorm Manager and the Vaisala AviMet® programs. This allows users to seamlessly transition between these applications without having to learn new navigation. In addition, the common software platform helps accelerate future development of next-generation systems, because, as new functionality comes available, it can be integrated into multiple applications.
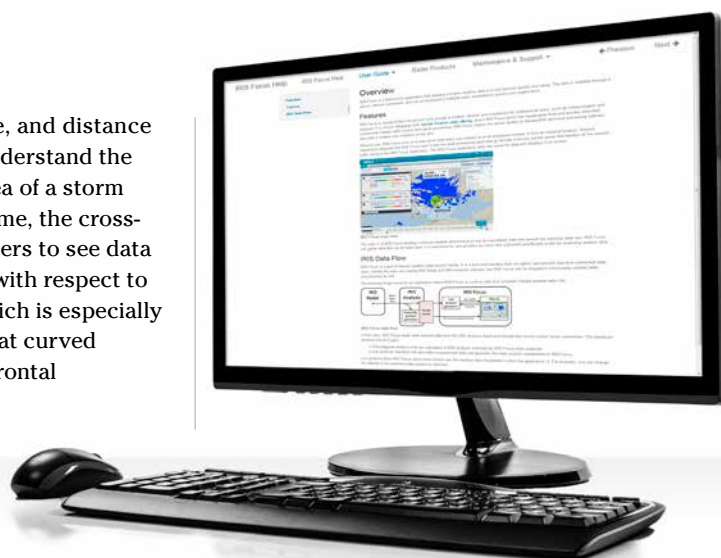
IRIS Focus provides a new approach to working with weather radar data. From the simple and easy-to-understand interface to the multi-panel display and storm tracking tool, IRIS Focus has the tools customers need for faster analysis of their data and better understanding of storms. Ultimately, IRIS Focus enables users to experience more from weather radar data.

Safeguarding Quality with Vaisala's Continuous Monitoring System

Efficient and Compliant Environmental Monitoring Safeguards Drug Quality in an Award-Winning Pharmaceutical Manufacturing Firm.

Shanghai Fudan-Zhangjiang Bio-Pharmaceutical Co., Ltd was founded in November 1996 in Shanghai Pudong High-Tech Business Park. From the outset the company operated under its vision statement: "The More We Explore, The Healthier We Are." Shanghai Fudan- Zhangjiang Bio-Pharmaceutical Co., Ltd specializes in innovative research, development, and production of biotechnology. As an innovator in the bio-pharmaceutical arena, the company holds intellectual properties as one of its key resources. Through nearly 20 years of hard work, Shanghai Fudan-Zhangjiang Bio-Pharmaceutical Co., Ltd has developed cutting-edge products such as genetically engineered and photodynamic drugs, as well as nanotechnology. This work has resulted in competitive advantages that will allow Shanghai Fudan-Zhangjiang Bio-Pharmaceutical Co. to bring numerous new medicines to market in the coming years.

Leveraging its capabilities in biopharmaceutical development and manufacturing, Shanghai Fudan- Zhangjiang Bio-Pharmaceutical Co., Ltd leads national R&D projects. These projects include the "National Key Science and Technology Project Program" and the "National High-Tech Research and Development Program" as well as Special Science and Technology Projects of China's National Major New Drug Development Program.

Since 1998, the company has been continuously recognized as a leader of Shanghai's growing biotech and high-tech sectors. In addition, in 1999 the company was approved for an "Enterprise Post-Doctoral Research Workstation" by the Ministry of Personnel.

Securing Quality

To guarantee drug quality and patient safety, Shanghai Fudan-Zhangjiang Bio-Pharmaceutical Co., Ltd formulated its internal standards to meet or exceed the requirements of cGMP regulations, FDA 21 CFR Part11 and Annex 11. Before upgrading their environmental monitoring system, the company used simple data loggers to measure and record temperatures. Personnel would manually record data for review and archiving at least twice every day. With dozens of data records in each production site, the quality management staff was unable to ensure that records were collected at the same time, and on the same data points. Concerned about their ability to continue to meet regulatory requirements as operations grew, Shanghai Fudan-Zhangjiang Bio-Pharmaceutical Co., Ltd sought a better solution for environmental monitoring.

