KEEP YOUR PRODUCTION **MOVING & IMPROVING**

BUILD YOUR **FUTURE FACTORY** TODAY WITH THE LATEST IIOT ADVICE, PRODUCTS AND SERVICES

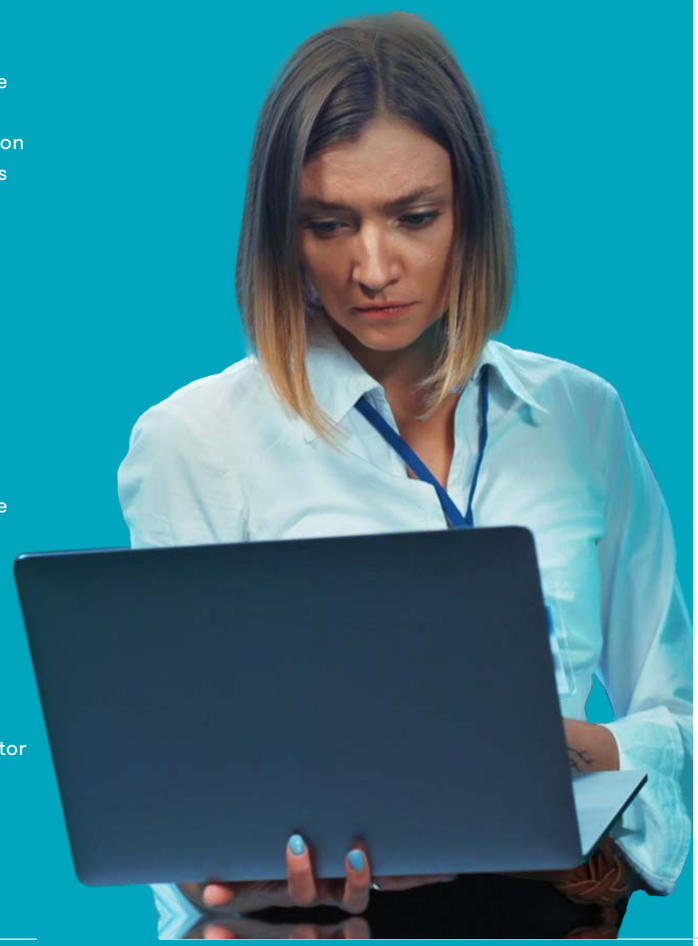
AN EFFECTIVE MAINTENANCE STRATEGY IS THE LINCHPIN OF BUSINESS IN THE INDUSTRIAL SECTOR - UNDERPINNING PRODUCTIVITY, REDUCING OPERATIONAL DOWNTIME AND HELPING CONTROL BUDGETS. IN THIS RAPIDLY EVOLVING MARKET, YOU CAN NO LONGER AFFORD TO IGNORE THE BENEFITS OR POSTPONE THE ADOPTION OF THE INDUSTRIAL INTERNET OF THINGS (IIOT).

While you may have moved on from a reactive to a preventative maintenance approach, the latest IIoT solutions are enabling truly predictive maintenance programmes by providing high levels of data that facilitate fast decision-making. Condition monitoring sensors and the latest in Computerised Maintenance Management Software (CMMS) - combined with universal communication technologies that can help the flow and collection of data - are paving the way for affordable, accessible solutions that can connect a variety of new and legacy devices.

The quest for the factory of the future can be daunting and present huge information overload, but by establishing clear objectives and taking small steps, you can make a solid start on what will be your continual and necessary journey.

At RS, we're here to support you in developing a proactive maintenance strategy that will help you avoid the heavy cost and disruption of downtime from unplanned MRO, by providing technology insight, product expertise and a choice of innovative service solutions available today - from condition monitoring technology to oil analysis and lubrication management tools. Our unrivalled consumption data collection and analysis capability will help you make strategic decisions based on accurate information.

The connected technology that has permeated the consumer space has proven its worth and benefits. Now the industrial sector must embrace the IIoT revolution to reduce downtime risk and achieve optimal operations within available budgets. Whether you're already on your Industry 4.0 journey or considering it, the future factory concept is no longer a choice but a necessity for survival.



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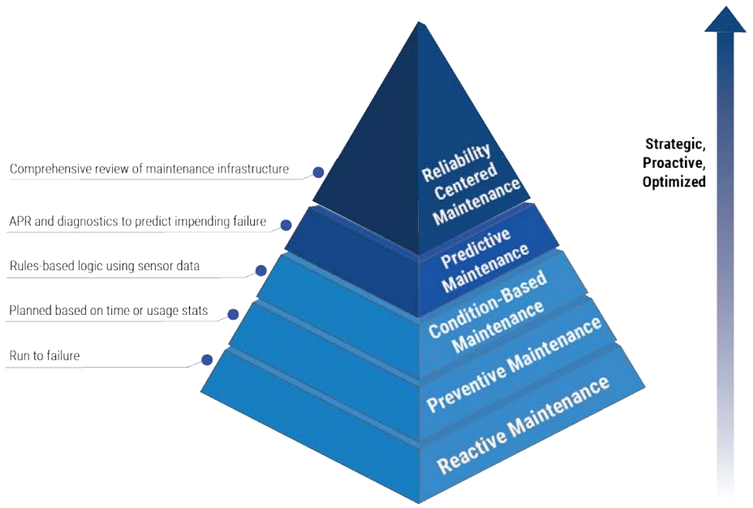
WHY **INDUSTRIAL IOT** SHOULD BE PART OF YOUR MAINTENANCE STRATEGY

MAINTENANCE IS AN UNAVOIDABLE CERTAINTY. WHAT IS CRUCIAL IS HOW YOU APPROACH THE TASK OF MAINTENANCE, AND HOW YOU ENSURE YOU MINIMISE THE IMPACT ON THE DAY TO DAY OPERATION OF YOUR BUSINESS.

Setting and evolving your maintenance strategy as technology and techniques develop is an important part of ensuring your organisation is setup for success. The activity of maintenance continues to change, and every business will be at a different phase of maturity – all with opportunities to use and benefit from Industrial IoT.

Moving up the maturity pyramid

Most businesses already enact preventative maintenance and an increasing number are adopting the principles of condition-based maintenance. However, implementing true predictive maintenance requires higher levels of data, and this is where IIoT can be a key enabler. It allows both existing process data to be unlocked, as well as additional data from condition monitoring sensors to collected. This data can then be combined with data from OEE (Overall Equipment Effectiveness) tools and other sources in a CMMS (Computerised Maintenance Management Software) – which are becoming increasingly cloud based.



Source: Plantservices.com

Total Productive Maintenance (TPM)

While not a new idea, the concept of getting operators involved in maintaining their own equipment, and emphasising proactive & preventive maintenance lays the foundation for improved productivity - fewer breakdowns, stops, and defects.

The barrier has often been the cost and implementation of in-process instrumentation that indicates to an operative when a machine or process performance is changing, and maintenance is required.

SMC is one of many manufacturers now creating simple to use, cost effective devices such as digital process indicators which can be easily added to machinery to show performance changes.

Monitoring variables such as pressure, temperature and current, then making these visible to an operator combined with some training on routine maintenance; such as cleaning, lubricating, and inspection can significantly reduce unforeseen stoppages.

It also has the additional benefits of giving operators greater "ownership" and knowledge of their equipment and frees maintenance personnel for higher-level tasks.

