

Rentokil

The Experts in Pest Control

PEST CONTROL **AND THE POWER OF DATA**

A new era for food safety

How actionable data-driven insights are transforming pest control in the food industry.

Multiplying challenges

The world is currently facing rapidly evolving pest control and food safety challenges on which billions of lives and livelihoods depend. This is a fact as much recognised by authorities and regulators as it is by the food industry.

The World Health Organisation estimates that food pathogens result in 600m cases of food borne disease worldwide¹. According to the same source, this leads to approximately 420,000 deaths a year.

Other statistics recorded over the past decade show that the impact of these outbreaks have as much impact on economies as they do on health. According to research undertaken by the Ohio State University, the annual cost of food poisoning is between \$52 billion and \$78 billion in the United States alone.²

The challenge of maintaining food safety and the pests that can lead to breaches is clearly significant. It needs to be addressed for the sake of both public and economic health. However, due to a range of emerging issues - including rising global population, increasing urbanisation and modern supply chain complexity - it's one of many food safety challenges which are becoming increasingly difficult to manage.

With these factors in mind, the big question facing the food industry is this:

“How is it going to be possible to meet increasing demand – increasing both output and distribution across the globe – while at the same time minimising food safety risk?”

In this white paper, we explore one way the food industry can address pest challenges through collecting data gathered via connected devices and thousands of site inspections worldwide.

Data alone is not useful without intelligent interrogation however, so we also look at how it is possible to analyse these data sources to take new forms of action. In particular, we look at how Rentokil is taking advantage of data insights to unlock innovative approaches that have the potential to help manage pests and food safety with a new level of efficiency and control.

Food pathogens result in 600m cases of food borne disease worldwide.¹

¹ <http://www.who.int/news-room/fact-sheets/detail/food-safety>
² ROBERT L. SCHARFF (2015) State Estimates for the Annual Cost of Foodborne Illness. Journal of Food Protection

Rise of the machines: how data can be collected

The Internet of Things

Currently organisations across commercial and industrial sectors can generate huge new volumes of data – known as Big Data, much of which is being gathered by connected Internet of Things (IoT) devices.

The IoT can be defined as the global network of devices, vehicles and industrial appliances that are embedded with sensors that communicate both with each other and centralised computing systems.

Typically, the IoT helps to drive business change in two main ways:

1. By helping organisations to remotely monitor in real-time the activity of machines, systems, humans, animals or environmental systems more efficiently than using manual recording methods or human observation.
2. By generating huge volumes of data that can be interrogated to provide new insight on how operations or systems can be improved.

How the IoT is being applied to pest monitoring and food safety

Various contributors to the food production supply chain already use IoT devices and data to achieve new efficiencies. Adoption is still developing, but all organisations involved in the food industry now have the option to deploy remote sensors that enable continuous 24/7 monitoring of all pest activity as part of their ongoing food safety efforts. Such systems are readily available and usually consist of connected traps that detect, capture or kill pests.

These devices and traps can also be fully integrated with online customer portals, which can provide 24/7 access to pest management reporting, including trends, recommendations and analytic tools to help support pest control audits.

The number of global active IoT devices is expected to grow to 10 billion by 2020 and 22 billion by 2025³.

³ IoT Analytics, State of the IoT & Short-term outlook 2018

Mining for gold:

The process that turns data into action

One of the primary advantages of connected devices for pest control is that they monitor pest activity in places that are difficult to observe.

But that's not where the power and potential of these devices ends. The devices also continually collect new data that augments the information already collected manually by pest control technicians, dramatically increasing the volume of data in the process. This data is then automatically fed into digital pest management systems where it can be analysed. This next stage of 'data mining' can uncover valuable new insights, comments Savvas Othon, Group Innovation and Technical Director for Rentokil Initial:

“We collect more data than ever via connected devices, but that's the easy part. What's difficult is the next stage, where we seek to understand that data and do something with it.”

Data can also be cross referenced with other data sources – such as temperature, rainfall and site proximity to water – in order to carry out predictive analytics and identify regions and facilities that

might be particularly vulnerable to infestation. This method of predictive analytics, which compares historical and current data trends to help make informed estimations about the future, can effectively forecast pest outbreaks or infestations before they occur. Pest controllers can then use that knowledge to be proactive and take precautionary actions – targeting their approach even further and delivering significant business benefit across every stage of the supply chain.

These benefits can address many of the pest challenges the food industry faces in the decades to come. But what's important to recognise is that this possibility is not just 'potential' or a future scenario. It's already a reality, and it's happening now.

Rentokil has an ecosystem of over 70,000 connected devices.

