



Helping customers
solve their IoT design
challenges

From sensors to
the cloud



consult. design. integrate.

From concept to reality

Turning great ideas into customer successes

Across Europe, we support hundreds of customers with innovative designs and leading-edge technologies. Every day, our engineers work with customers as an extension of their in-house teams. They are the subject-matter specialists who combine their technology expertise with sector experience to find the right solution for the customer's situation and application.

Read some of our customers' stories

We are proud to share some of our customers' stories with you – a small selection of where we have worked together closely to make the impossible possible and bring better solutions to market faster.

From saving some of the largest utility companies hundreds of man hours with smart wireless energy meters, to giving quadriplegic patients their independence back with an ingenious new method of motion control, our design support and vast technology portfolio has enabled countless customers to make the world a better place for millions of people around the world.

Get in touch

Whether you use these examples as inspiration, are evaluating our offer or only just discovering us for the first time, this is just a sample of the ways we support customers across Europe. The most important thing for us is to find or create the right solution for your requirements. So, when you are ready, simply contact any of our offices, and we will be happy to help you with your next challenge.



Eight examples of how our sensor and IoT expertise supported four customer sectors

Medical



Using air-pressure sensors for motion control



Monitoring home patients' medical equipment

Industrial



Creating intelligent gas-cylinder regulators



Controlling crop irrigation remotely

Smart home



Making antiquated meters digital



Gathering thousands of meter readings wirelessly

Environmental



Monitoring air quality in towns and cities



Digitalising HVAC systems with dual connectivity

About Acal BFi

We are a group of technical specialists who use leading-edge technology to create custom solutions for your designs and applications.

We ensure your solutions are ahead of the curve with market-leading technology and total design support. Our competence centres across Europe are home to some of the leading specialists in their respective fields.

Using our vast technology portfolio and pan-European team of technology experts, we have enabled thousands of designs to be realised, pushing many sectors and markets to new boundaries.

Areas of expertise

- Cables and Connectors
- Electomechanical
- Electronic test and measurement
- Embedded computing
- Fibre optics
- Imaging
- IoT and Wireless modules
- LEDs and Lighting
- Magnetic components
- Photonics
- Power
- RF and Frequency control
- Semiconductors
- Sensors



Enabling a brand new type of motion control for quadriplegic patients with a custom solution

Quadriplegia, the paralysis of all four human limbs, can have a devastating impact on patients, severely restricting their mobility and independence. However, one customer had an idea for a completely new type of control for mobility devices.

The customer, a manufacturer of powered wheelchairs and mobility scooters, recognised that quadriplegics had control over their respiratory system and wondered, could a powered mobility device be controlled by a patient's breath?

Sharing their idea with us, we knew it could be feasible with a pressure sensor capable of accurately measuring low pressure. Working closely with the customer to identify and specify the pressure range, we worked with our partner supplier Honeywell to produce a pressure sensor specific to the customer's requirements, capable of measuring pressure as low as 2.5 millibar. With a sample batch of suitable pressure sensors provided in just a few weeks, the customer could produce a prototype.

Moving forward with the full support of Acal BFi

We supported the customer with technical advice throughout the development and production process, helping them refine the prototype to create a new method of controlling mobility solutions. Support continued during production, where we provided lean stock / supply management, ensuring the customer received components to order.

Following the successful development of prototypes, a new form of mobility control – known as 'sip and puff' – was demonstrated to patients who had no leg or arm function. Not only was the design highly successful, but it restored their freedom to move and gave an independence that would otherwise have been lost.

Key points

- Customer came to us with just an idea
- We specified a solution with the customer and developed a custom solution with one of our partner suppliers
- Final design has provided an entirely new form of control for mobility devices and given quadriplegic patients some of their independence back

Services

- Design advice
- Technical support
- Lean stock / supply management

Supporting the effective deployment of medical devices for home patients

An essential part of every medical service is funding, and, with finite resources, it is essential these are used effectively. A specialist manufacturer of medical equipment needed greater visibility of their devices in the field.

