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The Experts in Pest Control

Coffee beans and cameras: digital SPI monitoring

Skadedyrdagene

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The challenges with SPIs

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Future innovation and AI-camera technology

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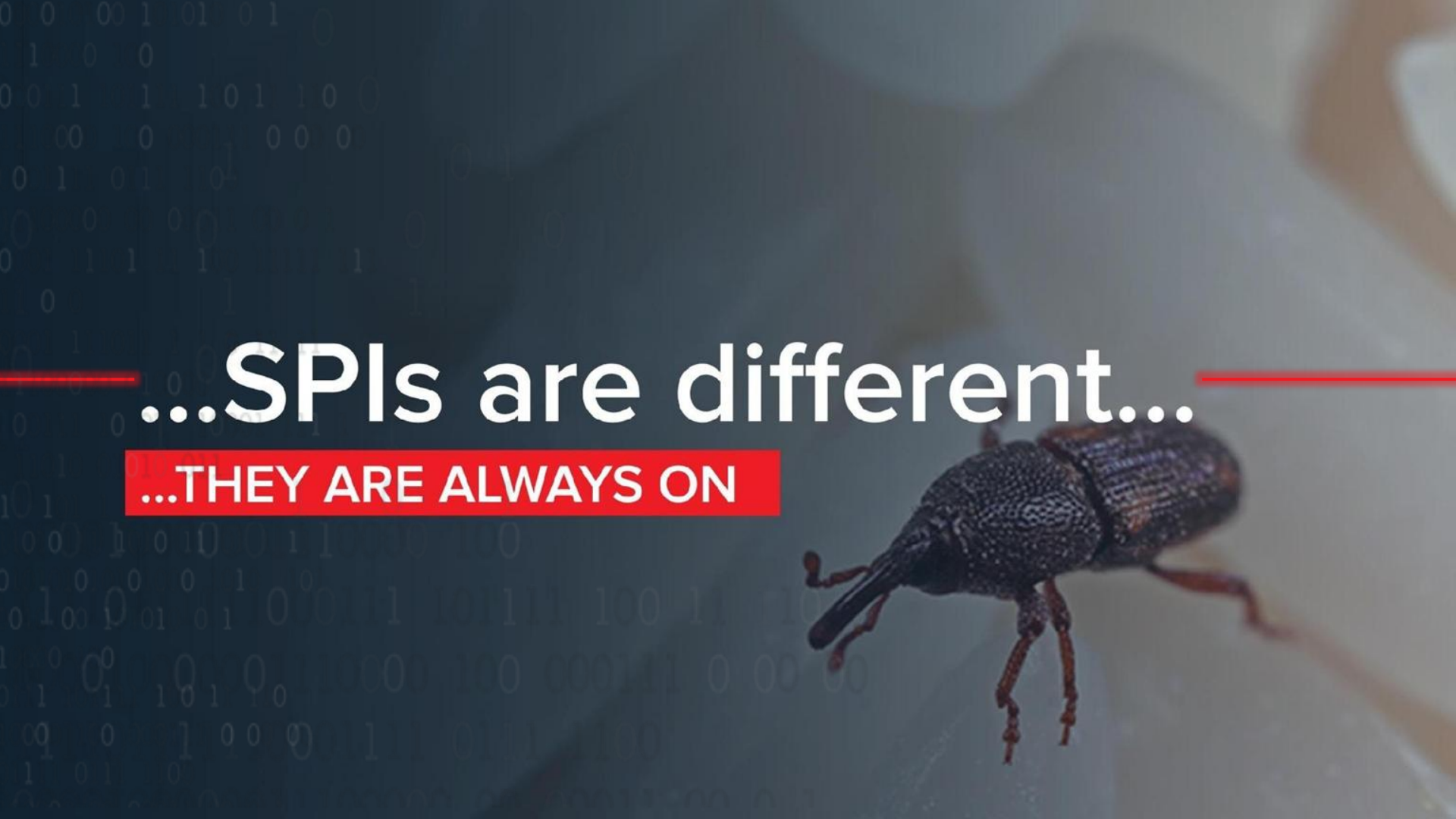
...SPIs are different...
...THEY ARE ALWAYS ON