Real world examples of data driven insight in action

Agriculture

Pest control in agriculture is often deployed to prevent pest infestations, reduce damage to crops and maximise harvest production. Equally, it focuses on avoiding contaminations of raw produce that could later appear further up the food supply chain.

Rentokil data demonstrates that rodents are by far the biggest pest challenge in agriculture. In North America, nearly 76% of stored grain is contaminated by house mice⁴. Due to this vast damage, nearly 60% of rodenticides are used by the agricultural segment⁴.

We also know that the biggest pest control problems in agriculture arise from issues with sanitation and hygiene and building integrity:

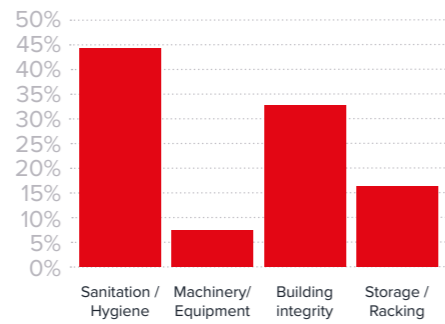


Fig. 1b - Issues identified⁵.

However, protecting storage and buildings is only one part of the challenge. As the following case study shows, the agriculture industry faces further challenges when trying to monitor pests in the fields where the produce is grown.

Rodents account for a staggering 76% of global agriculture infestations.

Knowing this information enables technicians to target pest management measures with unique accuracy. For example, it enables them to minimise the blanket use of chemicals and proactively focus on targeted measures to prevent rodent entry into facilities. In turn, this helps customers to stay one step ahead of their pest challenges as well as meeting increasingly stringent regulatory demands which limit the use of toxic chemicals.

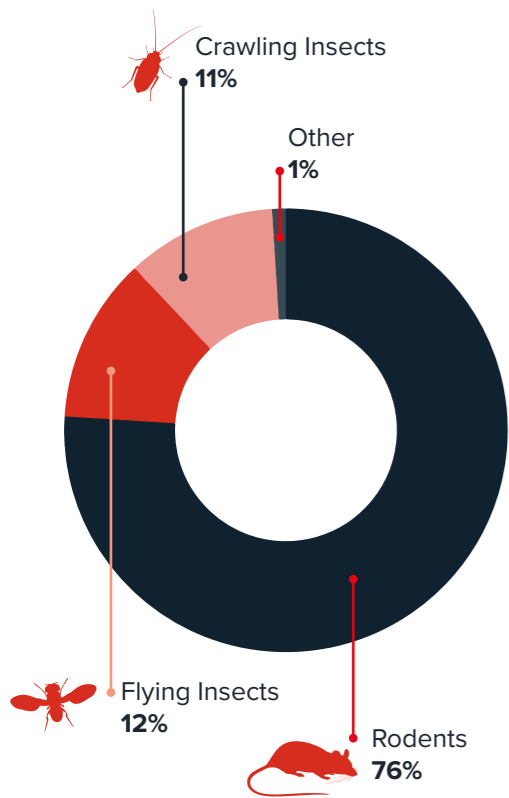


Fig. 1a - Infestations by type⁵

⁴ Rodenticides Market: Global Forecast to 2022, Markets and Markets

⁵ Reference data as recorded by Rentokil across all 2017 pest infestations and identified recommendations

Case Study:

Drones and predictive analytics make a breakthrough

This innovative project started following the discovery of rodent hairs on raw tomatoes. Using traceability technology, it was possible to confirm that contamination was not occurring during storage, transportation or harvest, but in the original fields that cover an area amounting to over 148 hectares.



Advanced drones collect new data

With such a large area to protect, using fences and barriers to try and prevent rodents entering the plantation was ruled out. Instead, data was collected using a specially designed drone fitted with thermal imaging technology that observed and recorded critical details, including small changes in temperature to track and identify the movements of rodents. The drone also featured multispectral systems that enabled the measurement of CO2 levels, water and chlorophyll levels that indicate crop health and leaf area index.

Predictive modelling enables a non-toxic solution

This information made it possible to target control measures more accurately. By generating greater understanding on the status of the plants (e.g. based on chlorophyll levels and leaf area index), it was also possible to predict when rodents are likely to be present and when damage to the plant was going to happen. As a result, novel repellents were developed for the implementation of highly targeted, non-toxic pest control measures to protect the raw produce.

Real world examples of data driven insight in action

Logistics and Warehousing

The key challenge in logistics and warehousing is maintaining the integrity of a product as it moves from the factory throughout the supply chain and ensuring it reaches the end user in good quality.

