

IoT Technology for Enhanced Environmental Compliance



IoT is considered one of the fastest growing trends in technology and has a potentially huge impact to automate how we manage water quality, air emissions, and other key environmental performance indicators for data monitoring.

In this white paper, we focus on how **EHS programs** can benefit from integration and interoperability of a multi-tenant cloud platform and Internet of Things (IoT) platforms for managing, organizing, and monitoring the structured and unstructured data coming from various different sources. Once in the platform, a centralized data repository is created that is suitable for analyzing the key environmental indicators for management, sustainability, and environmental compliance.

We're going to go through some of the reasons you may be pursuing an IoT implementation as well as some of the pitfalls—things to look out for when you are planning an IoT project.

IoT definitions

The **Internet of Things** is a system of physical objects that can be discovered, or interacted with by electronic devices that communicate over various networking interfaces and eventually can be connected to the wider internet.

A **Thing** may be a sensor or actuator. It may be able to execute computations and or communicate over wired or wireless interfaces.

A Thing may be **tagged** (passive) or **connected**.

Definitions from "Building the Web of Things" Guinard and Trifa



Why embrace IoT?

Allows automated monitoring that is otherwise impractical or impossible

Based on frequency or accessibility of the monitoring application. IoT allows monitoring of data every second which is impossible using other means.

Reduce cost of data collection

The biggest driver for most companies looking into IoT solutions is to reduce costs of data collection. You can collect a volume of data that is simply not cost-effective to do manually.

Improve quality of data collection

To remove the human element from your data collection processes. Automate as many things as possible to simplify your data collection.

Regulatory requirements

Certain types of IoT such as CEMS are already required by Part 75 and other regulations. It's not unreasonable to expect as IoT becomes more prevalent that there could become more requirements.

Use of data to gain insights using additional data and reduce operational costs

This is harder to quantify, but for example you could be using your IoT data to recognize you are changing air filters too frequently or maintenance on a frequency that's not necessary.

Take advantage of AI tools to generate advanced insights into your processes

AI is the next wave of technology into the EHS space. AI requires a lot of data to be effective. The more data you can collect using IoT devices, the more value you'll get from that technology.



IoT use cases in the EHS space



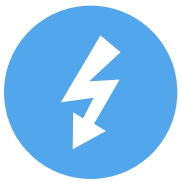
Stack monitoring / CEMS

Continuous emissions monitoring systems have been around for decades as a Part 75 requirement but CEMS devices can now be connected to a cloud-based solution. IoT helps record air data at an extreme frequency in relatively inaccessible locations—which is then used for reporting your emissions and operational monitoring.



Water treatment process monitoring

SCADA systems and other technologies have been in place for years. IoT allows you to record flow rate, pressure, tank levels, chemical dosing, and/or similar parameters at a higher frequency. This data is crucial for reporting, troubleshooting, triggering alarms, and things of that nature.



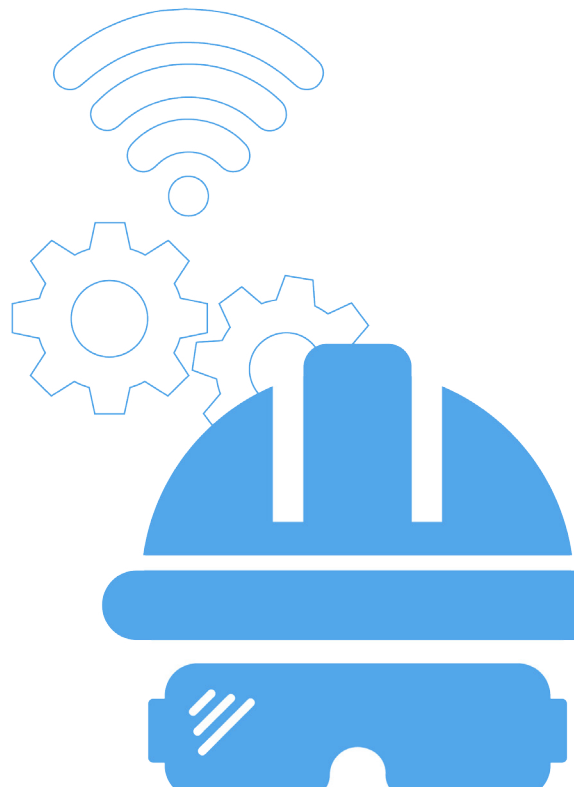
Resource consumption

Using smart meters, you can record energy, water, or fuel use for assets or buildings. Data can be recorded monthly, daily, or even more frequently depending on your use case. For reporting, monthly data may be sufficient. However, if you're looking at use optimization you may monitor more frequently to analyze energy surges or consumption by location.