More data, less maintenance?

Big data is an often-used phrase, but with reference to maintenance it's clear that if you knew the current condition of all wear parts within your process predicting when and what needed replacement would be easy.

While this is still some way off there are emerging technologies which can be retrofitted to provide you with enhanced levels of information on the status of your process.

Diagnostic technologies such as thermography and vibration analysis are helping identify changes in equipment performance, but these still require the maintenance team to inspect the equipment.

IO-Link is an embedded technology which is being increasingly added to presence and proximity sensors to provide additional performance or status information.

The big benefit of IO-Link is that this data is invisible to the machine and is captured via a gateway. This allows IO-Link enabled sensors to be added to existing equipment without extensive re-work. The status data can then be extracted and displayed via a separate PLC or IPC allowing the operations team to gain useful insight on the process or production line. It can also be fed to a CMMS or OEE tool as an additional dataset.

Regardless of the size of business, moving up the maintenance maturity pyramid and starting to think about how IIoT could be part of your maintenance strategy isn't just a nice to have – it could be the difference between staying competitive and thriving or merely surviving.

THE BIG BENEFIT OF IO-LINK IS THAT THIS DATA IS INVISIBLE TO THE MACHINE AND IS CAPTURED VIA A GATEWAY.

6 STEPS ON THE INDUSTRIAL IOT JOURNEY

THE CONCEPT OF IOT – THE INTERNET OF THINGS – IS WELL ESTABLISHED IN THE CONSUMER SPACE. SYSTEMS SUCH AS GOOGLE NEST ARE ALLOWING US TO CREATE A CONNECTED HOME WITH THERMOSTATS, CAMERAS AND EVEN DOORBELLS ALL CONNECTED VIA THE INTERNET TO SMART APPS AND CLOUD SERVICES. HERE WE CONSIDER SIX IMPORTANT STEPS ON YOUR INDUSTRIAL IOT PATH.

1 Carefully consider what you are trying to achieve

Be clear on what the challenge is you wish to use IIoT to solve. If it's just one or two elements or conditions which you want to monitor or track, focus on those. It will reduce complexity and cost allowing you to prove the benefits faster.

2 Start small

Don't try and create a complete IIoT infrastructure in one hit, even if you are considering purchasing an off the shelf software solution. Prove it, build on that knowledge, and demonstrate the value.

3 Get the buy-in from IT

If this could be a potential barrier don't try and go around the IT team, be clear on your objectives and work with them. If they have concerns, you can start with closed networks or cellular networks (3/4G) which create physical isolation from the business's IT infrastructure for which the IT team are responsible.

4 Operational Equipment Effectiveness (OEE)

If your primary objective is improving this then you may wish to consider a combination of tapping into existing data – trapped in PLCs or other parts of the control system – and connected T&M which can help improve predictive maintenance, reduce unplanned downtime and speed up the diagnostics process. You may also need to add additional sensors which can provide data on conditions – for example motor vibration – which are not known to the control system.

5 Exposing Productivity Data

If your main objective is accessing production data so you can better understand how your process is performing, unlocking existing data should be your first step. Virtually all the key attributes – speed, output, process variables, etc – are available within the process control system. In many cases these can be retrospectively released via protocol monitors completely transparently, without the control system being compromised.

6 Start on-premise before thinking about the cloud

This approach has multiple benefits. Firstly, it can allay security concerns that your IT team might have. It can also simplify the solution, while not preventing the data from being 'cloud ready' in the future. Our experts suggest that in many cases the information will only be used or accessed on site so the benefits of a cloud-based solution might be negligible.

Within the following pages you'll find solutions which can help unlock productivity data, products which can add intelligence to existing machinery making them IIoT ready and equipment which enable you to monitor conditions or make measurements and share these easily with colleagues or for reference.

One thing is clear. Industrial IoT and the concept of Industry 4.0 is here to stay, and you need to be considering how – not if – you will start using it today.

PREDICTING AN EFFECTIVE MAINTENANCE FUTURE

BIG DATA IS A WELL-RECOGNISED TERM AND CONCEPT, WITH BUSINESSES NOW GRASPING THE IMPORTANCE OF ITS ROLE IN IMPROVING OPERATIONS, PROVIDING COMPETITIVE ADVANTAGE AND POSITIVELY IMPACTING PROFITABILITY – AND THIS IS PARTICULARLY PERTINENT IN THE INDUSTRIAL SPHERE.

With the effective collation of disparate pieces of information about a problem, we can apply artificial intelligence and predict future trends. This concept certainly appears to be the nirvana of solving maintenance issues, providing total visibility of failures before they occur.

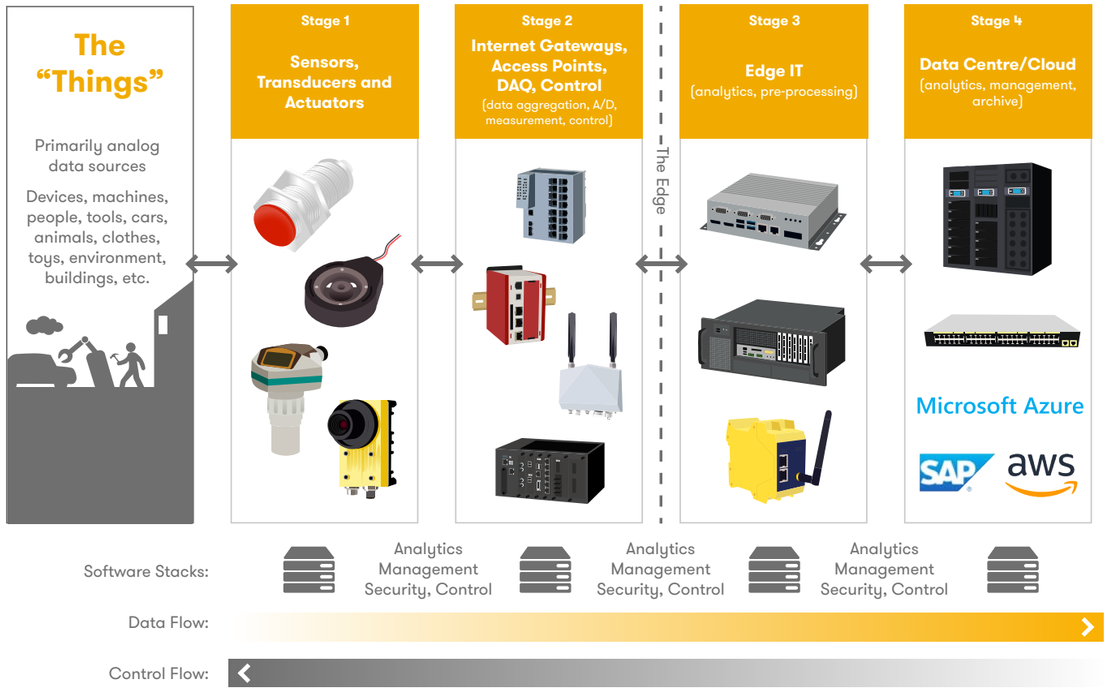
But while this all sounds ideal in theory, the operational reality can be very different. Over the last year, I've spent time with industrial end users trying to get under the skin of the organisations to understand what the real challenges are and explore key barriers to adoption for businesses when it comes to implementing IIoT technologies.