Rentokil supports this process by continually gathering data on the specific nature of the pest threats to warehouse and transport facilities. The data is collected via two methods. Firstly, via the recommendations made by the thousands of technicians that visit and assess logistics and warehouse facilities worldwide every year. Secondly, the data is collected by PestConnect, an ecosystem of connected devices deployed in customer facilities to alert and report on pest activity 24/7.

As figure 2a shows, the data demonstrates that rodents pose the greatest risk.

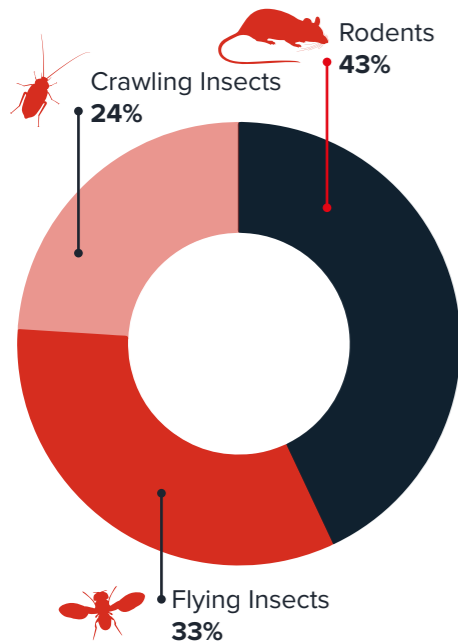


Fig. 2a. - Infestations by type⁵

The issues identified through Rentokil data also show clearly that building integrity is where the greatest effort needs to be focused:

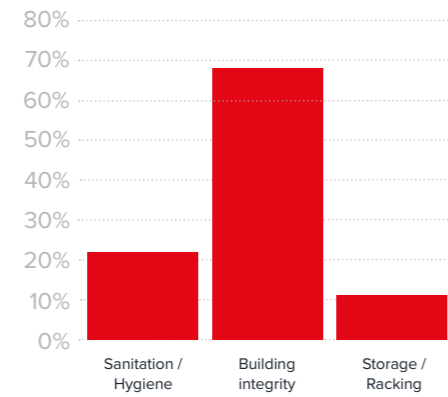


Fig. 2b. - Issues Identified⁵

The clear message is that if your building is poorly maintained allowing further entry points in addition to the continuous opening and closing of roller shutters, you will get pests. This is common sense of course, but when examining further relevant data, the seasonality of pests can be established, and the month of when a pest infestation is likely to occur can be predicted.

For example, Rentokil data has

previously been aggregated with third party weather data and subsequently showed a spike of rodent infestations of 27%+ in early winter, which in turn helps technicians to plan preventative measures with greater accuracy.

This data-driven insight then makes it possible to make sure pest management and risk mitigation strategies in logistics are targeted on areas and times that have the highest chance of infestation. It also makes it possible, more than ever before, to predict and prevent problems before they happen.

Data-driven insight allows pest management strategies to be targeted to areas, and times, that have the highest risk of infestation.

Case Study: Seeing the previously unseen

Modern warehouses and distribution centres are complex and sophisticated facilities. In this instance, the facilities included several buildings, a five-shift system, 24 hours a day operation and several loading docks and entrances. Monitoring pests in large and constantly active facilities like these is notoriously difficult. Regardless, products must remain contaminant free across each transport and storage process within the warehouse to maintain the integrity of goods at all times.

Connected devices monitor difficult areas and provide new data sources

The challenge of effective pest monitoring was solved by implementing Rentokil's safe ecosystem of connected devices, PestConnect. The devices automate the capture of rodents 24/7 and alert technicians to the need for a response. The data gathered from these alerts is also fed in to a central database and made available to the customer via the myRentokil customer portal, enabling both parties to see where problems were occurring (both real time* and through the identification of historical trends) and implement further preventative measures where required.

Continuous data feed helps to refine risk management

As a result of the PestConnect solution, the warehouse has achieved 24/7 protection of facilities without disruption to daily operations. As PestConnect is fully integrated with myRentokil, the solution also provides a continuous feedback of data, which can create transparent audit trails required for regulatory compliance.

*at point of technician visit

Real world examples of data driven insight in action

Food Processing

Analysis of 2017 Rentokil data as visualised in figure 3a. shows that in food processing there is an ongoing need to address problems with flying and crawling insects.

Further research and data analysis commissioned by Rentokil and carried out by the Centre for Economics and Business Research confirms that the business impact of flying insects in food processing is severe. The research showed that food processing businesses spent an average of \$9,000 every year dealing with flies.

