PROFILES
GAS CUSTOMER MAGAZINE

2/2021

Hydrogen:
ready or not?

Production relocation of commercial diaphragm gas meter

Greening the natural gas network:
Green natural gas for Maryland

Honeywell

ALHA PARMIGIANA

Jean-Paul Piques
Global Gas Product Line Director

"Sometimes, only one person is missing, and the whole world seems depopulated," wrote Alphonse de Lamartine, a famous French poet. In my prosaic case, as I was preparing one of the few dishes that my limited cooking skills permit, the missing bit was Parmesan cheese. If you think that Emmental or Cheddar would have done just as good, you probably do not see my point here, and you would probably not think much of Lamartine's quote.

But for those of you who are familiar with Italian cuisine, it will come as no surprise that "risotto alla parmigiana" is a simple yet refined delight, where the presence of Parmesan is not only required, but also demanded, lest the rice will feel very lonely or disregarded.

It served as no consolation that my fridge was abundantly filled with other useless cheeses (for that particular case), and I wished I had a smart fridge to remind me to buy what that unique dish really needed when it needed it.

In our fast-paced world, limited attention span and forgetfulness are commonplace, and the more items you juggle, the more likely that something will slip through your fingers. At Honeywell, we understand that managing many assets in a critical infrastructure is a formidable challenge – and leveraging all the help that we can get from technology and artificial intelligence to address it is simply common sense.

ALHA, our Asset Lifecycle Health Assessment tool, is a free, secure web-based portal for our customers to monitor the support status of their Honeywell solutions. It is a powerful tool for identifying your aging assets that could lead to reduced reliability, rising maintenance costs, and increased risks of unplanned downtime. ALHA helps calculate the potential savings from upgrade or migration and its built-in artificial intelligence engine identifies a path to new technologies that could enhance the system operation.

So, while ALHA will do nothing to improve your favorite dish, be it risotto, curry wurst, big mac or nasi goreng, it will go a long way to keep your Honeywell installed base up to date for optimized operations while removing the mental burden of keeping everything in sync. So why wait? Get on board today at Manage the Lifecycle of your Automation Assets (honeywell.com)

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THE FUTURE OF GAS CHROMATOGRAPHERS

HYDROGEN READY OR NOT?

> In a world where hydrogen seems to be the new buzzword, there are a lot of ongoing debates where often facts are mixed with myths.

THE SOURCE

Let me start with some myth-busting: hydrogen is not a new energy source. What!? That is correct, it is not. To be more precise, the major energy source our Earth knows is the Sun. All our fossil fuels have been created with the major contribution of our Sun – and all our renewables as well.

Think about it; coal, crude oil, and natural gas are all considered fossil fuels because they were formed from the fossilized, buried remains of plants and animals that lived millions of years ago. Because of their origins, fossil fuels have a high carbon content. The source that made all plants and animals grow was the Sun.

And what about renewables? That is basically the same story. For instance, wind energy is indirectly solar-powered, since the wind is generated by the Sun heating the Earth's surface and the Earth is heating the air above it, causing the wind. Water evaporated by the Sun forms clouds and rain to give us flowing streams and rivers. Both the wind and flowing water (hydropower) are valuable sources of energy.

Biogas is made through the fermentation of biomass. Plants store energy from the Sun as they grow. Fruits, vegetables and wood from trees, for example, all contain stored solar energy. We call it biomass energy, from "bio" for "life" or "living." These kinds of energy are also renewable, but of course it takes longer to grow a plant or a tree than it does to get heat directly from sunlight.

THE CARRIER

So if hydrogen is not the source of energy, what is it then? Hydrogen is an energy carrier. We can use hydrogen to store excess energy from renewable sources. Electric power is used to split water into oxygen and hydrogen; the hydrogen, in turn, is inserted into the gas network as a storage form for this initial energy.

However, when we store hydrogen in our natural gas network, this changes some significant characteristics of the natural gas. Density, heating value, and the Wobbe index are affected and therefore adjustments in many processes are required. One can think of air/fuel ratios that need re-adjusting; or flow computers that need to read in hydrogen contents from gas chromatographs or other devices.

GAS QUALITY READINESS

When it comes to gas quality devices, adjustments are also needed. However, rest assured, most of the hard work has been already done. The EnCal 3000 is our flagship gas chromatograph for natural gas and can measure up to 100% Hydrogen if needed. For now, it

is PTB Approved until 5% extensions are in progress. Even upgrades to C6 or C9 devices are possible.

The EnCal 3000 Quad is the most sold GC in Germany and can also measure 0-20% Hydrogen plus Oxygen and Helium.

Furthermore, our newest GC, the EnCal 3000 proChain, has been fitted with a new module in order to measure 0-30% Hydrogen. The unit has been tested with several clients and will come back for some improvements.

The background of GasLab Q2 is a bit different. At this point, we are doing extensive trials together with OGE in Germany to test the unit up to 30% Hydrogen in natural gas. Initial tests show very promising results, and we will keep you up-to-date in the upcoming period.

CONCLUSION

If you are worried about the presence of Hydrogen in your gas in your network, then we can assure you that we have got you covered. Our gas quality portfolio is ready to look out for Hydrogen and towards the future. So if you are also getting ready for the future of Hydrogen, let us know and we will help you with updating your current gas chromatographs. And if you are not a client yet, we are more than happy to support you with a test device.