The challenges are varied, and experiences mixed, but there are some common themes that emerge across the board. A major barrier seems to be that IIoT maintenance solutions are difficult to understand and specify, and confusing and fragmented to purchase. Many focus on futuristic benefits, rather than practical results that can be delivered with pace. Implementations can be costly and complex to organise and manage – and could take years to fully and successfully implement. The objectives get blurred and focus shifts to adding new sensors rather than utilising the data which is already available.

There are some specific examples of true predictive maintenance, where the cost of data is a fraction of the cost of the asset or the cost of failure – for example, aero-engines. However, there are substantially fewer success stories within industry. There are several reasons for this:

- **Representative data sets are expensive.**
  Techniques such as full wave form vibration analysis and motor current signature analysis are very mature and are widely deployed on critical assets. However, a single vibration point is likely to cost around £1,000, making mass deployment to medium criticality assets cost prohibitive.

- **Merging different data sets is technically challenging.**
  The issues around the integration of operational technology (OT) and informational technology (IT) are significant: different architecture; different protocols and different approaches to security. Even once the connectivity has been addressed, sensor data will be accurate to the millisecond, but often failure data is reliant on human data capture and may only be accurate to the hour.



- **There's a lack of failure events.**
  Predicting failure using supervised Machine Learning (ML) relies on having large data sets of leading indicators of failure and the associated failure events. However, maintenance professionals work hard every day to prevent and mitigate failure, capturing many potential failures prior to them occurring.

- **Hidden failures have no leading indicators.**
  Many potential failures are hidden, and are only apparent when you operate the system. These failures are found through regularly testing the functions of the system. In this case, not only is there a lack of failure data, but also a lack of indicators.

To mitigate the impact of these issues, the concept of small data can be applied to predictive maintenance. Instead of looking in terms of huge new data sets and complex predictive models, look to extract as much value as possible through limited data sets. Use this to identify where to deploy resources, either labour or investment, to understand the problem more fully. Instead of looking to predict failure, look to identify abnormalities. The steps to address these are:

- Identify what data you already have - which is often a lot more than you think. Modern field devices are full of data, but it's rarely utilised
- From this, choose the parameters that could tell you what is normal or abnormal. For example, monitoring current, voltage and phase angle for all the phases of an induction motor will tell you a lot about how things are changing over time
- Use a suitable data tool to identify normal conditions during a training period. At its simplest, you can do this in Excel, or any of a range of statistical tools
- Once you've identified normal, you are only interested in abnormal readings - use these to trigger deeper investigation through, for example, full wave form vibration analysis, thermography or oil condition monitoring
- Depending on the data tool you use, you can feed back into the model the outcome of the human investigation to improve the validity of the abnormality detecting.

It is clear to me from my engagement with customers across the industrial sector that instead of getting hung up on big data and the daunting, mammoth task of understanding, sourcing and implementing technologies to harness it, that the focus should be on small data that already exists within the organisation. Small data has many benefits through reducing the cost, technology and organisational barriers to entry. Using this data in a smarter way is the key to enhancing your maintenance effectiveness.

Richard Jeffers is RS Components Director of Industrial Digital Solutions. A trained Mechanical Engineer with expertise and a passion to create inspiration around technology to lead transformational change, Richard leads the development of digital solutions for maintenance customers.

EXPLORING INDUSTRIAL MEASUREMENT & MONITORING

IN AN INCREASINGLY CONNECTED WORLD

WITH AWARENESS INCREASING WITHIN THE MANUFACTURING SECTOR REGARDING THE POTENTIAL BENEFITS OF THE INDUSTRIAL INTERNET OF THINGS (IIOT) AND INDUSTRY 4.0, THERE'S A GROWING DEBATE AROUND WHERE THIS TECHNOLOGY REVOLUTION IS HEADING.

So, to help engineers navigate the world of IIoT we spoke to industry representatives, including manufacturers and end users, to help answer some key questions such as where to start, the opportunities and pitfalls of IIoT, and provide insight on achieving the Holy Grail of turning the data gathered into valuable, actionable information.

Embarking on the connected journey

Engineers may be suffering from information overload when it comes to IIoT. However, according to Simon Chabriere, Global Offer Director, Telemecanique Sensors, a global player in sensors and sensor-related technology, engineers do not need to be the experts.

"For engineers, getting as much knowledge as possible is key. They should use forums and communities such as DesignSpark, as well as trade magazines and LinkedIn. Additionally, testing and developing is an inexpensive way of dipping your toe in the water. The rapid rate of technology evolution can be off-putting, but at one stage, you do have to jump in," says Simon.

It's also important to consider which assets would benefit most from this kind of technology. David O'Reilly, Vice President & General Manager, Fluke Digital Systems - a world leader in the manufacture, distribution and service of electronic test tools, biomedical equipment and networking solutions.

"We always recommend starting by ascertaining which assets are the most critical and cost the most money when they fail."

DAVID O'REILLY
VICE PRESIDENT & GENERAL MANAGER
FLUKE DIGITAL SYSTEMS

"Look at existing data within the organisation and consider what data would be useful to add such as vibration or thermal imaging, temperature or pressure – key monitoring areas to help in the move from a reactive or preventative to a predictive maintenance programme. Start small and measure in context - a strong data set can lead to big wins. Be sure to document those as a proof of concept to help convince other stakeholders of the benefits."

A lot can be learned when looking at the topic from the perspective of an end user. Frank McAlister, an Engineering Manager at RS Components in Nuneaton, has been piloting IoT at the warehouse in different areas of the operation. He explains: "We trialled IoT in our warehouse in a variety of different areas and used technology from a range of suppliers, to make the pilot worthwhile.

"START SMALL – YOU CAN ALWAYS COLLECT DATA ON ANOTHER AREA LATER ON...."

SIMON CHABRIERE
GLOBAL OFFER DIRECTOR
TELEMECANIQUE SENSORS

We used it in areas such as monitoring cranes remotely and assisting some office functions. We can see the potential for huge benefit but the technology has not been without its issues. The main one has probably been intermittent connectivity.

When connection is lost it can be troublesome to resolve, and this was the case with technology of different types and from different suppliers.

My main advice to those considering implementing IoT would be to really think about where it's needed."

"Don't jump in unless there's a real benefit and consider the criticality of the data."

FRANK MCALISTER
ENGINEERING MANAGER
RS COMPONENTS

"IoT works well for us as an assistance tool, but trying to capture data on a minute by minute basis with connectivity issues could make it less reliable than a hardwired solution."

The impact of IOT technology on the future of the manufacturing sector

While industry automation and data capture isn't new, people are now trying to acquire a different type of data to help facilitate predictive maintenance. Simon from Telemecanique Sensors believes that's where the value is, but says adoption is still fluctuating. "Many of the larger companies are moving into deployment stage having overcome early difficulties with adopting Industry 4.0. It's more challenging for smaller firms as the scale and knowledge tends to be lower and they are most likely waiting for a fully industrialised solution to be made available," he says.

David O'Reilly believes the future of IoT in this industry relies on data insight, rather than centring around providers of monitoring equipment. "The winners will be data insight providers. The workforce is rapidly changing. The 'new breed' of engineer will use a mobile device as their primary interface."