Mitigation system automation

Another case where IoT is helpful is in a dispersed air monitoring program. Rather than actively recording data, the primary purpose is to trigger alarms. Air monitoring network is put in place to collect and monitor critical systems. If something is detected it then triggers a text message via cellular signal.



Considerations for IoT platform

IoT is more complicated than deploying a network of devices and waiting for reports to roll in. There are several processes involved in an IoT setup between the device and final output. Many people often forget the human element of someone using this data to make a decision. It doesn't simply end with computers.



Device management

You may think of your device management as more of an IT responsibility than EHS, but there is some information you want to track from the beginning for EHS purposes. Location and quantity of devices for example. The ability to on-board new devices and expand your network with new monitoring locations may be important to you. It's better to plan for that up front. Meta-data including device id, location, units of measure, and QA/QC support information is often overlooked but very important.



Support of protocols

Connectivity of your devices to your cloud or application is crucial to ensure data gets properly communicated. There are several different protocols available now such as RFID, WiFi, Bluetooth, and LTE with more on the way. Make sure your devices aren't relying on outdated technologies. If you do have an older system that is using older SCADA-based PLC automation, you'll want a platform that can take advantage of legacy protocols.



Scalability for desired use

Data collection frequency is driven by your objectives or requirements. Sometimes you'll have more data than you need. You may not need to keep all records indefinitely. Retention can be limited to only keep what you need to make the data easier to analyze. You'll greatly benefit from elastic, cloud-based data storage. You'll eventually run out of storage if you are plugging all of your data into a desktop. It's good to plan up-front for how much data you plan to accumulate in the future.



Data processing and rules

This is essentially your initial data processing—analyzing your incoming data stream and triggering alarms or any other actions. You should look for a rules engine that is transparent and editable should your processing needs change. It's important to have the ability to see what the engine is doing and adjust as needed.

Your tools have to be capable of handling big data. Spreadsheets won't cut it. It's important to separate your real-time data processing from your batch processing. A good system can separate your dashboard viewing and alerts from your reporting and monthly roll-up data. Having separate processes will be more efficient.

Considerations for IoT platform



Security

The data you're assembling with these IoT devices is presumably not public in its raw form. You'll need to consider security of the device and the platform it feeds data to—looking for the highest level of encryption between the two. Role-based access control allows you to grant different levels of access to users—making sure only the intended users are able to make changes to the settings or trigger conditions.



Integration with existing applications

Consider existing applications that could benefit from this new IoT data if you are looking for maximum return on investment. There are applications on the operations side, for example, that can benefit from IoT data. One of the ways to secure funding is find multiple uses for your IoT data. Much of the information EHS professionals store overlaps with ERP systems. A final consideration is authentication services, such as SSO or LDAP, which can save time if integrated properly. These will allow you take advantage of the user setup already built into your organization—removing the secondary setup for separate user credentials.

Preparing for the future

In summary, we want you to be prepared for the future. IoT is becoming more dominant in the EHS space. We are seeing more and more applications where it's becoming more cost-effective. IoT may eventually become a regulatory requirement in some capacity. You'll want to plan now for what you're going to be using 5 to 10 years ahead as the technology evolves. This is setting the stage for AI and predictive analytics to use all of this data—preparing you for the next wave of tech to invade EHS. The intent of IoT is to simplify your workload. If implemented correctly, it can do just that.



How can we help?

If you're looking for an all-in-one EHS solution you can count on, make sure to put [Locus Technologies](https://locustec.com) on your shortlist! Our fully configurable solutions for environmental, health and safety, incident reporting, water and air quality, waste management, sustainability tracking, and other compliance-related data are built to adapt to your business processes, down to the most specific state regulation or corporate metric.

Find out more about Locus, our service-oriented staff of engineers and domain experts, and why our EHS software is the solution you've been looking for:

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