Home patients have been provided with continuous positive airway pressure (CPAP) devices since the early 1990s, with the financial support of health-insurance companies and government bodies. However, these bodies had no way of monitoring these devices or proving that budgets were being effectively used.

CPAP devices treat the symptoms of sleep-disordered breathing by providing continuous supply of compressed air through a small facemask. Devices were loaned to home patients with costs covered by supporting bodies. Some patients, however, would stop using these devices after a short period of time without letting the healthcare provider know or returning the equipment for redistribution. Therefore, it became necessary to monitor the equipment and enable redeployment.

Providing a solution for both new and existing devices

We worked with the customer to develop a wireless solution that could be added to both old and new devices through a serial connection. Using the Sierra Wireless SL series of cellular modules, which featured an open AT application framework, existing software could be used with the equipment, reducing development and deployment costs and timescales. Two SL-series chips were used in final designs, the SL8082BTQ for the European market and the SL8084BTQ for the Japanese market, adding a further benefit of multi-territory device monitoring.

Once in place, the customer was able to gain the insight needed to ensure equipment was effectively used and to provide better support to patients.

Another benefit provided by the wireless solution was additional insight into a patient's condition over time. This enabled devices to be fine-tuned to the patient's exact requirements, providing more effective treatment.

Key points

- Customer was looking to monitor home patients' medical devices
- Wireless solution needed to be compatible with both new and existing equipment
- Custom cellular solution enabled customer to monitor devices in multiple territories

Services

- Design advice
- Integration support
- Custom wireless solution

Improving industrial gas-operation safety with a new intelligent solution

Increasing insight and convenience is only part of the IoT revolution, with many operating companies turning to technology to improve safety. One oil-and-gas customer sought a solution to proactively warn workers of gas cylinders that were not connected correctly during the refilling process.

The existing mechanical solution was reliable but did not provide any fail-safe mechanisms or intelligence to operators. The refilling process operated in a harsh, industrial environment, demanding a design that was both reliable and robust.

With technology getting smaller and more efficient, there was an opportunity to replace the ageing design with a new digital solution; however, there were still significant challenges to achieve this. Power consumption was a critical factor, as it would need to operate for three to five years on a single battery. The new design also needed to fit into the same space as the old, analogue solution, requiring compact components.

There was also the option of adding wireless connectivity to the design, further enhancing safety and operational insight, with LoRaWAN™ technology ideally suited to this low-power, low-data, compact design.

Supporting the integration of a compact solution

Working with the customer and our partner supplier Honeywell, we identified a low-power, magnetic switch sensor that matched the requirements of the application. The compact solution enabled two sensors to be integrated into the cylinder connector design, enabling the customer to monitor both the connection between the feed line and cylinder, and control the valve in the feedline.

Along with Honeywell, we further supported the customer with simulation software to review the design's operation and performance digitally. This support reduced the customer's development period from several months of trial-and-error testing to just a few weeks of computer-aided prototyping and enhancement.

Thanks to this comprehensive technical support, the project is ahead of schedule and physical prototypes are currently being tested.

Key points

- Legacy manual design offered no safety insight
- New connected solution had very tight space requirements
- Industrial application required robust, reliable solution for safety-critical operation

Services

- Design simulation software
- Rapid prototyping
- Technical support

Creating a wireless crop-monitoring solution to control irrigation systems where water is scarce

Irrigation systems in third-world countries, where water is a scarce commodity, require constant monitoring to ensure crops are regularly and efficiently supplied with water.

Many farms cover thousands of acres, which makes supervision of irrigation systems a challenge. Using our expertise, we helped a customer implement wireless technology to monitor and control irrigation systems, ensuring plant growth was maximised through efficient water delivery.

The solution was designed around a cutting-edge Skyworks RF module with wireless transceivers mounted in strategic positions across the plantation, negating the installation of costly cabling.

We worked closely with the design team to integrate the Skyworks SKY66243 868MHz front-end module. The module enabled the wireless solution to operate at a much lower output power with greater efficiency, extending the battery life of each remote transceiver without compromising on performance or wireless range.