Overcoming potential barriers to IIOT adoption

We opened Pandora's box when asking our industry spokespeople about potential barriers to IIoT adoption. Issues included security, skills and standardisation – but they claim that each can be tackled. Simon believes that, like everything, it will get easier for the end user the more it develops. He cites a real need for simple solutions, and says it's down to suppliers to manage complexity and provide this. Cyber security remains a key consideration, and according to our spokespeople it is still a barrier to the wider adoption of such technology. Those companies that are jumping in are willing to manage the risk, as the benefits of IIoT are worth the investment in cyber security.

Integrating IoT into an existing system is also a worry for manufacturers. Products need to be easily integrated and have the flexibility to be added to, believes Simon, but in an area where standardisation is non-existent, this presents challenges.

The standardisation debate is added to by David and Frank. David agrees that there are too many players and data models at differing levels of maturity, with no real modular solution available yet. Frank feels that as an end user, it's hard to know which technology to go with, and there's a real need for a 'plug and play' solution.

David also raises the issue of lack of understanding of the technology at the right levels. He says: "There is money being spent at the top end of the spectrum to get CIO's and CEO's excited about IoT, which creates push down on engineers, who are just trying to focus on the job to be done. We need to bridge the gap between the vision of the connected world and getting the job done."

Achieving the holy grail of turning data into actionable insight

In a world where data is collected in so many ways, we could easily drown in it. Focusing on collecting only what is needed, and having the capability to manage and analyse the data to glean the relevant information is key, according to our spokespeople. Simon advises:

"Start small – you can always collect data on another area later on. Focus on the objective! Business value from data analysis can be gained in a reasonably short amount of time."

SIMON CHABRIERE
GLOBAL OFFER DIRECTOR
TELEMECANIQUE SENSORS

David highlights the importance of context. Integrating historic data where available and recording better data now means the data will become more contextual and allow for the building of models to achieve predictive insights. Frank is keen to highlight the pitfalls of using computer algorithms to analyse data. "In my experience, computer algorithms can sometimes struggle to interpret what a human would identify as a blip. The human brain can interpret better than computers and not over analyse."

Steering a course through the products, their application, how and when to integrate them and how to get the best out of IIoT is daunting to say the least. But with the rapid rate of technology evolution, it's a vital journey for all engineers. Knowing when and how to make the leap of faith is one of the key barriers to adoption today, but it must be overcome in order to thrive in the manufacturing world.

CUTTING THE MRO COSTS OF A CONFECTIONERY GIANT

RS HAS HELPED A LEADING CONFECTIONERY MANUFACTURER ACHIEVE SIGNIFICANT COST SAVINGS IN THE INDIRECT PROCUREMENT PROCESS THROUGH ITS RS PurchasingManager® SYSTEM

End inefficient, costly procurement processes

Procurement teams and engineers face several challenges regarding the maintenance, repair and operation of their organisation's assets and facilities. The supply chain for indirect materials is complex due to the number of stakeholders involved, a fragmented supply base and the number of products that are split across categories. In addition, there is constant pressure from senior management to reduce costs.

As one of the largest industrial suppliers, RS is in a unique position to understand the complex needs of its customers, and to help these businesses streamline their processes and make cost-efficiencies.

The crucial fact for organisations to appreciate is that indirect procurement process costs can be twice as much as the amount spent on the products themselves. So if your organisation spends £100,000 on purchasing products over the course of a year, you will spend a further £200,000 on processing or 'soft' costs. As such, there is significant value in reducing process costs rather than focusing solely on purchase price. Streamlining processes can bring other major advantages too.

The challenge

An example of how RS has been able to help a customer take better control of its process costs is our work with a well-known confectionery manufacturer, a market leader within its category with a turnover in excess of £100 million. RS has worked with this company for a number of years, supplying a wide variety of products. This includes electrical and automation products, PPE equipment, tools and test equipment, which are used by maintenance engineers to help keep operations running.

As a large organisation, the confectionery manufacturer had a long-term plan to streamline their purchasing process, which included reviewing all indirect spend. The procurement department was challenged to reduce admin and bureaucracy around the purchasing process so that it would be quicker and require less input from multiple stakeholders across the business.

Typically, the customer was spending significant time locating suppliers who had the products they needed and then comparing quotes; raising POs with a finance team; and arranging for delivery to be achieved in a time that didn't impact the day-to-day business.

They also felt there was a great deal of duplication and manual entry of information during purchasing. In short, the process was delaying procurement of low-value products, while taking valuable time away from employees' core responsibilties.

The solution

The first step was to process map the company's current procure-to-pay process. This was led by RS's dedicated team of eCommerce specialists and the customer's key stakeholders then, using a process cost calculator, it was possible to calculate the time taken for each process step in order to produce the total cost to the company for every order they place.

By doing this, it was identified that each PO raised, took 88 minutes from end to end, costing £74 per order. For RS alone, they were placing over 200 orders annually, with a similar number of orders being placed with multiple suppliers.

RS found that the simplest way to remove many of the issues (and additional cost) in the process was to introduce RS PurchasingManager® to the customer. RS PurchasingManager® is a web-based, order management system used alongside the RS website. Buyers can create account structures across their organisation, assign spend controls, cost centres and approval limits to help manage all RS Online purchasing.

The system allows the end user, usually an engineer, to go onto the RS website, choose the product they need, order it and see when the delivery will be made. Behind the scenes a confirmation request is sent to a senior colleague who can quickly approve the cost and the order is processed.

RS PurchasingManager® addressed the authorisation process and became the only authorisation required to approve an order from RS. Once an order is approved, it is sent directly to RS without procurement being involved.

The confectionery customer was able to use a single monthly blanket order rather than individual POs, meaning that the only PO processing now takes place at the end of the month.

The existing process was unnecessarily complicated:

- An engineer would choose a basket of goods, raise a paper requisition and send it to their superior for authorisation
- Once this authorisation was granted the requisition was sent to procurement. Procurement would then check the price online before raising a purchase order
- The purchase order would need to be signed off by the head of procurement before the PO was emailed to RS for fulfilment
- Once the goods were delivered, a three-way match was needed between the email request, the PO on their system and the individual invoices

