

Guide to Intelligent Monitoring



auburnTM SYSTEMS

Invent Implement Innovate

in·tel·li·gent mon·i·tor·ing

/in'telijənt 'mänətərɪŋ/

Noun

1. Writing your Compliance Assurance Monitoring Plan thoughtfully, so that you gain approval and protect health & safety without creating unnecessary work, burden and cost for you and your company

“The engineer at ABC smelting meant well by cutting and pasting guidelines from the EPA regulation into the CAM application, but he didn't realize that failure to plan for intelligent monitoring destined his company to squander resources unnecessarily for the next four years.”

2. Replacing older generations of single-point BLDS detectors with network capable devices that continuously log data, provide early warning threshold alarms and predictive maintenance insight, reduce operating costs, vastly simplify required reporting, and integrate other data such as differential pressure, temperature or fan amps.

“Steve was home for dinner with his family for the first time in memory. Not only did his upgraded bag leak detection system cut his data logging and report preparation time to a mere fraction of what it had been... the predictive capabilities of the new intelligent monitoring system, and resulting maintenance reductions, meant that he was almost back to 60 hour weeks.”

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Intelligent Dust Monitoring

What | When | Where

Is there such a thing as “dumb monitoring?” Maybe... what if you’re monitoring more than you need to? Or even MUCH MORE than you need to? That would at least be a bit silly, wouldn’t it? The goal should be to monitor what’s necessary, when and where it’s appropriate – to satisfy regulations, company policies and reasonable requirements.

Believe it or not, many companies draft their CAM plans using templates of other permits, in some cases even drawing from the regulations sample guidelines. If that shortcut is inadequate, their application is returned for additional work (and potential scrutiny...); if it’s excessive, they’re stuck. We’ve never heard of an agency recommending that they scale back their monitoring commitments, even if they exceed, by a wide margin, what the agency would have required. For the life of that permit, they are obliged to monitor more than they would have, had they taken a different approach to the CAM plan.

Now, we don’t recommend that companies simply do the minimum monitoring required to satisfy the letter of the regulation. However, in today’s hyper-competitive business world, it’s important to make resource decisions consciously. Doing well by doing good is a real and viable business philosophy – but it doesn’t mean doing everything.



We've worked with hundreds of companies on countless projects, often consulting with them on writing their CAM plans, air permit applications and renewals. In our experience, one can generally discern a reasonable degree of monitoring, that often exceeds strict compliance requirements, without committing the company to excessive resource obligations over the life of the permit.

The foundation of "intelligent monitoring," therefore, is a sensible and appropriate, but not excessive CAM plan. Often, a modest investment in a consultant can easily pay for itself, as an effectively prepared CAM plan will simultaneously optimize compliance effectiveness and reduce the ongoing resource cost of compliance.

S P E C I F I C
M E A S U R A B L E
A C C U R A T E
R E S P O N S I B L E
T I M E L Y

Intelligent Dust Monitoring

How?

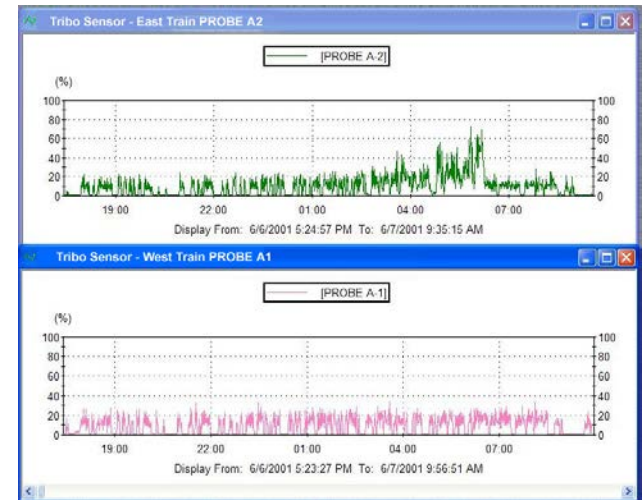
Continuous Monitoring - you need it (and know it), or you need it (and don't know it yet)

Generally, companies fall into one of those two categories. If you're subject to MACT compliance by virtue of your industry, or by identification as a major source, you've probably got some type of BLDS already in place.