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Link to
Document library:

THE MISSING CYBER SECURE PIECE

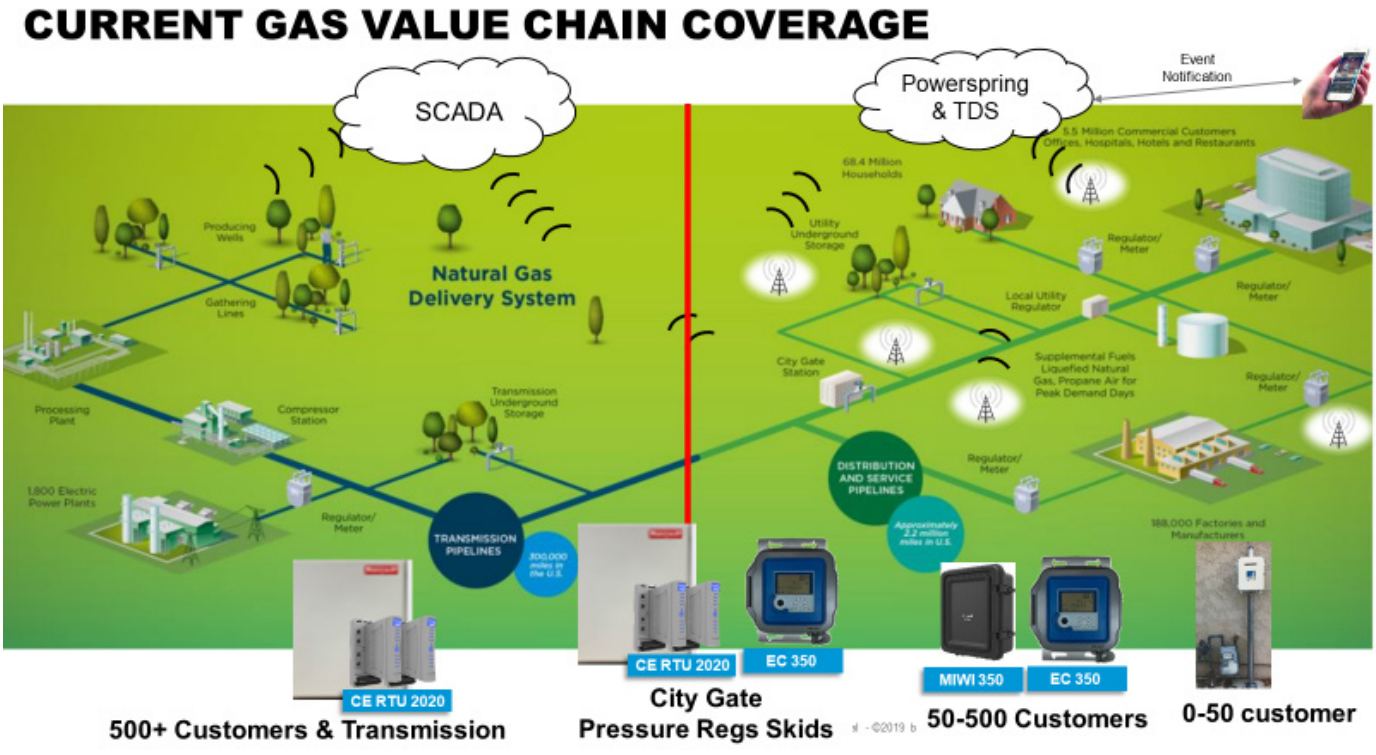
From skyscrapers to refineries and drones to submarines, Honeywell Automation is everywhere – including Gas grid monitoring.

From skyscrapers to refineries and drones to submarines, Honeywell Automation is everywhere – including Gas grid monitoring.

Gas distribution and transmission customers utilize a multitude of Honeywell products to measure, regulate, control the quality, detect gas and monitor their grid.