Digging further into the issue, figure 3b shows clearly that there are factors leading to crawling insect and other infestations in food processing facilities related to sanitation. However, the data shows that there are also clear challenges with building integrity which in combination with sanitation issues can provide ample harbourage for pests such as cockroaches.

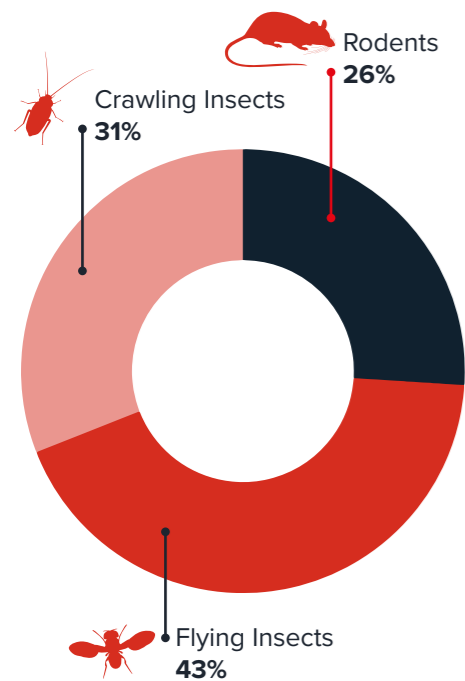


Fig. 3a. - Infestations by type⁵

However, just having this data and insight does not generate a solution in itself. Achieving a tangible business benefit relies on acting on the insight to proactively develop innovative new solutions that address these longstanding business issues; as the following case study shows.

Achieving a tangible business benefit from data relies on acting on the insight to proactively develop innovative new solutions

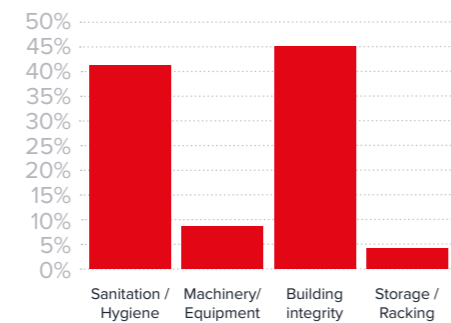


Fig. 3b. - Issues identified⁵

Case Study: Innovating towards a non-toxic future

Rentokil data shows that building integrity and numerous safe harbourage opportunities cause crawling insects to proliferate within food processing plants. With this in mind, Rentokil proactively tasked itself with finding a new solution that would mitigate the risk and keep infestations under control. However, the challenge was further complicated by the fact that treatment of pests in food processing needs to be carried out via non-toxic treatments that meet regulatory requirements.

Insight from data leads to development of innovative new solutions

Rentokil acted on the insight by developing a novel solution in the form of a new environmentally safe biological solution for eliminating cockroaches. The product uses natural fungus spores specific to the control of cockroaches with zero mammalian toxicity, meaning only the target species is destroyed and food production areas remain toxin-free. Another benefit is that only very low volumes are needed to gain control over large populations.

Taking action results in high impact, low-toxic pest control

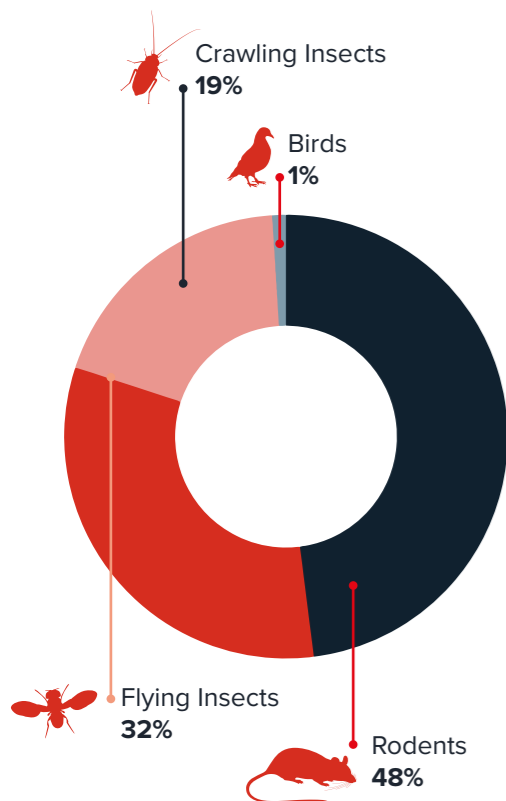
Tests have shown that the biological solution controls cockroaches with 99.9% efficacy. It is especially useful in out-of-sight harbourage areas such as sewers that have previously been difficult to monitor. It also helps businesses in the food processing industry to deal with the issue using a non-toxic solution that doesn't contaminate ingredients or disrupt operations.