If you've dodged the MACT (lucky you!), you may use a BLDS depending on your state or local requirements and corporate philosophy. Maybe you just "keep your dust collection system in good working order" for the maintenance benefits, as well as to remain in compliance.

Based on traditional technology (analog and early digital, either AC or DC, single point monitoring systems) and simple air permit requirements, the above was a sensible approach in years past. However, technology has advanced enormously in ease of use, business value and other benefits... and it actually supports compliance now, instead of just verifying it.

Here's a quick look at how continuous monitoring is intelligent monitoring – why facilities that already monitor can probably do so 'smarter,' and why even facilities that have traditionally avoided continuous monitoring should take a serious look.



Networked Monitoring – unless your office is located near all of your dust collectors, it might help to have them linked together. Now, that would be intelligent.

Steel toes, hard hats, safety goggles and... clipboards to run from monitoring point to monitoring point around the factory, manually logging data... sound familiar? Of course, maybe you've upgraded to retrieving data with a USB drive or some other slightly less cumbersome method.

However, isolated detection points create the same problems – regardless of how sexy the local data retrieval method is. These 'islands' of "check-the-box" monitoring for compliance are functionally antithetical to every trend in efficient manufacturing. Every hour allocated for someone to conduct remote function checks and retrieve data is an hour unavailable to apply to core functions.

It also sacrifices the predictive value of monitoring, since the data is only intermittently reviewed – like a series of snapshots vs. watching the movie.

Networking detection devices provide these operational benefits:

- Reduced time/staffing required to retrieve data
- Earlier warning of alarm conditions
- Enhanced predictive capability (via continuous monitoring)
- Consolidated automatic data logging for easier record keeping and compliance



Predictive Monitoring – unless you really enjoy the 3am call about a dust event... wouldn't you love to know if a bag is about to let go? That's pretty darn intelligent.

Traditionally, folks thought of bag leak detection monitoring in the green/red or go/no go context of compliance. When triboelectric technology was first introduced, that was often appropriate based on technical capabilities – but advances in the interim 30 years, and especially in the last 5 years, have substantially improved the technology. With those improvements has come an additional range of monitoring capabilities.

Today, the green/red modality is presumed – **Intelligent monitoring** is distinguished by its range of predictive capabilities. These include:

- Predicting bag deterioration by identifying diminished performance in real-time
- Predicting bag replacement timing (often substantially reducing maintenance costs)
- Predicting imminent reportable events through a series of lower level, non-reportable early warning indicators of dust excursions

Dust detection that knows what's going to happen seemingly before it does – and gives you time to correct before you have a reportable event. That's intelligent (and likely a source of huge cost reductions!).



Parametric Monitoring – you could spend Mondays on differential pressure, Tuesdays on fan amps, Wednesdays on temperatures, Thursdays on dust, etc... or you could pull it all together in a single system. A centralized monitoring system – it doesn't get much more intelligent!

Most companies have to track a lot of data, in a lot of places. Reams of paper (or numerous Excel files) are required to log temperatures, fan amps, differential pressures and sometimes other factors, in addition to bag leak detection history.

Cumulatively, recording and logging requirements quickly become cumbersome. The common solution, a disparate system, requires parallel procedures and operational attention to capture, storage, consolidation and access. If you're the kind of person who enjoys repetitive tasks that don't create much value for your company, then this might be the perfect solution. For the rest (we assume all) of you, there's an intelligent solution.

Today's intelligent triboelectric Bag Leak Detection Systems (BLDS) include the ability to simultaneously accept inputs from various external sources. Inputs are monitored (including the ability to alarm on out-of-range values), and continuously recorded – all through the BLDS. Alternatively, if you already capture other data sets through your primary factory automation system, OPC compliant software packages, which centralize the monitoring, logging and reporting functions for entire factories, can be configured to pull those data streams in for monitoring with dust collector data.

In short, a more intelligent solution than a clipboard!



Enhanced Reporting Monitoring – information at your fingertips... really... that's intelligent

Kind of like the end of a vacation, which always seems to arrive quickly, the quarterly or semi-annual compliance reporting deadlines seem to always be looming just ahead of the next project that you're supposed to complete.