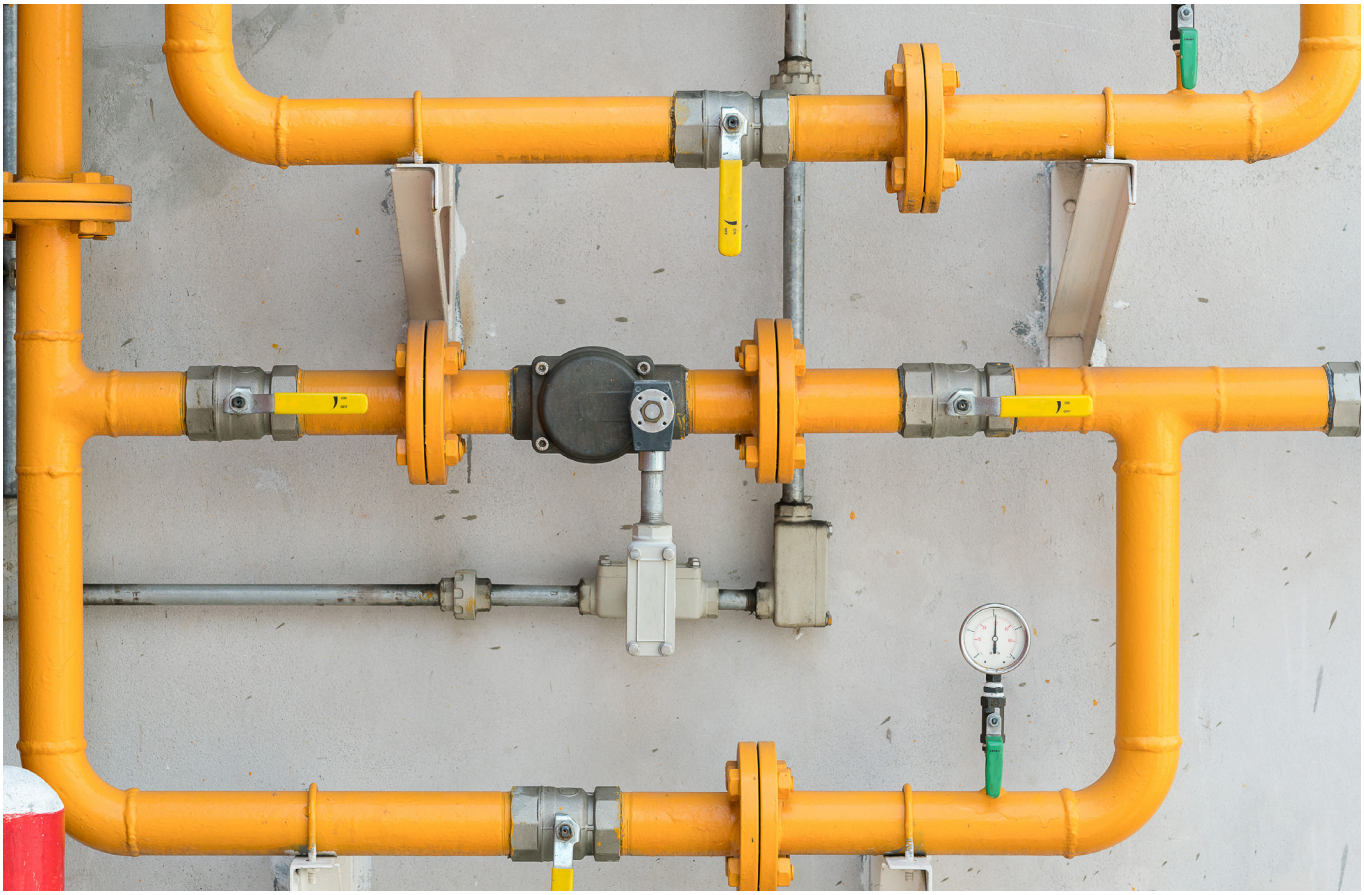
But until recently, Honeywell Remote Terminal units were indeed missing from the tool boxes of gas grid operators; fortunately, distributors now have access to such tools.

Expanding from a few inputs to hundreds, ControlEdge MI was developed based on customer feedback and industry trends to cover modern automation needs; let's discover how:



ControlEdge MI has been developed based on key trends and customer feedbacks:

- Remote is the "new normal": video conferences, home offices, and webinars have become a "new normal" for office folks. Remote operations are the "new normal" for field service and operation leaders. A stable connected platform is key to solid remote operations.
- Safety is still the first priority. Recently enhanced by the Pipeline Safety Act, grids but also assets such as pressure regulating stations are recommended to be permanently monitored. Integrating a safety shut-off device is also part of the recommendations.
- Big Data and IIOT changed fundamentally the way we large companies look at data. Decision-makers need more to quench their thirst to always gain visibility of their assets.
- Cyber safe: recent hacks proved



how vulnerable legacy solutions can be, and how agile hackers have become. Not only Government entities are targeted – pipeline companies and other businesses can also be exposed.

- Productivity continues to be a large factor in investment. After years of low BTU prices, utilities have now developed a habit for seeking productivity improvement.

These challenges, and many others, have been considered while designing ControleEdge MI. This solution is the answer to modern Gas Grid automation: ControlEdge MI is a packaged, “plug and Play” yet modular, powerful, and scalable controller capable of all remote automation and control applications.

Combined with the streamlined configuration and operator experience of PowerSpring R300.1, it meets the most demanding automation and control requirements.

The RTU includes redundancy features to improve availability; the highest Cyber security rating – Level 2 secure – is designed for harsh environments.

Sold as a turn-key package, it encloses in a Class 1 Div.2 box the already wired RTU with its power supply, a high Definition 8” HMI for local configuration, and a router

for remote communication.

Versatile, ControlEdge MI only has a streamlined 5-model line which includes a redundant remotely upgradable version, a solar-powered version, and can integrate ISA100 or Hart wireless instrumentation.

Based on one of the most powerful CPUs in the industry, ControlEdge MI can also be used as a flow computer, approved by AGA and API.

ControlEdge™ MI is an out-of-the-box, standardized, fit-for-purpose solution for today’s complex and distributed operating environment. You get improved capacity management, accounting and asset integrity through efficient remote equipment management. The solution offers safe and reliable monitoring, diagnosis and management – while reducing the total cost of ownership.

Honeywell Mercury can now – better than ever – take good care of the entirety of your grid!