Overcoming issues in the field with an alternative antenna solution

Early trials of the design revealed issues with the original whip antenna. Any damage to the antenna structure, from the environment, weather or animals, drastically reduced the range of the transceiver, resulting in operational issues.

We further supported the customer by redesigning the transmit-receive circuit, replacing the whip antenna with a compact, high-gain, surface-mount alternative from Johanson Technology. This included the application of MTC shielding to protect the radio board against spurious emissions of radio waves and ensured compliance with FCC and ETSI regulations.

With initial boards now in production, trials will demonstrate how this new wireless system could revolutionise farming worldwide, with effective remote monitoring and control of water supplies across acres of farmland.

Key points

- Irrigation systems in third-world countries are crucial to growing essential crops
- Supervision of large farm areas is a challenge
- Bespoke antenna solution overcame operational issues to enable low-power, long-range, wireless solution

Services

- Technical and design-in support
- Additional deployment and regulatory support
- New antenna solution with custom shielding

Bringing an antiquated metering system into the IoT universe

Creating a smart energy meter requires more than just a low-power, long-range, wireless module. The mechanical methods of measurement used by many meters is similar to those first installed with utility grids in the late 19th century, with an analogue output that is unable to communicate with a digital wireless solution.

One of our customers sought to overcome this challenge with a new digital meter. The design had to be cost effective, robust, absolutely reliable, and able to operate for many decades. It also had to be ultra-low power, with only one small battery for a power source.

The customer established they could use ultrasonic technology to measure the flow of water in the pipe; however, they found that even minor fluctuations in temperature caused water density (and therefore volume) to change. To address this, they needed a solution that could accurately measure the water temperature and instantly respond to minor changes.

Finding the perfect solution from a vast portfolio of technologies

We identified Shibaura thermistors as the perfect solution. Offering instant, accurate temperature measurement, their incredibly robust design provides a zero failure rate with an operating life of more than 30 years. The quality of the solution gave the customer total assurance with best-in-class performance.

This resulted in the creation of a new digital water meter that was both cheaper and more accurate than its mechanical predecessor. With no submerged mechanical parts, reliability was also improved. Most importantly, the solution enabled the customer to realise their ultimate ambition of a connected meter, which is now being deployed across Europe.

Key points

- Existing meters used analogue methods to measure consumption
- New solution had to be able to deliver decades of reliable, accurate measurement, with only a battery for a power source
- Digital solution was more accurate and cheaper than the outdated design

Services

- Design advice
- Technical support
- Specification and sourcing of appropriate solution

Solving the analogue energy challenge with a brand new wireless solution

Every home with mains utility provision uses meters to measure consumption. Traditionally these meters were analogue devices, requiring manual meter readings.

To collect independent meter readings, a company official had to visit each property one by one – a costly and inefficient process. We recognised this process could be streamlined and made vastly more efficient if a suitable wireless solution was integrated into the meter.

With clear requirements and significant demand from several utility providers, we started investigating a suitable long-range, low-power solution for the application. However, existing wireless bands were crowded, did not offer the required range or were too costly and power hungry to be used for this application.

Meeting market demands with a brand new solution

We worked with our partner supplier Skyworks to develop an entirely new wireless solution. A new high-performance front-end module was specified to make use of an old pager bandwidth, which could efficiently transmit and receive the tiny pieces of data from home meters to a central gateway. Mounted into a service vehicle, these gateways could connect to hundreds of modules at a time, allowing for thousands of meter readings to be gathered every day by simply driving through residential areas.

The new front-end module was the first of its kind in the market place and exactly met the needs of smart-metering applications. Since launch, it has enabled multiple European utility companies to make considerable savings in time and resource, whilst providing their customers with a better user experience.

The solution has since sparked further development, and we have continued to work with utility operators to deploy meters with additional Bluetooth® capabilities. This will allow customers to connect to their energy meters using their smartphone or tablet to see their energy consumption in real time, enabling them to take steps to reduce it, save on their energy bills and reduce their carbon footprint.