If your requirements are anything more than plain vanilla, not only are there a lot of reports, but each one also represents a lot of work; finding the data sets, hoping that all the data was captured and organized, cutting and pasting the file into the report, etc. It's cumbersome, time consuming and an opportunity for error – and while you're working on that, you're not creating the real value that you would be if you were tackling a challenge.

Even that is only if it's a routine report... toss in a reportable event or two, and suddenly completing that report becomes a project itself – one that requires careful attention to minimize unwelcome consequences.

You've been there? Then you know what we mean. There's got to be a better way... there is – intelligent reporting.

As the monitoring capabilities of triboelectric broken bag detectors have increased, parallel developments have occurred in the networked system approach to monitoring. Among the most significant of these is the inclusion of comprehensive software, which simplifies the monitoring and data collection of multiple detectors, and as noted earlier, even other parametric values. But far more than a monitoring assist, this software further enhances the 'predictive' capabilities incorporated in today's detectors, and most importantly, it provides simplified reporting capabilities for whoever creates the reports – even when the report includes reportable events.

With proper set-up and configuration, this class of software transforms:



- Monitoring – from a “Where’s Waldo,” frustrating search of snapshots looking for something of value, to an easy-to-follow motion picture story.
- Reporting – from cumbersome drudge work to a routine, “leaned” business function

Altogether, an intelligent transformation!

Early Warning Monitoring –if you’d like to know about a problem BEFORE it’s reportable, that might be intelligent.

Today’s monitors are more sensitive than they’ve ever been. How’s that you ask? After all, particles aren’t any more charged today than 30 years ago, and the interaction with the probe is unchanged. You’re right – the difference is actually 1.) the ever evolving electronics capabilities, and 2.) increasingly sophisticated signal filtering. That is a substantial challenge – processing pico amp signals against factory background ‘noise’ and challenging process conditions require sophisticated algorithms.

Technical distinction aside, the bottom line is that it’s now possible to observe trends and progressions. So, instead of an ability to register an “out-of-range” condition, multiple progressive thresholds can now be set to “alarm” as conditions change. A gradual deterioration can be noted well in advance of “reportable” levels, providing engineering and maintenance teams adequate time to respond, troubleshoot and resolve developing issues in a proactive, lower stress approach. This reduces disruption, often precludes reportable events and eliminates remediation/penalty expense.

More important (at least financially) than remediation is the ENORMOUS COST



of unplanned factory shutdown. Often logistically challenging, an emergency shutdown carries enormous secondary and tertiary consequences in cost, customer service, quality and efficiency. Avoiding emergency shutdowns is a task not frequently assigned to environmental compliance folks – but it's one where the right solution can have substantial and far reaching implications! Talk about intelligent...

Advanced Monitoring – technology that combines the best of all earlier technologies in one unified solution – that's basic intelligence.

Obviously, this range of “intelligent monitoring” benefits is only available if the probe in the duct is connected to an intelligent device. This is an area where engineering teams need to pay particular attention, because there's lots of 'marketing noise' that floats around the industry.

Two key attributes account for most of the differences between systems:

1. Signal filtering algorithms
2. Full range of signal

First, it's crucial to see what you need clearly, without irrelevant signals obscuring critical data.

Second, it's important to pull from a full range of signal breadth. Generally, 80% of available triboelectric signal comes from the DC (direct contact) range, while



the remaining 20% comes from the AC (induced signal) range. For years, patent restrictions on DC monitoring prompted some vendors to rely exclusively on the much smaller AC range. More recently, however, advances in Tribo detection have led to a unified approach – meaning that a single detector can simultaneously monitor across the DC and AC ranges. In short, there's no need to tie one monitoring hand behind your back anymore. Monitoring the full range of available triboelectric signal instead of an incomplete portion – that's 100% intelligent!