Alberic Avisse
General Manager Americas

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	ERX 350 ELECTRONIC PRESSURE RECORDER	**ERX 350 + CLOUDLINK 4G MODEM**	**MI WIRELESS - FULL PRESSURE MONITORING**	**CONTROLEDGE MI**
APPLICATION	Offline monitoring of Gas Distribution grid pressure point. Good for investigation after the fact and permanent records. Can log at high frequency for after event troubleshooting.	Online/Offline monitoring of Gas Distribution grid pressure point. Typically records hourly pressure information and sends daily audit trail and reports by exception (RBX) to host system upon alarm condition.	Online monitoring of Gas distribution station. 24/7 accessible.	Full Gas distribution Station Monitoring and control.
I/O CAPABILITY	Up to 2 pressures. Temperature. Up to 3 digital Inputs (intrusion, water alarms)	Up to 2 pressures. Temperature. Up to 3 digital Inputs (intrusion, water alarms)	Up to 3 pressures. Temperature. Up to 3 digital Inputs (intrusion, water alarms)	8 to 24 Analog Inputs, 2 to 6 Analog Outputs, 10 to 30 Digital Inputs, 6 to 18 Digital Outputs, 2 to 6 Pulse Inputs. Redundant controller
COMMUNICATION	Requires manual on site download with PC No SCADA integration.	The device only calls on alarm and scheduled calls but is not reachable the rest of time.	Communication link can be ON 24/7 for online monitoring.	Communication link can be ON 24/7 for online monitoring.
POWER SUPPLY	Alkaline or Lithium batteries.	Lithium batteries.	AC/DC power or solar panel needed	AC/DC power or solar panel needed

MEASURING "GASES OF THE FUTURE"

HONEYWELL TURBINE GAS METERS ACHIEVE VERY GOOD TEST RESULTS

The reduction of CO2 is one of the most important goals of the European Union, and many measures have been started at the Europe-wide level that will change the industry over the next few years.

The use of hydrogen as an admixture – or even as a complete replacement – for natural gas has been intensively investigated in the field of fossil gases for some time.

In particular, the use of "green hydrogen," i.e., what results when the electricity for the electrolysis is generated by renewable energies such as wind power or solar energy, can make an important contribution to achieving this goal in the future. However, the amount of green electricity is currently not enough to cover the current energy needs.

As we move towards this transformation, admixtures of hydrogen in natural gas of 10% and, in the future, of 20% are being discussed. Therefore, when planning future investments, users needs to be sure that all components are suitable for later use with hydrogen.

Using the example of industrial gas meters, we would like to show that the analyses are quite diverse – and, in some cases, are still ongoing. The top priority for Honeywell is the safety of the product. Both the suitability of all pressurized parts – such as the meter housing – and the explosion protection were examined in a recent safety assessment. In addition to the new meters, products in the field were also retrospectively included in the safety assessment. The conclusion is very encouraging: All mechanical measuring devices can be declared as "H2-ready." A detailed list of all Honeywell-Elster gas products is included in the white paper "Injection of hydrogen to the natural gas network – Suitability of Elster Gas metering technology & Mercury EVCs" (www.docuthek.com > Elster-Instromet > Products > Hydrogen in the natural gas network > General customer information.).

In the next step, the metrological properties were evaluated. All manufacturers face the same challenge here: There are still no adapted product standards for a metrological approval, i.e., MID certification. The biggest problem in this context is the insufficient availability of suitable test rigs. The approval bodies, as well as the manufacturers, simply lack the testing facilities for medium to high flow rates in order to be able to examine the metrological properties of rotary, turbine and ultrasonic gas meters. Due to the currently very limited database, it is difficult at this time to define the requirements for gas meters in the EN standards in a meaningful way.

Against this background, it is very gratifying that DNV, an international accredited registrar and classification society, started a project in Groningen,

the Netherlands in 2020 in which both meter manufacturers and gas distribution companies were involved. DNV had converted an existing test rig for operation with natural gas/hydrogen and natural gas/CO2, whereby flow rates of up to 1000 m³/h could be achieved. The master meters were calibrated in close cooperation with the German National Metrological Institute (PTB) for the measurement of these gases.

Honeywell participated in the tests, which took place in the spring of 2021, with a TRZ2 G 650 DN 150 ANSI 300 turbine meter.

At 16 and 32 bar pressures, natural gas without H2 was used as the first test medium, followed by additional tests using natural gas with increasing amounts of hydrogen admixture – up to 30% hydrogen admixture. The same program was carried out with admixtures of CO2

In both series of measurements, the Honeywell turbine meter TRZ2 G 650 DN 150 showed a very small measuring deviation for "mixed gases." Furthermore, very good reproducibility was able to be certified, which was within the measurement uncertainty of the system

The results of the tests with hydrogen admixtures are shown here as an example. An initial test was carried out with the "Groningen gas (Ggas)." Hydrogen was then added in several steps and the test was repeated. The very small deviations are clear from the graphic. Comparably good results were also shown when testing with CO2 mixtures.

SUMMARY AND OUTLOOK

TRZ2 turbine meters are quite suitable for measuring natural gas/hydrogen and natural gas/CO2. After submitting the final test report from DNV, we then want to discuss with the German National Metrological Institute the issuance of a clearance certificate for Honeywell turbine gas meters.

Honeywell is, therefore, ready for the future!