The outcome

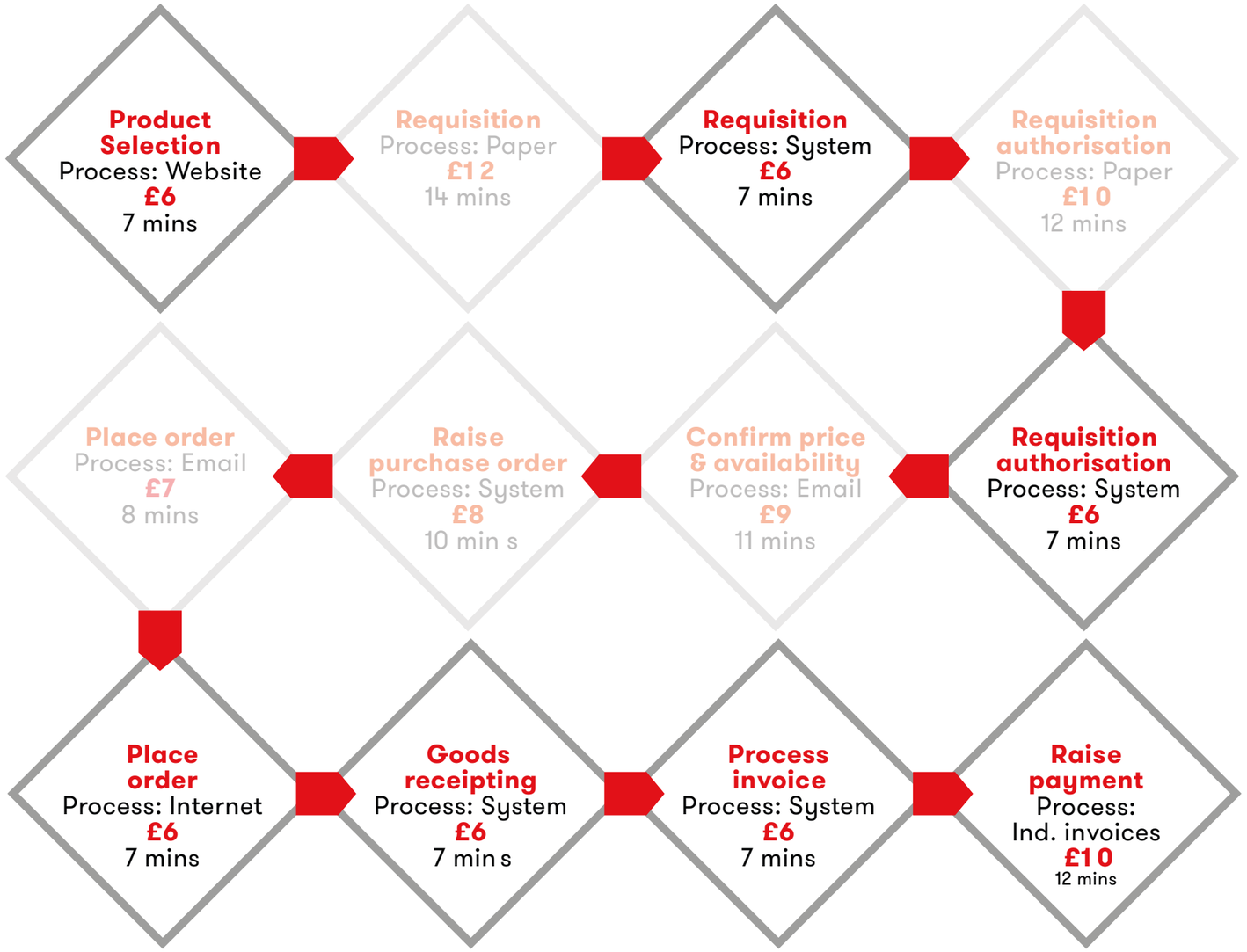
The customer now has a simplified workflow with empowered end users, which has significantly reduced processing costs, enabling all functions involved in the indirect purchasing process to focus on value added activities in their respective roles. The customer has moved from an average cost per order of £74 before RS PurchasingManager® was introduced, to £46 now. The number of orders also increased to 1,089 annually as they consolidated more orders with RS, reducing their supplier base. Based on the new cost per order, this equated to a £30,492 saving annually compared to their old process.

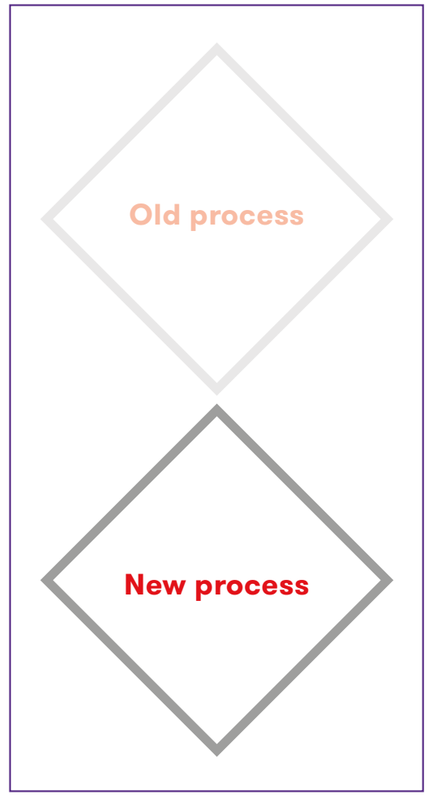
The entire purchasing process has been greatly speeded up, more employees are ordering from trusted suppliers (rather than using local or online purchases), which improves contract compliance, and parts are being successfully delivered when engineers want them, which means there is far less downtime.

The result is that the customer has gone from an inefficient, costly process with too much duplication of tasks and a lack of clarity to becoming highly efficient with real transparency throughout the purchase-to-pay process.

£30,492
Savings per year

(3.7 weeks)
Time per year





OLD PROCESS COST

Per order: £74 (88 mins)
Per Year: (1089 orders*)
£80,586 (9.5 weeks)

NEW PROCESS COST

Per order: £46 (54 mins)
Per Year: (1089 orders)
£50,094 (5.8 weeks)

*Based on the number of orders with the new process

Discover the benefits of RS Purchasing Manager®

- Gain more control over orders and spend
- Save time
- Boost visibility
- Improve reporting
- Speed up processing

Learn more about Purchasing Manager and our other E-commerce Solutions here

IO-LINK

THE SMART, EASY SENSOR CONNECTIVITY AND DATA COLLECTION SOLUTION WHICH CAN BE USED ON EXISTING MACHINERY TODAY!

SENSORS HAVE LONG BEEN THE EYES & EARS OF THE CONTROL SYSTEM, IN DIRECT CONTACT WITH THE PROCESS AND THEREFORE EXPOSED TO POTENTIAL DAMAGE. SINCE THEIR INTRODUCTION THE VAST MAJORITY OF PRESENCE AND PROXIMITY SENSORS ONLY PROVIDE A SIMPLE DIGITAL ON/OFF OUTPUT, BUT IO-LINK IS SET TO CHANGE ALL THAT AND UNLOCK INFORMATION ABOUT THE STATUS OF THE SENSOR AND IT'S ENVIRONMENT WHICH WAS PREVIOUSLY UNKNOWN – ALL VIA THE SAME WIRING THAT THE SENSORS HAVE PREVIOUSLY USED.

IO-Link in maintenance and repair

With IO-Link the last metre between the field level of automation and the sensor/actuator level becomes communication-capable. This means that in addition to the process variables, information about identification, parameters and the status of the device can also be sent. This helps avoid replacement with the wrong device model and sensor parameters can be stored in the controller and automatically transferred when the unit is replaced. IO-Link simplifies equipment replacement, reduces the level of training required, reduces maintenance costs through better diagnostics and prevents downtimes.

IO-Link reduces maintenance costs while increasing equipment uptime

IO-Link devices can provide information about their basic status. For example, the increasing contamination level of an optical sensor can be reported and maintenance requested. These self-diagnosis functions and the ability to convey information back to the control system enables greater levels of predictive maintenance, less preventative maintenance and uptimes are increased.