As trade moves,
they move...
...THE PROBLEM ISN'T GOING AWAY

Macro trends impacting pest risk

Growing population

World population growing by 80m people p.a. and forecast to be 8.6bn total by 2030 creating further demand from pest proximity

Urbanisation

By 2030 60% of the world's population are predicted to be living in cities, up from 56% today

Emerging markets

Growth in trade and complexity of supply chains means more food is being transported allowing for migration of pests

Increasing regulation

Increasing controls across a variety of areas, including; chemical usage, communications, labour

Global standardisation

Increasing global convergence and transparency in global standards, particularly adoption of global standards in emerging markets

Consumer education

Information access and transfer is promoting higher recognition and lower tolerance of pests

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Products now move faster than traditional monitoring systems

Urban Pest Control

Tends to monitor populations of SPI with pheromone traps and control with mating disruption

Agricultural Heritage

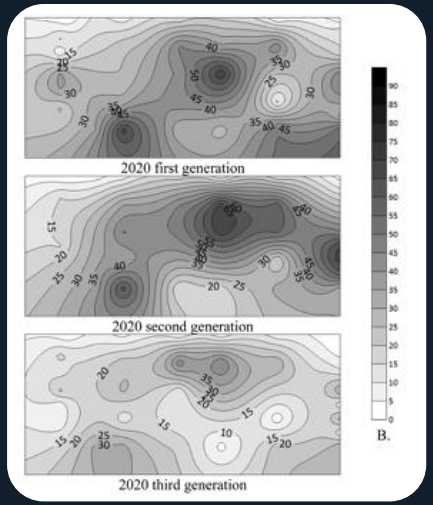
These techniques come from the agricultural industry where cropping intervals are longer and more fluid than in stored product insect control

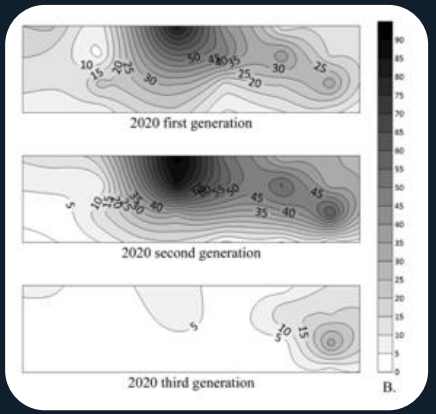
Rapid Product Movement

In warehousing and product storage, the movement of product is much faster and less predictable

Limited Insect Range

Sex pheromones are male-specific and the range is very short as these insects have no inclination to travel far from food





Pan, X, Wang, C (2023) Population dynamics of Indian meal moth in coffee bean warehouses in New Jersey. *Journal of Stored Products Research.* 100 (2023) 102044

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The line between monitoring and control is blurring

Control Gap Identified

Despite active intervention, high *P. interpunctella* population densities remained during the 2.5-year study, highlighting the critical limitations of standard monitoring protocols.

In summary, this study revealed 2–3 generations of *P. interpunctella* occurred per year in two coffee bean warehouses. *Plodia interpunctella* also occurred outside of the warehouses with similar trap catch in 2019 and significant lower trap catch in 2020. MD reduced *P. interpunctella* reproduction but was not able to completely prevent *P. interpunctella* females from laying viable eggs. In spite of multiple control measures were implemented, high *P. interpunctella* population density still existed during the 2.5-year study period. Using pheromone traps, water traps,

Table 5
Comparison of percentage of *Plodia interpunctella* females between two warehouses and three types of traps based on 2020 data.

Trap type	Warehouse 1		Warehouse 2		Statistics
	Percentage of females[a]	*P. interpunctella* counts	Percentage of females[a]	*P. interpunctella* counts	
Light	24.4 aA	3,640	16.0 bA	3,786	$\chi^2 = 80.23$, df = 1, $P < 0.001$
Sticky	40.8 aB	4,525	44.2 bB	1,442	$\chi^2 = 30.05$, df = 1, $P < 0.001$
Water	45.3 aC	3,640	56.8 bC	3,786	$\chi^2 = 27.17$, df = 1, $P < 0.001$

[a] Numbers followed by different lower-case letters indicate significant differences between warehouses. Numbers followed by different upper-case letters indicate significant differences between trap types (Chi-square test, $P < 0.05$).