Michael Franz
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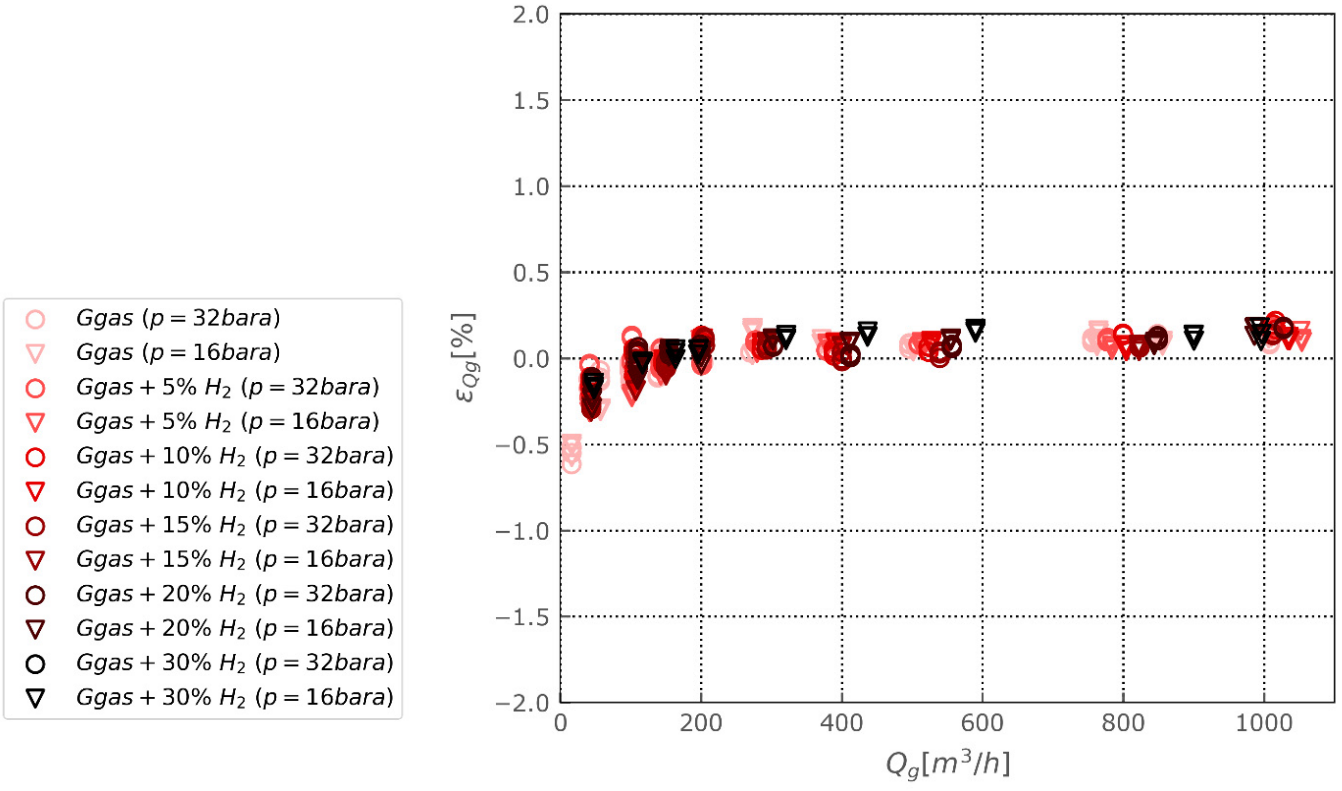
Link to Document library:



Quelle: DNV Report

MAKE A CHANGE

Honeywell is relocating the production of diaphragm gas meters BK-G10/ -G16/ -G25 from Lotte, Germany, to an existing, larger Honeywell European Production Centre operating in Stara Tura, Slovakia. The start of production in Stara Tura is planned for the fourth quarter of 2021.

The Honeywell Stara Tura site has been manufacturing and calibrating diaphragm gas meters of various sizes for many years. In addition, measuring units for the commercial gas meters affected by the relocation have also been produced at this plant for some time. Production in Stara Tura is subject to the same high requirements and quality standards applicable to our Lotte facility. The site is regularly audited in accordance with the applicable EU Directives and is MID certified.

The products manufactured in our Stara Tura facility will retain the same design, components, functionality, performance, and quality. Our manufacturing processes are transferred in accordance with best practices and utilize our own experience as a global company.

If you have any questions about the production relocation, please feel free to contact us!

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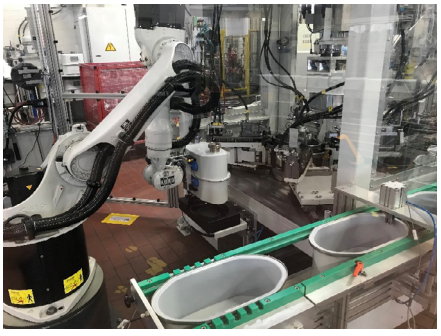

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GREEN NATURAL GAS FOR MARYLAND

With hundreds of units in operation, Honeywell's turnkey renewable gas injection points make it a leader in Europe, helping build a more sustainable future. Now it's ready to do the same in America.

Honeywell's a big name in European biogas. Our technology helps capture methane produced from agricultural waste, manure, municipal waste, food waste, green waste and even sewage to use as a renewable energy source.

In the UK biogas industry, Honeywell developed the country's first commercially built grid entry unit to inject biogas safely into the natural gas grid. Across Europe today, there are more than 200 of our renewable injection systems, providing sustainable energy that powers the equivalent of over one million homes.