The Vaisala Continuous Monitoring System comprises multi-functional data loggers and viewLinc monitoring software. Data loggers feature integrated sensors for measuring temperature and humidity, or use current or voltage inputs to record pressure difference, CO_2, level, particles, conductivity and other critical parameters. Some types of data loggers can also integrate a Boolean channel for a gate switch or alarm contacts. Each data logger can connect directly to a computer through a USB port, and to existing networks via Ethernet, PoE or Wi-Fi. Powered by lithium batteries with a life-span of approximately 10 years, each logger also contains autonomous internal memory for recording parameters at the point of measurement. With independent power supply and storage capacity, records are never lost or compromised by power or network interruptions.

The viewLinc monitoring software is a Windows® operating system that delivers 24/7 monitoring, multi-stage alarming, (local and remote), real-time trends and continuous, gap-free records.

Zhou Dong, Quality Department Shanghai Fudan-Zhangjiang Bio-Pharmaceutical Co., Ltd. says; "We chose the viewLinc Continuous Monitoring System because Vaisala's data loggers have reliable accuracy across our industry. We first adopted Vaisala's temperature and humidity monitoring products in 2012, and since then we have continued to upgrade our temperature and humidity monitoring with Vaisala's systems.

Each upgrade has seen an increase in our work efficiency."

"We've found Vaisala's validation technicians are well trained, easy to work with, and continually provide onsite and remote assistance. They've provided detailed and careful training to our staff and we are pleased to have them as partners in helping us achieve our goals in Quality Control and regulatory compliance."

"One major difference between viewLinc and other monitoring systems is Vaisala's reputation for reliability in industrial measurement. The system's data loggers are very stable and accurate. The data recording, monitoring capabilities and reporting features of the viewLinc system are powerful – we can have data from dozens of monitored locations easily summarized into a report for comparison and analysis. This is extremely convenient and timesaving."

"The viewLinc alarm functions are especially helpful because we can customize alerts by type, area, personnel schedules and recipients."

For more information on viewLinc, please visit:
www.vaisala.com/viewLinc

Challenge

- The standards of the Fudan-Zhangjiang Bio-Pharmaceutical Co., Ltd ensure that temperature and humidity are maintained within application specifications in all laboratories, incubators, cryogenic refrigerators and storage areas.

- By adopting an enterprise-level monitoring solution, multiple users were enabled to remotely manage their areas of responsibility, generate customized reports, and receive remote alarms in the method most appropriate for each user: phone, PC display, text, or email.

- Sensor-to-network connectivity is flexible and ranges from Ethernet, to Wi-Fi, as required by an application.

Solutions

- The viewLinc Continuous Monitoring System provides secure access from designated PCs on the network.

- Alarm notification is user-configurable and flexible, with options including: email, PC display, text to phone, local audible/visual, and more.

- Environmental data is backed up and archived automatically.

- The audit trail ensures that all historical data and charts/reports conform to the requirements of FDA 21 CFR part 11 and Annex 11.

- viewLinc has an optional IQ/OQ (Installation/Operation Qualification) for comprehensive validation.

Benefits

- System administrators can assign rights for accessing data, setting threshold values and sending information to relevant users.

- Alarm notifications are sent only to relevant personnel and include: date, time, recipient information, zones, and acknowledgements.

- Detailed, user-customizable naming and description of monitoring points makes the software user friendly and easy to learn.

- Complete data protection: autonomous power and memory ensure that no single point of failure results in lost data.

- Service plans are available and can include installation, validation, calibration, and extended warranties.

