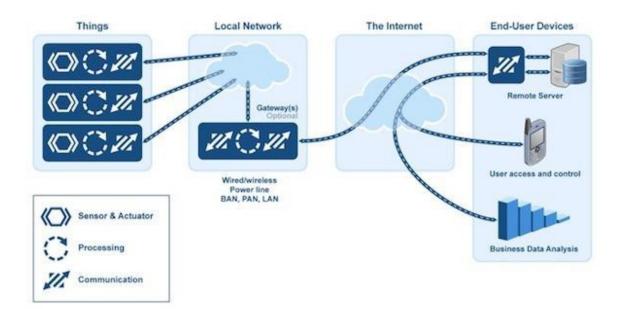# Stern Environmental Group LLC

30 Seaview Drive
Secaucus, New Jersey 07094

Stern's Real Time Monitoring Device for Bedbugs

Remote Pest Monitoring: Catching Up to the Digital Age

Introduction: Pests are elusive nuisances; their workdays never end, and they don't cease procreating. Despite their proximity, simply detecting a pest can be difficult and expensive, especially at low-infestation levels and even more so when dealing with nocturnal species. Identifying a detected pest can be even more exigent, but it is a crucial step to forming an effective response plan. The best way to detect and identify pests requires: 1) locating "harborage" and "high-traffic" areas; and 2) perpetually surveilling these locations. But this approach can be problematic because PCOs aren't always able to physically access these sites, and round-the-clock monitoring isn't humanly practical.

Fortunately, recent advances in sensor technology, wireless networking, and data aggregation enable PCOs to remotely detect and identify pests, and give PCOs the ability to continuously monitor several locations at once. This evolution is commonly referred to as the Internet of Things, wherein standard, sometimes traditionally passive, systems are configured with sensors, processors and communication capabilities. Data is passed through a local network, to the internet, and can be stored, used to send alerts and be collected for macro-scale analysis.
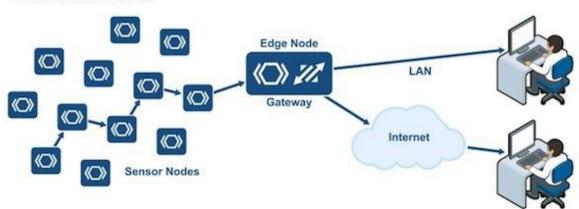
Telemetered Persistent Monitoring

Stern's Real Time Monitoring for Bedbugs provides a comprehensive, multi-pronged approach to pest control. As a precursor to, or in concert with treatment, Stern's RTM can be used to handle pest detection and identification. Stern's RTM can also be used post-treatment to ensure effectiveness with post-treatment monitoring.

Stern's RTM for Bedbugs is comprised of the following elements:

Processors: These components collect signal data from sensors, manage active lure dispensation and capture mechanisms, extract data pertinent to pest detection and identification, store data, and manage power usage.

Communications: Some systems may be physically connected (i.e., hardwired) to the PCOs and clients, while others may be wireless. Topologies range from peer-to-peer to distributed networks, with models that may include Wi-Fi, Bluetooth, USB, RS232, TCP-IP, and cellular.

Sensors: Thermal and accelerometer sensors detect heat, vibrations, or sounds from a pest, while imaging sensors would capture photos or videos of the pest in action.

Lures: Stern's RTM supports *passive* and *active* lures, including chemical evaporation/diffusion, as well as, remotely-controllable release of heat, pheromones, synomones, kairomones, and other scents.
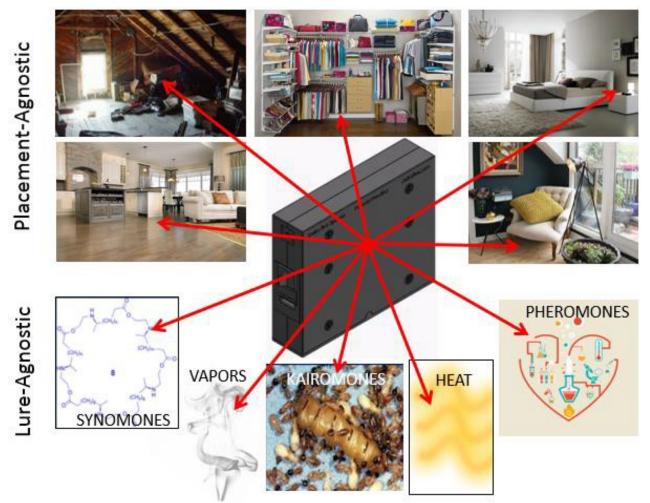
Entrapment: Stern's RTM supports physical capture mechanisms, which may be passively driven (e.g., pans or triggers), or actively controlled (e.g., by a processor and actuator).

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Solutions to Common Trade Challenges

A PCO's job is challenging on many levels. Coordinating schedules with clients and occupants can be difficult. Emergency calls and clients' not providing timely access to areas can create unexpected schedule delays. Beyond clients, the pests themselves create challenges: nocturnal pests are hard to detect during normal working hours; fast-breeding pests can reach infestation levels between inspections; cluttered spaces magnify the number of places in which pests might hide; and trap's placement may be suboptimal due to the size or orientation of the space.

Stern's RTM systems meet these challenges to prevent infestations by _detecting pests_ early. It gives PCOs and their clients 24/7 real-time, tangible, sensor-based evidence of pest presence without the need for in-person monitoring. It also allows for pest-specific treatment, which is cost-effective and reduces collateral damage. Data collected by and sent from its systems informs PCOs and clients about infestation magnitude and spread, growth pattern tracking, as well as post-treatment effectiveness monitoring.