Upgrade existing equipment and designs with minimal cost

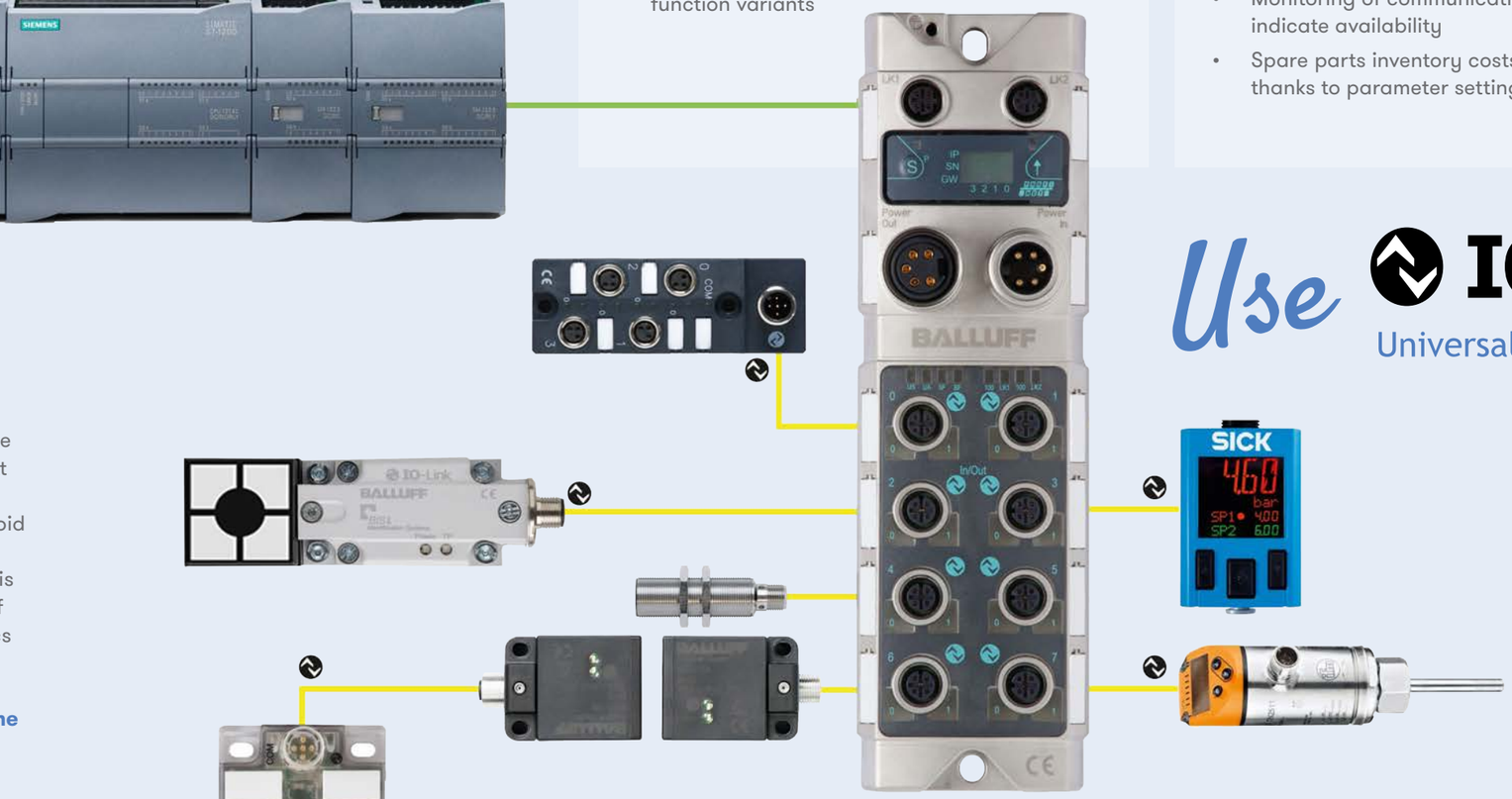
One of the biggest benefits of IO-Link technology is its use of existing wiring. It transmits the additional information via the 3-wire connection used by the sensor or actuator without affecting its basic operation. This means IO-Link is invisible to the system unless a gateway is used to interface with this data, which allows IO-Link enabled sensors to be implemented into existing machines or designs with minimal re-work.

Previously

- Replacement of sensors and actuators having parameters only possible using special programming device or in situ on the unit itself
- Simple diagnostics possible on additional cable lines
- Mix-up of model types not detected, since the devices cannot be identified by the host system
- No early warning for compromised operation possible
- Failure of digital sensors or actuators not generally detected
- Often a need for different models due to differing measuring ranges and function variants

With IO-Link

- Device parameters can be stored in the host automation system and automatically downloaded reducing documentation or expert knowledge requirements
- Conveniently run diagnostics information is sent over the same line as the process data
- Devices can be identified and replaced with no risk of inserting the wrong type
- Status- and need-based maintenance is possible
- Operating status information supports need-based maintenance – reducing reactive maintenance
- Monitoring of communication and diagnostics indicate availability
- Spare parts inventory costs are reduced thanks to parameter setting capability



Use IO-Link
Universal · Smart · Easy

So what does this mean to the industrial end user?

IO-Link technology has been rapidly gaining acceptance since its launch in 2009, with over 160 manufacturers now supporting the technology. IO-Link is an open-standard, and has been adopted as an international I/O standard (IEC 61131-9) allowing different brands of actuators and sensors on a machine all to communicate with the control system.

This high level of manufacturer support, openness and ability to retro-fit IO-Link to existing processes and designs means you should be demanding IO-Link support from machine build and integration partners now to ensure you can gain the operational benefits.

We've been expanding our IO-Link range and now have nearly 400 enabled products in stock, giving you the opportunity to design or upgrade machines with this game changing I/O technology.

View our range visit IO Link products

UNIVERSAL COMMUNICATION IS KEY

THE BIGGEST HURDLE INDUSTRIAL IOT NEEDS TO OVERCOME IS STANDARDISED DATA COMMUNICATION. THE TRUE VALUE AND OPERATIONAL BENEFITS OF IIOT WILL ONLY BE DELIVERED ONCE OPEN DATA STANDARDS ARE EMBRACED BY THE AUTOMATION MANUFACTURING COMMUNITY AND DEMANDED BY END USERS.

Open Wireless Networks

One challenge which IIoT faces is the need to connect devices, often legacy ones which are not Ethernet enabled, or those which are outside the reach of cabled Ethernet networks. While IEEE 802.11 WiFi networks are one solution their range and other technical restrictions can be a barrier.

LoRaWAN™ and Sigfox

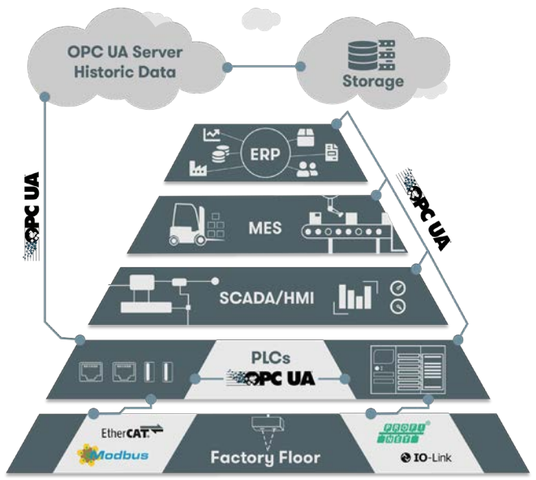
Low power, wider area open networks can meet the increasing requirements of mass IoT applications Their combination of low device integration cost, low connectivity fee, high network capacity, low power and long range have made them attractive to industrial applications which often require a small amount of data to be transmitted frequently.

4G and beyond....

While there is much excitement about the arrival of 5G, the reality for industrial applications is that 3/4G offers more than enough in terms of data-rates and latency for the vast majority of industrial IOT tasks. Cellular network coverage is continually improving and the choice of industrial cellular hardware – such as modems & routers – is continually expanding. This combined with the relatively low subscription and hardware costs makes cellular connectivity an attractive option for many IIoT projects.