Real world examples of data driven insight in action

Food Retail

Food retail is another area of the food supply chain making significant use of data.

As figure 4a. shows, the most danger arises from rodent populations, accounting for nearly half of all infestations, with over 50% of issues relating to sanitation and hygiene as shown in figure 4b. adjacent.



The number of rodent infestations alone is not surprising, however as a result of this, a higher number of building integrity issues would typically be expected, which suggests that pests are being

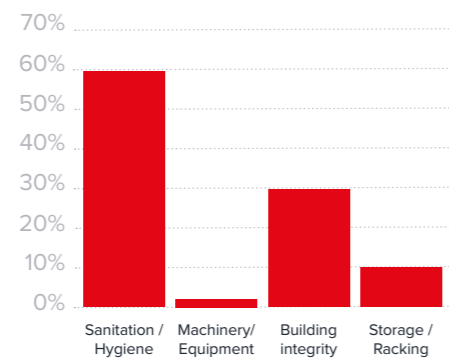


Fig. 4b. - Issues identified⁵.

brought in on product. This means that more rigorous inspections may be needed by businesses to prevent pests establishing within a facility and thriving due to sanitation and hygiene issues.

In other cases, such high rodent infestations can be due to the location of a particular site, which can be ascertained through the aggregation of data such as weather and location proximity to water, to understand how susceptible a site is. Using this insight enables food retailers to then undertake predictive modelling and be more intelligent about how they locate, design and protect stores to mitigate specific pest threats, as the following case study demonstrates.

Rodents account for nearly half of all infestations in food retail.

Case Study: Predictive analytics – the foundation for exceptional pest control planning

Food retail is proving to be a fertile testing ground for predictive analytics and modelling techniques that take the use of data for food safety a step further. Increasingly, these projections are applied even before a facility is built. This proactive approach provides the surest possible route to intelligent pest management and prevention.

Proactive analysis helps to pre-empt potential pest problems

One USA supermarket chain partnered with Rentokil to determine whether there were any environmental factors impacting sites that were particularly vulnerable to rodent infestations. The work involved aggregating and analysing Rentokil and third party data from thousands of supermarkets alongside key seasonal and food audit data. The aim was to discover the correlation between factors such as temperature, rainfall, proximity to water and the threat from pests in different types of locations.

Decisive action minimises risk with unprecedented accuracy

This aggregation of data led to predictive modelling that enabled the supermarket chain to evaluate a site before a new store is built. With this unique insight it can determine whether the site is particularly vulnerable to pest infestation before work starts. The data-driven insight is then also used to advise on site design or remodelling, to make sure it incorporates preventative measures during the building of new stores that keep food safety risks to a minimum.

Data needs action to create value

There is no doubt about the full scale of the challenges facing the food industry, which now needs to do more than ever to mitigate risk and improve food safety.

These challenges are significant. However, there is also clearly an opportunity for organisations to overcome them more effectively than they have done in the past by leveraging data.

This data, collected via connected devices and thousands of worldwide manual inspections, is helping the food industry and pest controllers to improve real-time reporting, be more responsive to changing patterns and record pest control activity for regulatory and audit purposes.

What's also clear, however, is that data is not valuable alone and is of limited long-term use without action. As the case studies in this paper demonstrate, data only becomes valuable and maximised to its full potential when it is analysed or aggregated with other sources in order to create actionable insight that helps to drive innovation and enable measurable, tangible and proactive improvements in the management of pests and their impact on food safety.

As we move further into the 21st century – and continue to address all the issues the food industry must overcome to deliver a safe and secure supply of food for the world's growing population – it is the companies that embrace this realisation fully that will stand the best chance of mitigating food safety risk effectively and efficiently.

“Data alone is not enough - it needs action to deliver insight”

Group Innovation and Technical Director for Rentokil Initial



Rentokil

The Experts in Pest Control

Why Rentokil?

Rentokil is the global leader in pest control, bringing expert, reliable and professional service to commercial and residential customers in over 70 countries worldwide.

As the experts in pest control, we work closely with you to:

Give you peace of mind

With over 12,000 qualified technicians worldwide, we have extensive experience across a wide range of industry sectors. Our experts work proactively in partnership with you to minimise the threat of pest infestations in your business.

Safeguard your reputation

We take a dual approach, incorporating both preventative and responsive strategies to enhance protection for your business through a consistent, continuous pest control programme.

For more information, visit:

www.rentokil.com