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Insect pest control is becoming more specific

The Biological Challenge

There is no 'silver bullet' solution that can reliably target such a diverse threat spectrum:

50+ Insect Species

5-6 Diff. Orders

30+ Families

Each family has a **highly specialised ecology**, making uniform treatment methods ineffective.

Key Question

With no new solutions, can we use existing techniques more effectively?

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Pest Evolution.
Digital Revolution.

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Then...

1960s - 1980s
- Manual
- Pen and paper

1990s - 2000s
- Moving Digital
- First Mobile Devices
- Electronic Auditing

2010s - 2020s
- Digital and Mobile First
- Everyone Connected
- Digital Experiences
- Connected Things (IoT)

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Digital pest management from Rentokil

PestConnect

24/7 PROTECTION

Pest**Connect** enables continuous, 24/7 monitoring and protection. Tailored to the needs of customers, its solutions will detect, capture and eliminate pests before alerting a highly trained pest control technician for safe removal.

myRentokil

IN-DEPTH REPORTING

Fully integrated with myRentokil, our real-time online reporting tool, customers can access trend reports, recommendations, interactive maps and charts, and analysis tools to support pest control audits.

CommandCentre

INSIGHTS

The Rentokil **Command**Centre is the platform that provides data and insights that are used as the basis for delivering ever better pest control.

People

Our frontline colleagues are at the heart of delivering on our expertise and world-class service and underpin our digital pest management ecosystem.

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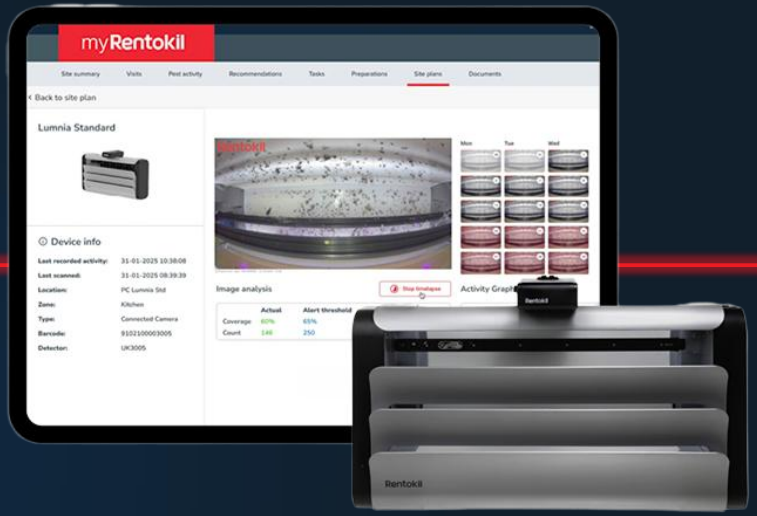
…. And now: AI-enabled camera technology



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What are AI-powered cameras & how are we using them for rodent control?