Open Data Standards – OPC UA

Industrial IOT enables a broader range of technologies which have previously not been connected to IP-based networks and connects them via new, emerging networks. However, they still need a common way to communicate if the information is to be usable. Therefore, a strong case exists for standardised 'Middleware' which can truly empower this fourth industrial revolution. OPC UA is a standard could make this a reality. OPC UA addresses the need for standardised data connectivity and interoperability either in Machine-to-Machine (M2M) data connectivity within factory floor systems or device-to-cloud or server data transfer – such as production data passing from PLCs to an ERP system. In both cases, OPC UA provides a secure, reliable foundation robust enough to facilitate standards-based data connectivity and interoperability.



The true value of IIOT can only be fully realised if communication between devices is based on a global communication standard that can satisfy a wide range of complex requirements. This could be a high speed one-to-many broadcast communication, or a secure client/server model for bi-directional communication and control. OPC UA supports both requirements.
Beyond simple 'data' sharing, a core IIoT era standard must facilitate rich information exchange, especially important when large amounts of data are pooled (aggregated) from a diverse eco system of third-party systems found in typical production environments.
The OPC UA standard's object-oriented information modelling mechanisms directly fulfil this requirement while standardising the semantic data description, enabling the possibility of integration across all network layers as well as platform and vendor independence.

If IIoT is to become 'business as usual' the need to find a platform independent data exchange standard is paramount. In many ways it's the missing piece of the puzzle as there are numerous technologies which can help convey device level data onto a network, IO-Link being one example. However, allowing this data to be shared seamlessly and securely is vital in allowing industry to really harness the power of Industrial IoT and seize the benefits.

FLUKE

FLUKE CONNECT™

How does it work?

As is so often the case these days, it involves an app of course! Then it uses Bluetooth communication between the test instrument and smart device. There is one exception to this for thermal imaging where due to the need to transmit detailed images or video which Bluetooth can't support, the camera acts as a wifi hub for smart devices to connect to.

Results can then be uploaded to a secure server for review or backup purposes, or for sharing with colleagues.

How can it help me?

Firstly, it allows you to work more safely. The test instrument can be connected to a live circuit, possibly inside a cabinet or elsewhere hard to get to. And you can review the readings from a safe distance on your phone. That could be all the connectivity you need!

Results can be compared with previous data, to help see if a machine part is deteriorating. Such insight can allow you to intervene before failure, assisting you to avoid unplanned downtime. Intermittent problems can also be identified more easily.

Get another opinion. Not sure what the data is telling you? Ask a more experienced colleague to take a look remotely, and advise you what the next steps should be. The faster a course of action can be agreed and taken, the less disruption will result.

If you know what you have to do, the sooner you can get approval to work on a failing part the better.

The evidence you capture of an impending failure can be shared with your line manager to get agreement to rapid action. Even if she is at another site.

What is it available on?

Over 80 instruments and sensors from the Fluke range now has this capability, covering many different measurement parameters.

View the range

EDGE COMPUTING EXPLAINED

IF INDUSTRIAL IOT HAS THE POTENTIAL TO UNLOCK PROCESS AND MACHINE DATA, ALLOWING BUSINESSES TO MAKE FASTER, MORE INFORMED DECISIONS, WHAT IS THE TECHNOLOGY MAKING THIS HAPPEN?

Edge computing is one technology concept, but what is the 'Edge'? The edge in this case is the edge of the local network on which IIoT connected devices communicate. In industrial terms this is most likely an Ethernet network – either specific to a single machine, process or a local site network.

While data can flow within this – often closed - network it may not be suitable for pushing to the cloud, or only certain elements of the data are desirable for remote analysis. Edge computing primarily focuses on the task of data collection, interrogation and manipulation on the network edge, forming a link to cloud services or the wider internet.

What is an Edge Controller?

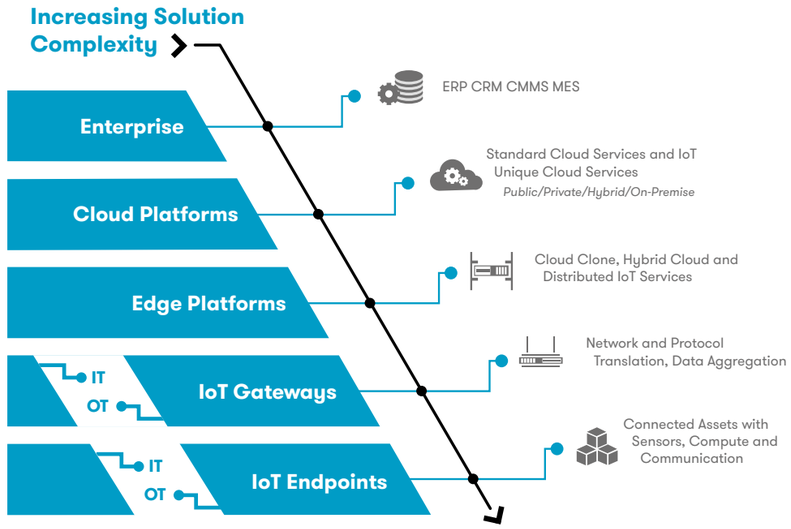
First a little bit of terminology. IT – Information Technology a phrase I'm sure you are familiar with – is the infrastructure and networks for all the computing, data storage and internet connectivity used within a traditional business. OT – Operational Technology – is all the industrial control systems, field buses and device specific protocols which industrial process control uses.

This is where an edge controller comes in. It acts as the bridge between fieldbus data from sensors or trapped within closed PLC networks (OT) by capturing it, and then processing and packaging the data for use within cloud based dashboards (IT) or condition monitoring services.

Edge controllers are open OS devices, permitting the systems engineer or integrator to use a choice of software solutions. Examples include IBM developed Node-RED, a low-code JavaScript based programming tool for event driven applications, or CODESYS, the leading IEC 61131-3 automation software for developing and engineering controller applications.

The real power of any edge controller is its potential to unlock data which was previously inaccessible.

This data, more often than not, can provide operations and engineering teams with insight that can help them identify efficiencies or spot performance changes that indicate early signs of failure, enriching their decision making process.



THE REAL POWER OF ANY EDGE CONTROLLER IS ITS POTENTIAL TO UNLOCK DATA WHICH WAS PREVIOUSLY INACCESSIBLE.

BB-400 Industrial Edge Controller

The Raspberry Pi powered BB-400 combines IO and serial connectivity with a range of network connections to allow data to flow to the application of your choice. It uses an innovative mix of a Raspberry Pi Compute module and an Arduino to provide edge processing, backed by an on-board UPS, making it a robust match for industrial demands.

Multiple hardware interfaces allow for communication with many different types of equipment and machinery. Offers Ethernet, Bluetooth, IO, Wi-Fi, NFC, USB and RS232/422/485 interfaces, providing seamless interconnectivity with existing or new automation equipment.

Delivers the flexibility of PC based systems via its open source API programming options, making integration easy. Uses programming languages, such as C# and Python or visually in Node-RED, circumventing many of the interoperability issues that have traditionally hampered integrated automation. Support for most industry standard protocols such as MQTT, OPC-UA, REST, and Modbus.