Vaisala Commits to 100% Renewable Energy by 2020

Renewable Energy Provides Clear Benefits

Vaisala believes in a future where societies are powered by renewable sources of energy. By consuming energy and using raw materials in a more sustainable manner, we can support the evolution towards a more circular economy, leading to increased wealth and well-being. As Vaisala is strongly involved in the renewable energy industry through its customers, we see a clear benefit in advancing the development and use of renewable energy sources. With the ever growing global demand for energy, sustainable growth can

only be reached by increasing the use of these sources. The private sector needs to be the driver of change, and accelerate the transition to a low-carbon economy.

Local Co-operation

Vaisala will reach the 2020 target by working together with local energy supplier as well as continuing to produce some of its own renewable energy. The company's headquarters and main production facility in Vantaa, Finland is already a prime example of sustainable manufacturing. The site has achieved its

zero-waste to landfill target already a few years ago, and has on-site solar and geothermal energy production. Today, the entire site is powered 100% by renewables using wind power from the local energy supplier, Vantaa Energy.

Vaisala is also strengthening its commitment, by engaging with the Road to Paris initiative that calls for companies to commit to ambitious climate actions, and to support a universal climate agreement ahead of the 2015 Paris Climate Conference in December.

Nomad 3 Provides Worry-Free Wind Tower Data Management

Cross-compatible, portable Vaisala wind data logger offers reliability, flexibility, and security in project decision-making

Earlier this year, Vaisala launched the Nomad 3 Data Logger, a flexible and highly portable data management device that makes wind measurement easier and more economical for developers and operators around the globe.

Early siting and ongoing investment and operational decisions, based largely on the quality of wind resource data, have a direct impact on the long-term success of a wind energy project. However, the task of collecting and storing this data reliably and securely has not always been achieved in a cost-effective manner.

Data loggers currently available to the market can be complex to install and operate, leading to higher costs for training, field time, and additional features typically required for full functionality. They also often fall short when it comes to performance in rough, remote locations and cross-compatibility with the broad range of wind measurement sensors employed across the renewable energy industry.

Furthermore, as the wind energy market expands into increasingly distant and more complex terrain worldwide, the portability and connectivity of data logging equipment for field technicians continues to grow in importance. In both emerging and established markets, it is imperative to reduce the costs and labor involved in data collection and management while maintaining data security and 100% uptime in all weather conditions.

Designed for the Wind Industry

The Nomad 3 Data Logger benefits from Vaisala's unmatched track record for reliability in harsh conditions and decades of in-house wind industry experience, including the introduction of the first data logger built specifically for the commercial wind industry back in 1981. The new device, however, has been completely re-engineered with the current challenges of developers and operators in mind.

The Nomad 3 offers technological sophistication, such as a Linux operating system, and a smaller, lighter design while remaining incredibly flexible and straightforward to use. It is compatible with all market-leading wind sensors, affording developers far greater control over equipment choices and allowing them to contain excess costs with simple installation, low energy usage, and remote configuration features. The Nomad 3 is also ideally suited for hard to reach regions of emerging markets like South America, Asia, and Africa, since it can be conveniently carried in a backpack to sites without road access.

This rugged, compact device is supported by telemetry and data storage features that significantly enhance the owner's capacity for remote data management. Nomad 3 benefits from wireless connectivity and Vaisala's SkyServe wind data management service - a secure web portal that offers a range of fleet management tools. Online operating systems also make it accessible to any web-enabled device, such as a smartphone, tablet, or computer.

All data from the logger is highly compressed, reducing file sizes to considerably decrease the cost associated with sending information over cellular networks. Data encryption also ensures maximum security and peace of mind to the developer.

A number of partners and government laboratories have already started using the Nomad 3 as beta clients at locations around the world.

Cost Sense with Vaisala HVAC Solutions

Vaisala offers measurement solutions for cost-conscious customers with HVAC (heating, ventilation, and air conditioning) applications. The GMW80- and GMW90-series transmitters are accurate, reliable, and require low maintenance. With these transmitters customers can keep optimal indoor conditions for several years without excessive costs.

The Vaisala HVAC Cost Sense is based on unique technology developed at Vaisala: "The measurements with our sensors are stable, they drift very little over time," says Vaisala's Product Manager **Lars Stormbom**. Vaisala's CARBOCAP® technology uses an internal reference measurement that allows the sensors to remain accurate and maintenance-free even in constantly occupied spaces.