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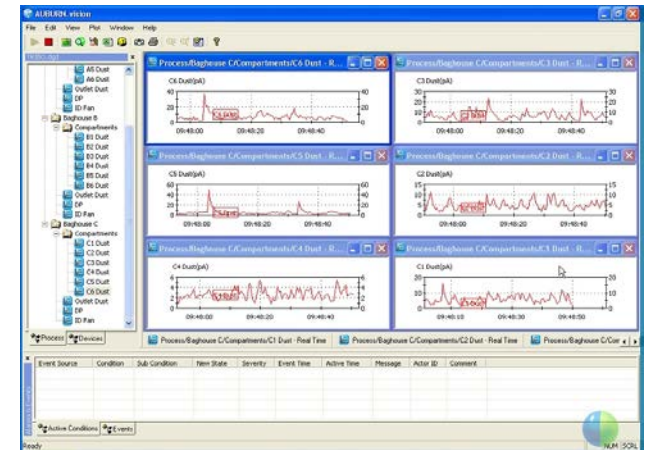
Intelligent Dust Monitoring

Why?

But why bother? Nobody needs to raise their hand to volunteer for another task, and even if intelligent monitoring can be “easily” implemented it’s still going to take some work and of course some money. Why do it?

As outlined above there are three general justifications:

1. Effectiveness – today’s triboelectric monitors are more sensitive and effective than ever before. They detect across the entire range of triboelectric signal; provide predictive capability; and are networkable for simplified, yet comprehensive, monitoring and data capture.
2. Operational benefits and savings – predicting maintenance requirements, and early warning of events, helps avoid costly emergency shutdowns; changing baghouse bags when required reduces material costs; elimination of emergency cleanup reduces labor, material and contract costs for remediation; and centralized parametric monitoring creates operational efficiency.
3. Compliance assistance – reliable data capture and logging; vastly simplified environmental reporting; enhanced event reporting; predictive monitoring and early warning to preclude reportable events all contribute to higher levels of compliance, at a lower cost



It sounds so good... there must be some reason not to do it? Fair question. We've heard two reasons: first, there's a cost. As outlined above, the expense is normally recovered in operational savings, and any reduction in fines is "gravy." A typical project can be in the range of \$25,000 – \$100,000, depending on the number of monitoring points. So, while not insignificant, it's also a relatively small investment. It can also be appropriately broken into discreet components, which easily fit within normal local capital expenditure approval limits.

Second, folks who are not required by their air permit to have continuous monitoring will sometimes respond that they'd rather not be on the hook for knowing all the details. "Ignorance is bliss," they'll say, and as long as there is no record of an excursion, and they are following their permit requirements to the letter, actually having data works against them.

While this reasoning is logical, both the premise and conclusion are faulty. There are a number of ways a dust event can be detected. Among the most common is a residential or commercial neighbor noticing and reporting it. Employees are also encouraged to report through EH&S compliance programs, and even whistleblower regulations; disgruntled workers are a frequent source of tips regarding environmental violations. It's actually pretty unusual that a reportable event goes undetected.

If it's ultimately likely to be reported, experience with event response, remediation and consequences indicate that it's far better to report preemptively. Having the recorded data works both ways – it documents the event, or shows that you were not out of compliance at all. If you're going to report preemptively, having complete data and proper details is an intelligent choice.



The bottom line

In the end, it's not really a question of "dumb" vs. "intelligent" monitoring – more often, corporate philosophy is the operative factor that determines which facilities will embrace **intelligent monitoring**.

Those companies that operate on the fringes (operational efficiency, profitability, modernity, compliance, worker safety, etc.) will typically reject the suggestion of a monitoring system upgrade to an intelligent level.

In contrast, companies which embrace the importance of EH&S, environmental compliance, automation, efficiency and lean processes value the improved capabilities and reduced direct and indirect costs which **intelligent monitoring** yields.

You know your company environment well... is it time to implement "intelligent monitoring" at your facility?



With proper set-up and configuration, this class of software transforms:

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- *Reporting – from cumbersome drudge work to a routine, “leaned” business function*

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About Auburn Systems, LLC

Auburn designs, engineers and manufactures advanced electronics. Our specialty is developing and refining devices for particulate monitoring. We focus on bag leak detection for emission monitoring and solids flow monitoring for process control applications – particularly where accurate detection and monitoring saves our customers time and money. Regulatory compliance and process improvement are business challenges – not simple hardware tasks. Although we invented triboelectric monitoring, we don't just rely on our large assortment of patents. We measure our application success by the return which we enable our customers to realize. By accurately monitoring the triboelectric effect created by particles in a process, we actually help you do, what you do, better.

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