Key points

- Recognised the need for a wireless solution for energy meters in Europe
- Created brand new front-end module with one of our partner suppliers
- Drive-by meter readings, taking hundreds of readings in seconds

Services

- Developing new wireless solution with one of our partner suppliers
- Technical support integrating first-of-a-kind solution
- Continued design support to add further functionality

Improving urban roadside air quality through data-driven decisions

Many governments and councils around the world have targets to reduce emissions and improve the air quality of their towns and cities. To make effective changes, they first need insight into current activity to identify what pollutants are in the air, and when, where and how much of these are being released. One street-lighting manufacturer sought to add sensors and wireless technology to their products, so they could help authorities make intelligent decisions.

Already working with us on wireless solutions, the manufacturer knew they wanted to measure the air quality, including CO₂, VOC and NO_x gasses, as well as temperature and humidity. By collecting reliable data 24 hours a day, seven days a week, and sharing this with researchers, authorities could make essential changes to traffic flow.

However, to bring their idea to market, the customer needed to overcome several challenges. The sensors had to be robust to reliably operate in all weather conditions. They also needed to strike the right balance between price and performance, to deliver an accurate and cost-effective solution.

Robust sensors were fundamental to future strategy

Many of the solutions considered by the customer offered ultra-high levels of accuracy, far greater than the application would ever need, but the associated costs would have made the project financially unviable.

Gaining a specific set of customer requirements, we recommended a series of solutions for the application, and worked with our partner supplier Cubic to optimise several types of CO₂, VOC and NO_x sensors, modifying standard products to create new modules for the specific gas analysis. We supported the customer throughout the design phase as an extension of their engineering team, providing technical advice and expertise.

The design is currently going through its final phases, with more sensor technologies now integrated into the design. Once implemented, the relevant bodies will be able to use the data to identify trends and start combatting the impact and causes of poor air quality, intelligently implementing changes that will create cleaner towns and cities.

Key points

- Measuring air quality remotely, 24 hours a day, seven days a week
- Solution had to be reliable and robust
- Sensor choice had to strike the right balance of price and performance

Services

- Extension to in-house engineering teams
- Specification and sourcing of appropriate solution
- Standard solutions modified to meet exact requirements

Overcoming temperature extremes to enable a new generation of smart HVAC systems

Several Italian customers had approached us with the same challenge – each was looking to provide their customers with a smart climate-control system for their residence. However, to integrate wireless capabilities, the solution would need to be compact, cost effective and operate at extreme temperatures.

Heating, ventilation and air-conditioning (HVAC) systems are fitted to thousands of homes across the country. Several manufacturers were looking to create smarter, connected HVAC systems, but all faced the same three challenges.

Integrated into the heart of the HVAC system, the wireless solution would need to tolerate a hostile environment. From the freezing cold to scorching heat, it had to operate reliably for many years.

The solution also needed to be compact, fitting into the existing HVAC system, which was installed into the tight confines of a building.

Cost was the final, crucial factor. Whilst a smart HVAC system could reduce installation times and save customers money on their energy bills, the system itself would cost more initially. If the additional cost was too great, customers would not choose a smart HVAC system.

Delivering a reliable, compact solution with dual-wireless capabilities

We identified a compact, cost-effective, dual-wireless module from our partner supplier Sierra Wireless that would integrate both Bluetooth® and Wi-Fi capabilities.

Bluetooth enabled engineers to connect to the HVAC system during installation, inspection and servicing, while residents could use Wi-Fi with their smartphone or tablet for direct control, or with a broadband router for remote access from anywhere in the world.

We provided our customers with direct on-site technical support throughout the development process to reduce their time to market. Currently, there are several products in testing, with the first products expected to launch imminently.

Key points

- Several customers looking to overcome the same three challenges – temperature, cost and size
- Wireless solution had to be robust, reliable, compact, cost efficient and resilient to temperature change
- Solution offered two modes of wireless connection, enabling a more advanced end product

Services

- Solution sourcing and integration support
- Technical support
- Extension to in-house engineering teams

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