Users don't need to calibrate or change the transmitters after a few years, either. "The weakest link is usually the lamp. However, in our CO_2 sensors, the light source uses microglow technology, which has a lifetime of over 15 years, compared to a traditional filament lamp lasting only a few years," Product Manager Stormbom continues.

Additionally, large HVAC projects gain considerable time and cost savings, as the installation takes only 2 minutes, and transmitters are accurate from power up.

Vaisala provides the level of performance that cuts costs – with quality that keeps them down.

For more information, please visit:
http://forms.vaisala.com/VaisalaHVACCostSense

Challenges in HVAC Carbon Dioxide Measurement

Measuring the concentration of carbon dioxide indoors is important to keep this environment optimal for wellbeing. However, sensor stability, constantly occupied spaces, transmitter operation verification, and temperature dependence pose the most common challenges in HVAC CO2 measurement. Due to the unique sensor technology, Vaisala has resolved these issues with its CARBOCAP® sensors.

Most HVAC instruments are rarely serviced or calibrated although they are still used for control purposes for many years. Automatic offset correction - if it works at all – only compensates for offset drift but not for sensitivity changes. Light sources, light paths, filters and detectors often have different aging properties.

The optimal way to eliminate most drift sources is using a single light source, single light path and single detector together with an adjustable filter, typical in Vaisala HVAC transmitters. By using these design solutions excellent long-term stability can be achieved.

Spaces Occupied 24/7

Many sensors depend on the CO_2 concentration dropping to 400 ppm at night to allow automatic offset correction in the transmitter. Without this corrective measure stability of the measurement is poor. The challenge here is that many rooms are constantly occupied and do not reach the level of 400 ppm at any time of the night. Vaisala HVAC transmitters, however, have the unique CARBOCAP® sensors that use an internal reference measurement instead of the offset correction.

Temperature Dependence

While the internal reference measurement of the CARBOCAP® sensors' eliminate most of the sensors temperature dependence, this is not enough to get correct ppm values. Measuring CO_2 absorbance is not enough – it is important to know the gas temperature, too. Without temperature compensation, you get a 0.3% of reading temperature dependence per °C. To overcome this challenge, temperature measurement for compensation of gas properties has been included in all Vaisala GMW80- and GMW90-series products for compensation purposes.

In 1975 Vaisala introduced the first automatic weather station and aviation system.

40 Years of Expertise on Aviation Weather

2015 is a landmark year for Vaisala, as we celebrate our 40th year in aviation weather. At any airport, weather support begins with an Automated Weather Observing System (AWOS). Forty years ago Vaisala began supporting aviation with an AWOS system at Helsinki Vantaa, Finland airport. In 1975, this system had all of its memory on a magnetic tape unit, and executables squeezed into the RAM-memory of the minicomputer Vaisala. Today, Vaisala has over 1900 installed systems around the world.

Weather Expertise in Aviation

Vaisala has designed and perfected solutions that touch nearly every breadth of weather and aviation. Weather and aviation go hand and hand; and thus, weather observations are always important to airport and aviation operations.

In the 1970s the development of a solution for low level wind shear began in response to several aviation accidents surrounding wind shear at airports. When aircraft are taking off and landing is when they are most vulnerable to sudden changes in the headwind. The National Center for Atmospheric Research (NCAR), located in the United States, was tasked by the U.S. Federal Aviation Administration (FAA) to create a

solution to the wind shear problem. NCAR created an algorithm that works in conjunction with a series of ground based wind sensors to monitor wind speed and direction in and around the airport. Vaisala initially licensed the algorithms from NCAR to develop the Vaisala AviMet® Low Level Windshear Alert System (LLWAS) so that a commercial solution was available for airports around the world.