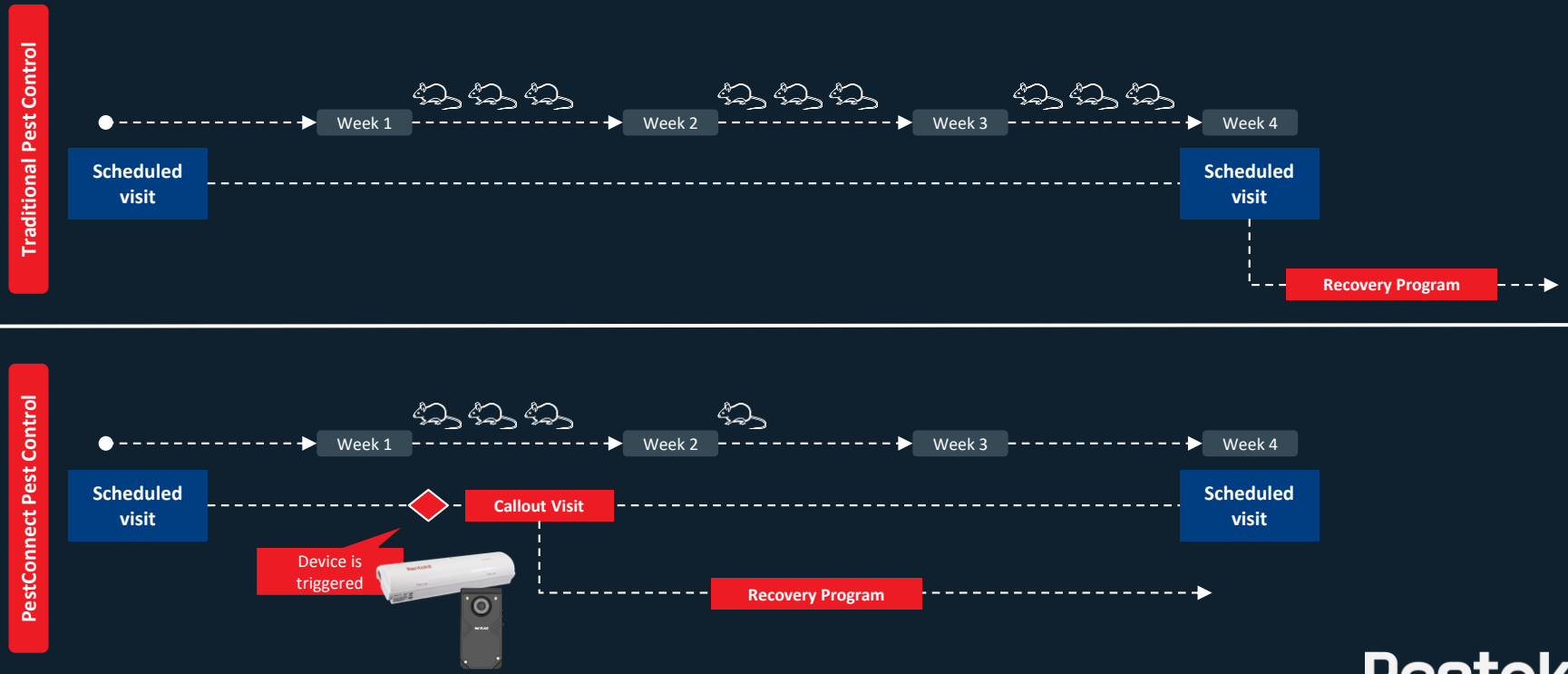
AI-powered cameras for rodent environmental monitoring are part of our PestConnect range.

Compact, intelligent devices monitor pest activity in near real time.

Machine learning technology detects and identifies pest activity, filtering out false positives.

Provides technicians with greater visibility and supports faster, more effective resolution of pests.

How technology changes our service



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Rodent monitoring: How AI-powered camera technology works

1

Cameras are placed in hard-to-reach areas, where rodents tend to hide, and photos are captured when the PIR sensor detects movement.

2

Images are automatically processed via our unique **image processing pipeline**, that first looks for changes indicating pest activity.

3

If the image accidentally contains a person/or people the machine learning will **automatically blur** these making them unrecognisable.

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Rodent monitoring: How AI-powered camera technology works

4

Machine learning that has been trained to look for rodents then scans the image and removes any irrelevant images and **highlights those only containing rodents**, avoiding false positives.

5

Images are **annotated** with bounding boxes **highlighting detections** and branded with Rentokil's logo.

6

Our team is **automatically alerted of detected activity**, to take action accordingly.

This technology facilitates faster, more effective resolution of pests.

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What have we learnt so far

01

Human Expertise

Does not replace technician visits to sites, but enhances their effectiveness.

02

Rich Data & Insights

Provides deeper, actionable information on how to proactively manage infestations.

03

Positive Disruption

Disrupts traditional pest control, creating a service offer that can **now be mirrored in insect solutions**.

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LED light traps:
The secret SPI solution

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Ultra Violet LEDs create darkness as well and light

Flying insects perceive the visual saliency (contrast) of LED light traps in a different way to fluorescent lamp traps.