In France alone, GRDF, the leading distributor of natural gas on the continent, has over 100 Honeywell compact biomethane injection systems in operation. These prefabricated systems give small producers such as farmers across the country reliable technology for injecting upgraded biogas into the gas grid.

We're the leader in this technology, helping businesses earn extra income, utilities green their networks, and governments work towards ambitious targets for net-zero carbon emissions. And now it is coming to the US.

BREAKING INTO THE US MARKET

Honeywell recently won its first project in the North American market to deliver a biogas skid for Baltimore Gas and Electricity Company (BGE). A subsidiary of Exelon Corporation, BGE is the largest natural gas and electric utility in Maryland, serving more than 1.3 million electric customers and 680,000 natural gas customers.

It has a strong commitment to reducing its carbon footprint. The company aims to cut greenhouse gas emissions from its operations by at least 50 percent by 2030 and achieve net-zero emissions by 2050. Pursuing these goals, the company has created an industry-leading green supply chain network, begun building the country's largest alternative-fuel and energy-efficient hybrid vehicle fleet, and developed industry-leading energy efficiency programs.

Recently, the company gained approval from the Maryland Public Service Commission to use biogas in its distribution system – the first utility to do so in the state. As the company's senior vice president of governmental and external affairs said, it intends to "jump-start" a new industry in Maryland, "contributing to economic growth, managing waste streams and bringing a cleaner, renewable energy source to our community".

Its project will see gas coming from Bioenergy Devco's anaerobic digestion facility, but the Public Service Commission's approval also opens the door to future renewable natural gas (RNG) projects in the state.

THAT'S WHERE HONEYWELL GETS INVOLVED.

A SOLUTION THAT'S READY TO GO

Maryland has a strong agricultural sector, including dairy farming, with over 42,000 cows across 340 farms. Often livestock is blamed for worsening the climate crisis, being

responsible for around 14.5 per cent of greenhouse gas emissions.

Honeywell's technology, though, offers a more sustainable future for this and other industries.

Honeywell has supplied a biogas injection point for an RNG producer from animal manure to inject the gas into BGE's grid. Using an existing installation building, we were able to reengineer and retrofit it with a complete solution for safe, compliant and efficient injection into the grid. From meters to the RTU and SCADA integration, the entire system uses Honeywell components:

- Regulators to reduce and maintain optimal pressure at the injection point
- Meters to accurately measure gas injected in the pipeline, with custody transfer level precision
- The Honeywell Elster® EnCal 3000 gas chromatograph analyzer specially designed for natural gas energy measurements. It sample

and measures the gas quality to ensure it is in line with the utility tariff requirements. It also measures the odorized biomethane as welland measures the gas quality to ensure it is in line with the utility tariff requirements. It also measures the odorized biomethane as well

- A BTU analyzer for real-time analysis of the heating value. If under value target, this triggers blending with propane or other gas, or the system can be programmed to send the biomethane back to the producer via the return line.
- An odorizer to meet the pipeline specifications
- Analyzers for C02 and H2S.

The system also includes automation and telemetry to enable remote operation of the unit and capture and send all custody transfer information to the historian. That ensures the producer doesn't have to worry about maintaining and running the unit, and can get on with its business.

Our proven library of designs adapts to any project, enabling Honeywell to meet the BGE's requirements for a fast turnaround. With no development necessary, we delivered the injection point in just 12 weeks and took sole responsibility for the execution. No customer resources nor engineering support was required.

The first of many for Honeywell, such projects will play an increasing role as utilities across the country pursue their goals for greening the network. With proven technology for linking utilities with renewable gas producers, small and large, we look forward to being at the heart of that transformation.

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CUTTING-EDGE NATURAL GAS METERING MANAGEMENT AND MAINTENANCE SOLUTIONS FOR MORE EFFICIENT AND RELIABLE METERING MANAGEMENT

MEASUREMENT IQ APPLICATION IN DONGGUANENN

Learn how a Honeywell integrated solution based on Measurement IQ (MIQ) is helping Dongguan ENN to eliminate measurement errors that erode profits in the long run, cut equipment maintenance costs, and improve overall safety.

Dongguan ENN, founded in 2003, is responsible for the construction, distribution and operation of gas pipelines in Dongguan, as well as the gas supply and service for civil, industrial and commercial users. Up to now, it has built four urban gas gate stations, more than 3,000 kilometers of various high-pressure pipe networks, and more than 60 main metering stations for more than 30 major customers, with an annual gas supply of 1.6 billion cubic meters (2020's data.) The new high-pressure pipeline they have been tasked to build will cover more than 160 kilometers and it is expected to reach 6 billion cubic meters of annual capacity in the next three years. Dongguan ENN is the largest subsidiary of ENN group.