Thirty years ago Vaisala developed a lightning detection network in the United States (NLDN), and later a global detection network (GLD360), which allowed meteorologists to develop a much better understanding of lightning. These networks detect both cloud to ground strikes and in cloud lightning to pin point the location of electrical activity in storms. Like many things Vaisala does, accuracy and science remain a key component to the networks.

Ensuring Reliable Observations

As airports grow from small general aviation to larger regional airports, one reason for this growth can be found in accurate weather observations. With better information pilots can be more confident about the airport weather, which results in more traffic.

Understanding the weather is the single most valuable tool to a pilot or meteorologist. It has so many applications, from near real-time conditions at a location, to historical information over time. Weather observations require two things to ensure their value: accuracy and reliability. Observations must be done at regular intervals to determine changes, and they must be accurate so that they can be compared to additional observations at the same location as well as other sites.

Today, more and more national meteorological services and aviation administrations are looking at fully automatic weather observations as a way to control costs. Vaisala has

been working with aviation authorities and met services to ensure that accuracy and reliability are never compromised. Vaisala has also developed algorithms to help solve some of the challenges related to automated observations.

Safety in Airport Operations

When it comes to weather, one of the biggest impacts of weather and aviation is increased delays, diverted flights and even cancellations. These result in serious costs to an airport, to an airline, and to the community. At major international airports these problems can have serious economic impact. Similarly, winter weather, in the form of snow or ice can really impact aviation, and tools that make decision making easier and less stressful are key to ensuring safe and efficient operations at any airport. Vaisala uses its expertise in several key severe weather disciplines such as wind measurement, lightning, and runway surface conditions to help aviation. Over the past 40 years Vaisala has developed solutions that aid in making critical decisions to maintain safety and increase airport efficiencies.

Lightning safety is an obvious concern for aviation. At Vaisala, we

bring our expertise in lightning to help customers minimize the impacts of severe weather and maximize safety and efficiency. Another important concern is heavy rains, which can also pose risks to aviation. Typically the final threat from severe weather after the wind and lightning is the sudden downpour of water. Too much water might not seem like a problem for an airplane, but when touching down on a runway surface with an excess of water, aquaplaning can occur. Grooved and properly sloped runways can make a huge difference, but still a loss of traction can occur during heavy rains. Vaisala has worked with airports to create a solution, and today we continue to look for new and innovative ways to solve this and many other severe weather challenges.

In forty years of providing cutting edge aviation weather solutions we have learned that accuracy, reliability, and providing tools that offer a true return on investment are key to being your partner in aviation.

Partnering with Vaisala means customers have the support of a weather company that offers a wide variety of technologies, and in many of our weather sciences, is considered around the world as the authority on meteorology.

Keeping Data Centers Cool

By Jarkko Ruonala,
Industry Expert, Vaisala

Increasing demand for data processing and storage capacity has led to major companies investing in new facilities that provide web-based services to an ever-higher number of users. In these facilities, having the correct conditions - such as temperature and humidity - is vital for maintaining the equipment and securing operations.

Data centers are energy-intensive facilities, currently consuming more than 1.3% of the world's total electricity production. This energy is transformed into heat that has to be conveyed and dissipated away from the equipment racks in order to maintain the correct operating temperature. Cooling and air conditioning is one of the most important processes in any data center.

Data center cooling can be done in a variety of ways, depending on the location and the local climate. Refrigerant cooling consumes a lot of energy, but its usage can be reduced by taking the climate into consider-ation when choosing the location for the data center.

In dry climates evaporative cooling is effective at dissipating heat. In cold climates direct cooling with dry, cold air can be used. Locations near water offer the possibility to dissipate the heat into the water.

The Right Temperature

The ASHRAE 2011 guidelines for conditions in data centers recommend an inlet air temperature and humidity envelope of 18…27 °C and 25…80%RH (dew point temperature 5...15 °C) respectively. In a traditional setup the equipment room is aircon-ditioned by dividing the equipment into rows (hot aisles) and feeding conditioned, cool air between the rows (cold aisles), usually through the floor. When cool air travels through the equipment racks from a cold aisle to a hot aisle, it conveys the heat generated by the equipment through the ceiling. Temperature is controlled using a Computer Room Air Conditioner unit (CRAC), which performs both heating and cooling functions (though not simultane-ously). For heating, the CRAC recir-culates warm air from the hot aisles with cool make-up air; for cooling, incoming air is chilled to achieve the correct temperature.