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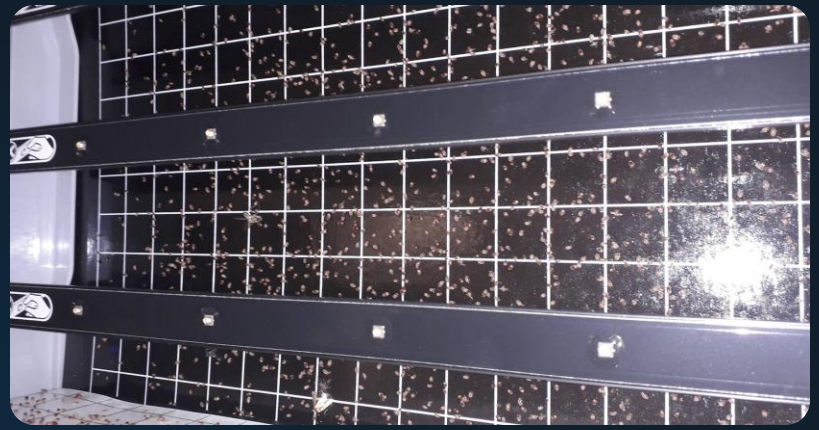
Global SPI catch from myRentokil for one year

SPI Species	Annual Catch
Indian Meal Moth	**935,200**
Cigarette Beetle	**698,608**
Mediterranean Flour Moth	**542,954**
Flour Beetle	**516,866**
Biscuit/Drugstore Beetle	**256,853**
Warehouse Beetle	**231,698**
Red Flour Beetle	**142,820**
Stored Product Insects (unspecified)	**93,455**
Tropical Warehouse Moth	**73,213**
Cacao Moth	**66,791**
Confused Flour Beetle	**44,764**
Almond Moth	**28,836**
Rice Weevil	**22,846**



- Field testing with **Lumnia** units effectively controlled Biscuit/Drugstore Beetle (Stegobium paniceum).
- This client subsequently removed Stegobamine pheromone lures from their site.

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The evolution of Lumnia: Creating an intelligent early warning system

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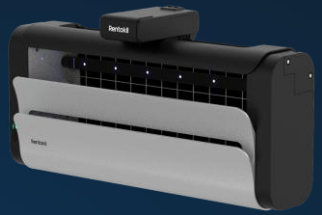

Compact

Standard

Ultimate

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How can AI-powered cameras be used for insect control?

AI-powered cameras for flying insect control are the latest addition to our PestConnect range.

The short focus length camera **monitors** for activity on the glueboard, **24/7,** providing **an early warning** system for flying insects.

Machine learning technology accurately identifies and labels, gets smarter with each image taken and allows future upgrades for enhanced data.

Tailored control with risk-based adjustable alerts for proactive prevention and protection where it's needed most.

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An early warning system designed to look for signs of infestation

24/7 Monitoring

Sending a photo a day of the glue board to track activity.

Automatic Alerting

Instant alerts when an agreed 'critical limit threshold' has been broken.

Retrofittable Design

Standard Lumnia's can be transformed into Lumnia Optix with minimal disruption.

Remote Inspection

Glueboard assessed by a trained Rentokil technician to determine the appropriate action.

Configurable Thresholds

Alert thresholds can be remotely configured and defined by the customer.

Service Efficiency

Ensures efficiency of on-site service, guiding technicians to devices in need of service.