THE DONGGUAN ENN PAIN POINTS

- **Large number of equipment providers vs. shortage of professional management personnel.** Dongguan ENN uses different gas flowmeter brands such as Elster, Daniel, Sick, Weise, etc., while the chromatography analyzers are mainly Elster Encal3000 and Daniel 570Series. The total number of ultrasonic flowmeters and chromatographic analyzers is about 70 sets. The user only has a metering management team of 5 people, which needs to manage more than 30 metering stations and 160 metering pieces of equipment (including turbine flowmeters), making it difficult to achieve fine management and maintenance.
- **Upstream and downstream measurement trade loss.** The current management mode of Dongguan Xinao, which relies on post-understanding of measurement data (i.e., measurement first, then identification of measurement issues, and then the problem traceability), leads to trade loss differences that are often solved through business negotiations. In the negotiation process, due to the lack of strong data and evidence, ENN is often in a disadvantaged position.
- **Lack of predictability in equipment maintenance and the resulting cost wastage and production uncertainty**. In the past, Dongguan ENN adopted a time-based maintenance strategy and carried out equipment maintenance by means of inspection. Therefore, it lacked real-time online monitoring and prediction of equipment, so it could not make more reasonable

and scientific arrangements for equipment maintenance. Time-based maintenance results in wasted labor costs and temporary equipment shutdowns.

THE HONEYWELL SOLUTION

Honeywell took time to understand the customer's pain points in detail and provided an integrated software and hardware solution matching ENN's requirements.

The Honeywell MIQ system server was deployed in the customer's central control room. The server is connected with each metering station and field equipment through the existing production network. This enables centralized and unified user management, thus greatly reducing the on-site maintenance efforts and time of the metering team. The limited installation space of the central computer room is used very effectively to manage all the metering equipment in the station through a high-performance server.

The on-site equipment includes ultrasonic flowmeters from brands such as Elster, Daniel, Sick, and Weise and Elster Encal3000 and Daniel 570series chromatographic analyzers.

Any computer on the customer Intranet can access the MIQ server through a browser. The MIQ detects any significant changes or deterioration trends in the Gas measurement devices, measurement process or measurement environment to ensure that the devices operate in a highly accurate manner, obtain high confidence measurement data, and turn abnormal changes into actionable maintenance guidance.

HONEYWELL SUPPLY SCOPE

Honeywell provided Dongguan ENN with a set of integrated software and hardware solutions. In terms of hardware, our solution included high-performance rack servers, switches, and fiber optic converters. On the software side, MIQ gave the customer visibility of their whole metering operation.

We also provided 70 software licenses for device diagnostics, enabling comprehensive coverage of Dongguan ENN's critical metering points. In the future, the cooperation will be extended to include the expansion of the diagnostic system and a long-term maintenance service and spare parts contract for the on-site metering system.

MIQ CORE VALUE

Improve asset integrity and measurement system accuracy

- Flow meter accuracy evaluation
- AGA10 sound speed verification
- Real-time velocity verification
- Full lifecycle management
- “Foot Print” verification with wet calibration

Enhance security and personnel expertise

- Ultrasonic parameters are fully monitored to ensure the reliable operation of the system
- Equipment early warning to reduce unexpected stops and safety risks
- Bridge gaps and deficiencies in industry knowledge and experience