Maintaining Humidity Levels

In addition to temperature, monitor-ing and controlling the humidity of the equipment room is also critical. Especially in cool climates where air-side economizers are used, the absolute water content of the air is naturally low. The relative humidity of air decreases when it is heated, meaning that it may fall below the desired level. Air that is too dry increases the risk of static electricity and requires additional humidifica-tion by means of spray or evapora-tive humidifiers.

When the outdoor temperature exceeds acceptable limits, the incoming air has to be cooled. In order to minimize the need for energy-consuming mechanical refrigeration, cooling can be achieved by spraying water mist – which instantly evaporates – into the incoming air. When the humidity of the air before and after the humidifier is known, the control system is able to adjust the humidifiers to ensure maximum adiabatic cooling efficiency while maintaining the relative humidity limits and avoiding possible corrosion problems related to too high relative humidity. In systems where liquid is used as the heat carrier, the coolant may be cooled in cooling towers, which are heat exchangers that employ a similar evaporative cooling principle. Efficient control of a cooling tower requires accurate humidity and temperature measurements, which in turn enable maximum cooling efficiency with minimized energy usage and also provides a means for monitoring the cooling power of the tower.

Vaisala HUMICAP® — Reliable Humidity Measurements

The Vaisala offering for data center management includes instruments for measuring temperature, relative humidity, wet bulb temperature, dew point temperature, enthalpy, and weather parameters. The wide range of Vaisala HUMICAP® relative humidity and temperature instruments includes industrial grade and HVAC transmitters that are suitable for use in data centers. Vaisala HUMICAP® sensors are known for their accuracy, excellent long-term stability, and negligible hysteresis.

Customers Appreciate
Vaisala's New Transformer Monitoring Device

Vaisala has shipped first orders for the new, unique in-oil condition monitoring probe that provides critical early warning information to track transformer faults.

Vaisala has shipped the first customer orders for the new Moisture, Hydrogen, and Temperature Transmitter – the MHT410. This device is designed to help power and energy utility companies minimize transformer-related downtime.

Mitigating Risks in Power Transmission

High voltage transformers are critical in the generation and transmission of electricity. Any transformer downtime will prevent the export of electricity, leading to substantial financial losses and energy shortfalls for national grids. Lead times for transformer repairs and replacements can be several months.

Efficient condition monitoring is one of the only recognized means of proactively mitigating the risks involved with power generation and transmission. Measuring the hydrogen content in transformer oil and the speed of its formation allows a utility to detect and assess the severity of a fault situation, while monitoring moisture content is an important indi-

cation of the condition of transformer insulation paper as well the oil's ability to act as an insulator.

Long-Term Maintenance Strategy with MHT410

Vantaa Energy Electricity Networks Ltd is one of the beta customers who have tested the transmitter for months. Maintenance Engineer **Mikko Piironen** says:

"Vaisala's MHT410 allows us to optimize the technical life cycle of our transformers and react to poten-

tial faults in the very early phase of their development – avoiding costly interruptions to production. The reliability and long-lasting nature of the MHT410's technology make it a key part of our long-term maintenance strategy, helping to extend lifetimes of our transformers."

Designed for Reliability

Vaisala's MHT410 benefits from a unique adjustable probe design that's installed in the transformer oil. This places its sensors in direct contact with representative oil in the transformer providing measurements and data with unparalleled accuracy.

The MHT410 has no complex pumps, hoses, batteries and other consumable parts. It is built to last and has no service or replacement needs that may affect the reliable long-term performance of the probe. Maintenance-free, with no calibration or adjustment required after installation, the MHT410 fits into a variety of transformer valves and can be installed and is ready to use within minutes – as experienced by our clients.

For more information, please visit:
www.vaisala.com/mht410

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