Discover the BB-400 Edge Controller here

7 TIPS TO SECURE YOUR IIOT DEVICES

JOSEPH DA SILVA, CHIEF INFORMATION SECURITY OFFICE AT ELECTROCOMPONENTS PLC OFFERS HIS VIEW ON HOW TO ENSURE YOUR IIOT IMPLEMENTATION IS AS SECURE AS IT CAN.

Cyber-security has been a subject that has given IT managers sleepless nights for years, however the emergence of The Industrial Internet of Things (IIoT) has elevated the potential risk as increasing numbers of devices are connected to business networks.

While IIoT offers many exciting opportunities for businesses, from predictive and proactive maintenance all the way through to potential new income streams it's important to see any IIoT implementations as part of a system, and not just in the context of the overall IIoT solution.

IIoT implementations form part of a wider system within your business, whether intentional or not, and it's important to consider how an IIoT implementation could expand the overall attack surface of the whole organisation. An insecure IIoT solution could offer an entry point to your operational technology environment or your wider IT environment; or it could offer an entry point to your logistics processes, your stock control processes or your finance processes.

So, what can you do to protect yourself? Is it time to put on a tinfoil hat and return to the age of steam? Obviously not. Security is a risk-based game and the first step to mitigating risk is to understand it. Security should not be considered 'someone else's problem', it certainly shouldn't just be left to your IT team, and worst of all it should not be left to external suppliers.

Remember: every device is a potential new entry point for a hacker. You don't need to be an expert, but you do need to ask the right questions and take the right actions. Some of these are described below:

1 **Change defaults.** Most IIoT devices, and indeed most IT software, ships with default passwords. Get these changed immediately to something strong and unique (definitely don't use the same password for everything…). Avoid any equipment with hard-coded passwords; if it's hard-coded, it is already known by every hacker out there.

2 **Separate networks.** Do not put IIoT devices on your corporate network, or on the same network that you use for your OT (operational technology) equipment. This really is asking for trouble. A single device should not be able to access multiple networks either, otherwise they can be used as a 'bridge'.

3 **Disable unnecessary functions.** See that TV you have on the wall of your meeting room? Bet you it's a smart TV. Bet no-one's turned off the Bluetooth functionality. Or its microphone. Or the webserver that it operates. Unnecessary functions can be used as a 'way in', both to the device and to the wider network that it sits on. Turn things off programmatically, or physically disable them; a pair of pliers or liquid epoxy are simple ways to permanently disable a USB socket for example.

4 **Stay up-to-date.** Software vulnerabilities are very common, but what's more common is known fixes to these vulnerabilities not being applied promptly. Ensure firmware and software are regularly updated and have a process to do this, particularly if it involves planning in downtime. You're not going to be able to take a 24×7 assembly line down, but you should be able to tolerate downtime in condition monitoring sensors.

5 **Test test test.** Hire a specialist penetration tester who has expertise with industrial equipment and operational technology – not all of them do. This is a specialist area that requires specialist knowledge of PLCs and SCADA equipment and you want a friendly face to test it before an unfriendly one does. Most importantly, follow their recommendations – you may not be able to fix everything, but make risk-based decisions on what you do fix, what you mitigate through another route and what you accept.

6 **Be clear who's doing what;** even if you're buying a supposedly 'turnkey' solution, it's never quite as simple as that, particularly if the service provider is themselves relying on a number of third parties. Understand where your data is going, who has access to it and how it's being protected. "It's in BigCloudProvider's datacentre, it's secure" is not a good enough answer.

7 **Finally, and most importantly:** have a plan for when things go wrong. Run some scenarios and regularly test it via a simulation or a dry run. In the event of a security incident, it needs to be very clear who does what and when, and having this clearly documented and easily accessible, including templated communication statements, will save a lot of time and adrenaline.

Joseph is an accomplished Information Security leader with extensive IT and business experience across multiple sectors; he is driving Electrocomponents Information Security agenda to help both the organisation and its customers to understand and address risk whilst enabling business growth. He holds CCISO, CISM and BCS qualifications as well as an honours degree in Biochemistry and is currently performing research for his PhD.

D-Link

UNLOCK THE BENEFITS OF YOUR AUTOMATED FACTORY

30%
of European IoT projects are in connected industry[1]

FOR SMARTER FACTORY AUTOMATION

Meet changing demands and support the evolution of your automated architecture. With D-Link's Industrial Ethernet switches, you can BENEFIT from one seamless network that increases connectivity between your machines and management systems – and maintains data flow from the office to the factory floor.

What transparent manufacturing can achieve

- Actionable product and process data intelligence
- Shorter cycle times
- Lower production downtimes
- Flexible, dynamic output
- Predictive maintenance

55% of companies expect Industry 4.0 investments to pay back within two years[2]

Connect in the moment

Real-time communications will deliver mission-critical applications, while high bandwidth supports increased information flow between your sensors, devices and systems.

IIoT devices in the future will share not only input and output data and diagnostic information, but also information about their own capabilities[2]

46% of manufacturers say increased visibility across their operations will support growth[3]

80% of manufacturers expect that improved factory connectivity would help them to increase output levels[4]

D-Link

Gigabit Unmanaged Desktop Switches

DGS-105 & DGS-108

Building Networks for People

D-LINK INDUSTRIAL SWITCHES

Designed for a more connected future

D-Link's Industrial Ethernet Switches are designed to withstand wide temperature ranges, vibrations and shock, with superior environmental specification compared to commercial network switches. With hardened design combined with high availability, they form vital parts of any network infrastructure facilitating the increasing demand for smart cities, surveillance and wireless connectivity.

1. RUGGED, HARDENED DESIGN

Designed to operate in wide temperature ranges, vibration and shock, allowing the switches to be deployed in enclosures or cabinets in outdoor locations.

2. HIGH AVAILABILITY

Comprehensive network redundancy features with fast fault recovery, together with advanced security provides industrial grade reliability and protection.

3. FLEXIBLE OPTIONS

Wide selection of port density, media and PoE provides customer with the flexiblity to choose the right switch that best fits their requirements.

4. 5 YEAR WARRANTY

The industrial quality and reliability of the DIS switch family enables us to provide an industry-leading 5-year warranty with every switch.

DIS-100E/100G Series Industrial Fast Ethernet / Gigabit Unmanaged Switches for edge deployment	DIS-200G Series Industrial Gigabit Smart Managed Switches for aggregation deployment	DIS-300G Series Industrial Gigabit Managed Switches for aggregation deployment	DIS-700G Series Industrial Layer 2+ Gigabit Managed Switch for core deployment
Plug and play; compact size	Cost-effective; compact size	High performance; compact size	High performance, dual redundant DC input
-40 to 75° operating temperature	-40 to 65° operating temperature	-40 to 75° operating temperature	-40 to 75°C operating temperature
DIN-Rail mounting	DIN-Rail mounting	DIN-Rail mounting	Rack mounting
5-port	12-port	8/12/14-port	24-port SFP + 4-port SFP+
Redundant power inputs	Optional PoE 802.3af/at support	Optional PoE 802.3af/at support	Supports intelligent Quality of Service (QoS)
Optional PoE 802.3af/at support (DIS-100G-5PSW)	VLAN support for added security	VLAN support for added security	Optimisation of network traffic

Sources
1 IoT Analytics, 2 Arc Advisory Group, 3 Zebra 2017 Manufacturing Vision Study, 4 The Manufacturer 2017 Annual Manufacturing Report