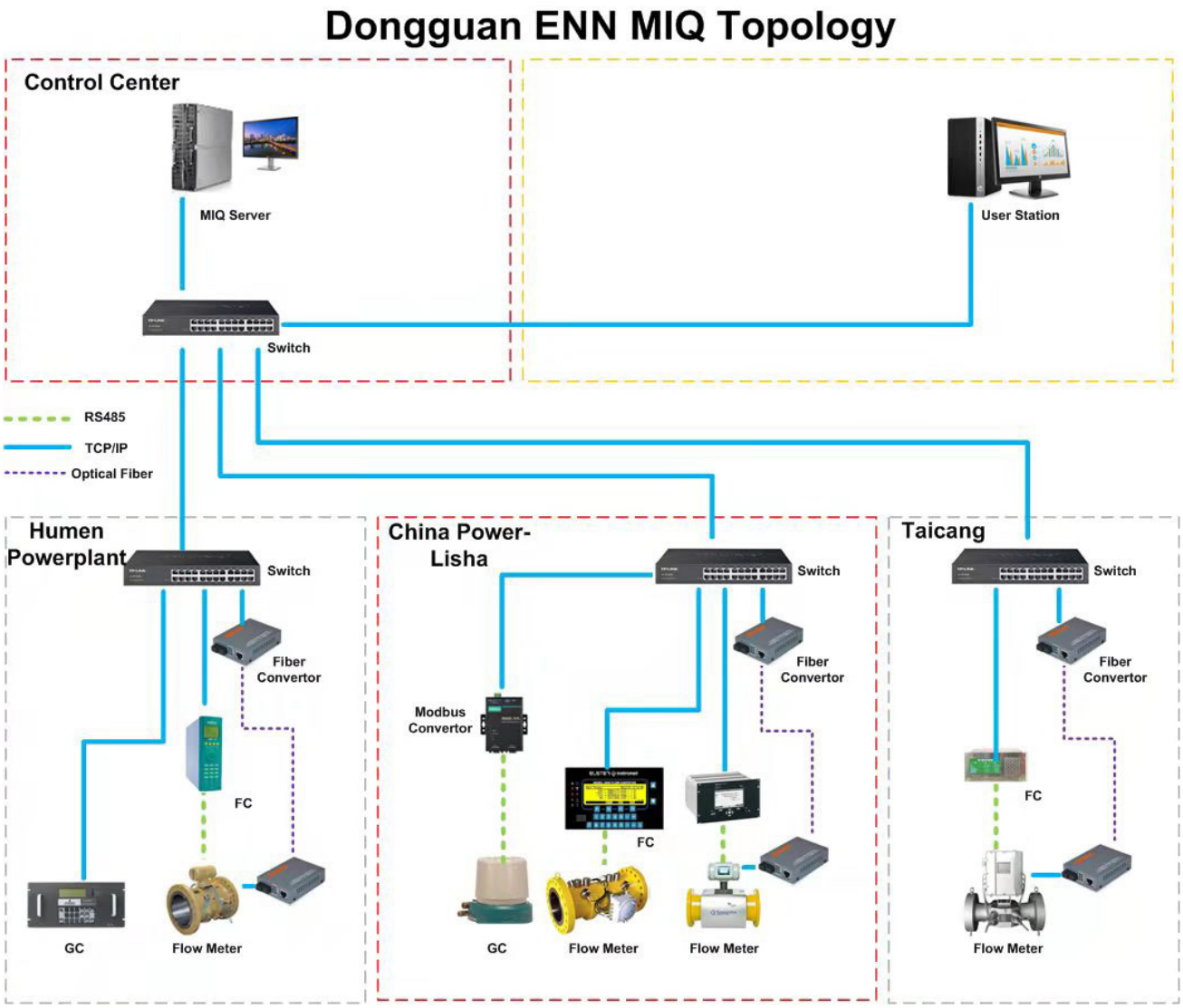
Reduce gas losses and operating costs

- Derive additional benefits from lean management of assets
- Avoid the loss caused by the recessive deviation of metering equipment
- Reduce site visits by person
- Reduce spare parts inventory and save spare parts inventory cost

Improve measurement compliance and corporate intelligence

- Provide compliance documents and support deferred referral verification
- Measurement system uncertainty assessment to avoid compliance risks
- Secure connections for remote assets
- Real-time remote management

DONGGUAN ENN MIQ NETWORK



PROJECT OUTCOME OUTLOOK

The Honeywell integrated solution enabled Dongguan ENN to:

- Reduce "unquantifiable" gas losses by 0.1% using AI diagnostics, increasing benefits by $9 million
- Reduce the work intensity of personnel and save labor costs, enabling a 5-person metering team to effectively manage more than 120 ultrasonic flowmeters
- Avoid risks to metering system compliance by assessing the uncertainty of the metering system
- Proactive forecasting and forecasting enables metering management teams to be more efficient and focused on necessary equipment maintenance work, significantly reducing the number of temporary stops

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PREVENTING GAS THEFT IN YOUR GAS VALUE CHAIN

HOW HONEYWELL IS HELPING CUSTOMERS FIGHT TAMPERING IN LATAM

Tampering with Natural Gas equipment is extremely dangerous and a serious public safety concern. Ensuring an installation is tamper-proof is a concern all gas utilities share. Each element of the metering ecosystem (Volume Corrector, Configuration or Monitoring Software) has to be designed and optimized in order to effectively prevent tampering.

IT ALL STARTS WITH PROTECTING THE INSTRUMENTS IN THE FIELD

Physical protection is key at the device level. To prevent physical tampering of field devices, a series of protection mechanisms need to be deployed:

- Installation behind a fence and/ or padlocking of the instrument.
- Special seal wire to secure bolts and index.
- Apply redundancy whenever possible; for example, redundant pulse input sensors can be used to activate switch alarms if magnetic tampering attempts are detected. Sensor alarms can be logged in an alarm log for long-term retention.

- Where applicable, use Cast Iron material to avoid magnetic tampering.
- Volume Correctors can be ordered with a mechanical index (UMB) for use on diaphragm, rotary, and turbine meters with instrument drive. The UMB is not susceptible to some of the more common methods used to tamper with electronic readings, such as magnetic tampering or using software to alter the corrected and uncorrected values in an EVC. Thus, by periodically comparing the uncorrected mechanical index reading on an EVC with the uncorrected electronic reading the utility customer will be alerted if something has been used to modify the electronic reading.
- Opening the door of an instrument can trigger and alarm which is logged and is transmitted immediately to Honeywell Total Data Services (TDS) or PowerSpring.
- Many EVCs such as Mercury EC350 have an audit trail. The audit trail records the time and date and by who metrological changes to the EVC were made. The audit trail should be reviewed anytime tampering or gas theft is suspected. If a bad actor can disguise his/her identity to the software, the audit trail will still indicate that a metrological change was made and when it was made.

MIGRATION TO CELLULAR AND CLOUD IS BOTH AN OPPORTUNITY AND A THREAT!

Basic cybersecurity considerations mandate that, as a minimum, instruments should be protected in the cellular space by using Virtual Private networks and TLS certificates, while passwords should be not left at default and rotated on a periodic basis.

In addition to that, Measurement IQ (MIQ) and TDS/PowerSpring will bring protection against tampering and errors.

- Measurement IQ is running a digital twin of the flow computer; MIQ will raise a flag if there is a mismatch between the digital twin and the flow computer.
- MIQ monitors the checksum of the flow computer. If a change is made on the flow computer, the change then needs to be accepted and validated by MIQ. This allows for close tracking and validation of the flow computer's configuration.
- MIQ will do condition-based monitoring based on the Velocity of Sound. MIQ can detect temperature and pressure tampering as it is calculating the Velocity of Sound and comparing it to the value measured by the USM.
- PowerSpring helps analysing hourly trends of Corrected and Uncorrected volume which can enable the detection of anomalies.

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