Case 1: Bed Bugs

Myriad dividends—financial and otherwise—can be gleaned from remote perpetual monitoring. Let's take bed bugs in hospitality as an example. Today's bed bugs are 1,000 times more resistant to pesticides than bed bugs from just a few decades ago. The incidents of bed bugs in hotels has increased seven percent every year since 2005 and costs the United States about $1 billion annually in monitoring, treatment and litigation. Bed bugs also exact an emotional toll on their human victims, causing mental and physical health problems.

Bed bugs have evolved to be more resistant to pesticide treatment, and are also extremely well-equipped for wreaking havoc on hotel guests. They can endure months of starvation, survive extreme climates, feed on hosts while they are asleep and vulnerable, and can latch rapidly (i.e., hitchhike) onto passing feet, pant cuffs, and luggage, easily migrating from one space to another.

Current approaches to monitoring for bed bugs do not fully facilitate early detection because current systems do not provide remote notification; humans must be present to inspect the sites. And current traps do not have remotely tunable lures that can optimally attract bed bugs.
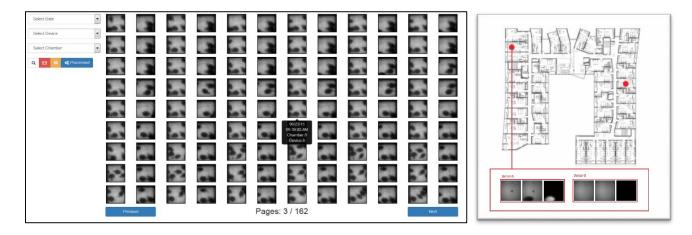
The Stern's RTM device is ideal for detecting, treating, preventing, and post-treatment monitoring of bed bugs in a hotel. The small form factor—the size and shape of a deck of cards—allows for optimal placement in tight spaces, like between mattresses and headboards where 96% of bed bugs are found.

The onboard processor would monitor the camera sensors, process the images, and dispense lures. Trap chambers, which are each removable, appeal to bed bug's preference for crevice-like spaces and tractable surfaces.

Once a bed bug enters the chamber, a camera snaps a picture of the bug. A text or email message containing the bug's photo and trap location information is sent to anyone who needs to be alerted. Meanwhile, the RTM "dashboard" collects data from all the sensors.

The manufacturer, in concert with its hospitality and academic partners, experimentally tested the device. Results from these demonstrations indicate that the device captures 80%-90% of the bed bugs within one meter, with an aggregate 80% early detection rate, given the 96% colocation of bed bugs at the head of a bed. Data shows that device could save an average hotel $15,000 each year.

Case 2: Rodents, Vermin and Reptiles

Rodent and vermin pest control requires significant labor and resources for transit to and from every fielded trap set, and most states require daily trap monitoring. It also can be labor intensive for PCOs, requiring them to climb ladders or navigate tight crawlspaces.

While some systems measure ambient heat at the bait station, and records a captured mammal by detecting its contrasting heat, heat can't be used to detect non-mammal pests like snakes, lizards or insects.

The Stern's RTM device can be configured for rodent, vermin and reptile detection. Capture includes imaging for pest identification, and the images are time- and geo-stamped. Data shows that in the field Stern's RTM help saves rodent/vermin/reptile PCO's and average of $50,000/yr.

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Case 3: Stored Product and Orchard Insects

Weevils, beetles and moths contaminate significantly more food than they consume, rendering it unfit. All stored and orchard products are susceptible, and infestations occur anywhere between fields, processing, stores and homes. Most monitoring approaches do not fully facilitate _early detection_ because they don't provide remote notification; humans must be present to inspect. In contrast, Stern's RTM provides remote monitoring and, thus, early detection.

The Stern's RTM is lure-, placement- and pest-agnostic, and can be placed in myriad locations (e.g., near pallets, on shelves). Both can host various lures. Both are also configured to capture pests. Similar to the rodent/vermin/reptile case, by eliminating the daily in-person inspections, data shows that the field Stern's RTM help saves PCO's and average of $50,000/yr.

The Value of Stern's RTM Remote Pest Monitoring

The innovative Stern's RTM device has a lot to offer the pest control industry and their clients. The RTM gives PCOs persistent monitoring capabilities that facilitate the _remote_ detection of invertebrates, rodents, and vermin. Stern's RTM can even help PCOs _remotely_ identify and detect a pest's species, age, gender, and condition/health. Additionally, Stern's RTM enables PCOs to _remotely_ tune settings, such as lure dispensation and entrapment procedures.

In return, a PCO's client base realizes significant savings, and feels better informed and in-control of their environment. This translates into happier customers, elevated profits, competitive advantages, and an added layer of tradecraft polish for PCOs. And all parties involved have the ability to track macro-level trends, such as infestations rates and vectors.

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System	Addressable Pest Types				Remote Support		Network Comms	Remote Lure Mgt	Remote Trap Control	Placement Flexibility
	Insect	Rodent	Vermin	Reptile	Detect	Identify				
Stern's RTM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Spensa	✓				✓		✓			
ClimbUp	✓									
BuggyBeds	✓									
Blackout	✓									
Beapco	✓									
Sensci	✓									
ServSensor		✓	✓		✓		✓			✓
Anticimex		✓			✓	✓	✓			✓
Advantek			✓							✓
Havahart			✓							✓
B&G		✓								✓
Victor		✓								✓
White Pete		✓								✓