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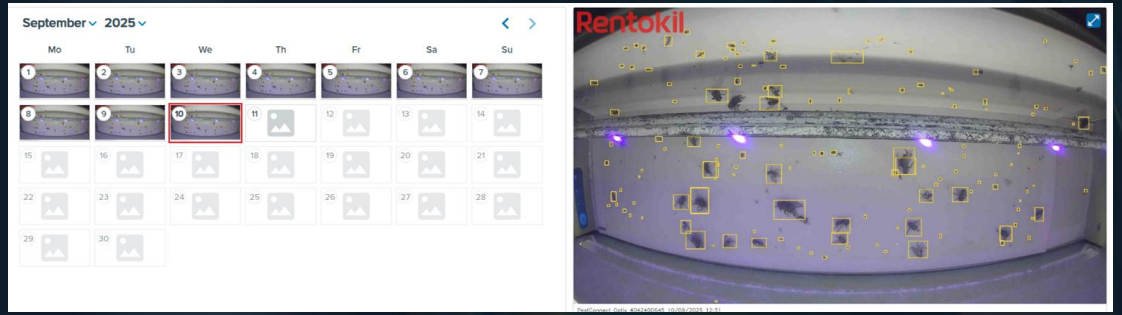
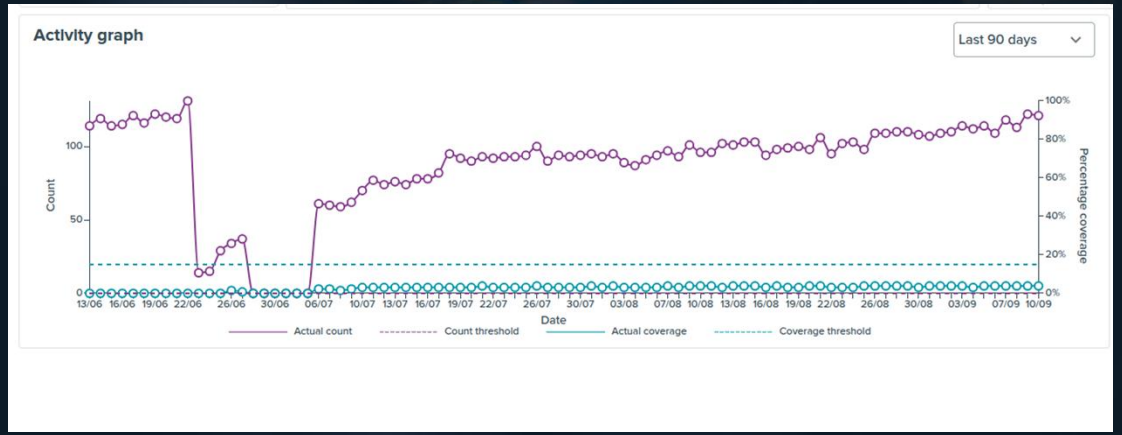
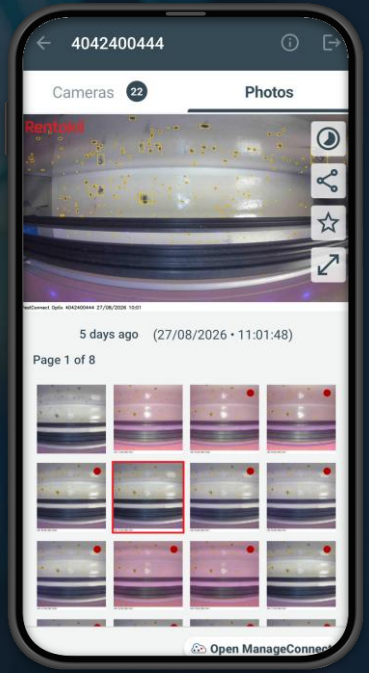
Colleague tools for remote visibility







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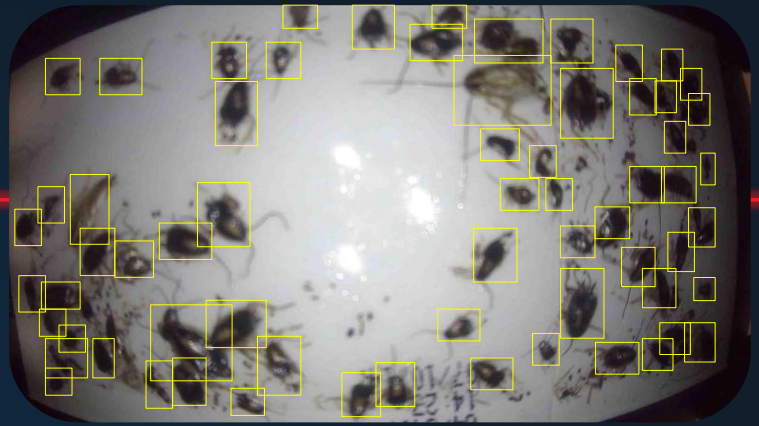
What’s the future of digital SPI monitoring?



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Q&A