Data Collection

Four Steps along the Industrial Internet of Things (IIoT) Path

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THE GLOBAL STANDARD IN QUALITY SOLUTIONS

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Four Steps for Data Collection along the Industrial Internet of Things (IIoT) Path

In today's digital world, data is the "raw material" that drives process and quality improvement from the shop floor to the board room. Most companies already collect production, inspection, and other quality data; but missed opportunities and issues occur when the data doesn't necessarily get pulled together to provide a trusted platform for performance-enabling analytics. Often times, data collection is used for narrow applications such as statistical process control, audit or production planning; thus, creating the inevitable data silos.

> The number of connected *things* in use will hit 14.2 billion in 2019, and grow to 25 billion by 2021.
>
> *Gartner, Network World*

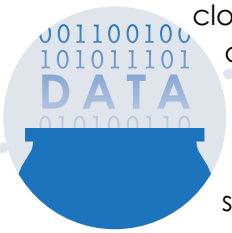
While these tactical uses have proven successful in continuous improvement, the next frontier in data collection and utilization is taking ALL types of data and analyzing it in new and even unexpected ways. This concept is the *Industrial Internet of Things (IIoT)*, and like its consumer-related *Internet of Things* cousin, the IoT, the industrial version gathers data from a variety of sensors, machines, devices, and databases for myriad uses. IIoT pulls together and utilizes data from many accessible locations so it is available for analysis. The process provides product information and traceability from the moment materials enter the door, until they leave the factory.

Data collection can be a challenge. Even the smallest enterprise can generate massive amounts of data, and collecting data is only a first step on the path to a successful IIoT project. Gleaning actionable knowledge from that data is the intention; however, reaching that goal can be a difficult path.

To help manufacturers integrate data collection in line with IIoT trends into their management plans, four broad areas relating to the data need to be considered: collection, connectivity, correlation/ codification, and processing.

Collecting the Data

1 Today, useful data is coming from every direction and from every imaginable type of equipment. These include human machine interfaces, PLCs, CMM, machine tools, connected sensors, corporate databases, supplier data silos, end user information and more.



All varieties of data are collected. Alphanumeric, graphical, environmental, audio and visual, as well as vast amounts of production data, process data, and inspection data are typically gathered for later analysis. For instance, production floor sensors on machine tools can collect data on vibration, hole specifications, and other forces involved in the milling process to determine process efficiency and product quality. Too often that valuable information remains in data silos in the form of raw data, serial output, excel spreadsheets, web storage, paper check sheets, OBDCs, or individual machines databases.

IIoT can help tackle this challenge. The Industrial Internet of Things connects machines, people, data, and automation across a facility or facilities to a digital platform or infrastructure. Often, this is in the Cloud, centralized storage, or database.

The overarching goal is to unlock data from isolated silos and enable data sharing and interoperability between closed components and subsystems. The ability to universally collect data in the manufacturing setting from ALL available sources will continue to grow in importance as more and more companies participate in IIoT.

Interconnectivity of Devices

2 IIoT is essentially a device-to-device communication system that allows connected devices to share digital data across devices. This data-sharing model encompasses ubiquitous communications, real-time analytics, machine learning, commodity sensors, embedded systems, edge-of-device equipment, and more.

To reap the benefits of this data generation on the shop floor, the machines need to be connected

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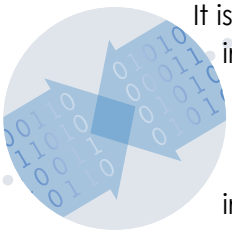
and communication must be all inclusive. They can be connected within a facility or remotely to other locations. This interconnectivity can link data sources, machines, et al, through the use of devices such as data collectors, tablets, and phone, or fixed operator stations.



It is increasingly more important that the connection be bi-directional, allowing for immediate action or response to the data being generated or transmitted. This increased data visibility across processes can greatly enhance decision making and continuous improvement efforts. For example, if a work-in-progress is trending toward the far reaches of an upper or lower control limit, a system or machine operator can be alerted to the problem and a determination made on solving that problem.

Then, this change can be instantly updated to the quality planning documents or work instructions. Decisions based on real-time data; not with post production data. This is the goal which many machinery and metrology suppliers are working to achieve. Today's devices and software solutions, help achieve the ultimate in smart factory control and intelligent asset utilization.

These solutions can help bridge information technology (IT) and operational technology (OT) systems such as SCADA, MES, and ERP, systems that do not always communicate with each other. For instance, the MES system can download data on a new order or change order and that planning data can be utilized to schedule production activities. If in the data collection process, a bad drill bit or faulty die is identified, a new bit or die can be ordered proactively before it causes untimely and costly downtime on the shop floor.

This IIoT predictive maintenance concept means using more sensors to collect better data on machine operations, and then using data analytics and machine learning to determine when that machine might need maintenance. This work can be undertaken based on actual usage data rather than just a date on a calendar. It can eliminate the problem of a machine failing prior to service being performed, or it can enable savings incurred from over-scheduling repairs.

Products and product data can also be scrutinized outside company-owned facilities. Through IIoT, every component in a supply chain can be tracked in real-time. Component level traceability can give precise history for each lot, part, or process, allowing faulty parts and machines to be isolated. This might reduce costs, recalls or rework, and prevent shipment of inferior or faulty product to customers. Having a pulse on all production processes through monitoring and having full data traceability are especially critical for the automotive, aerospace, pharmaceutical, and medical device industries.

Codifying/Correlating the Data

3 After successfully collecting data on the shop floor, the next step is to harmonize the data through codifying and correlating processes. The ability to pull data from all of these sources through universal interfaces and unify the data into one central storage or database is a key element in the success of IIoT implementation. This can only occur if the machines and the users understand each other.

Unfortunately, like the Tower of Babel, there are many different languages used around the world. Production is often spread out in massive factories, at multiple locations, and throughout global supply chains. In addition, legacy systems are often in use, as well as proprietary software.

The diverse systems may utilize differing outputs and interfaces, reporting formats, and labeling.

Often there are untraceable data sets and issues with lack of traceability. Stand-alone machines gather information in data silos that are often proprietary in nature meaning that the format of the data is native to that device or company.

Hence, the data must be harmonized so that it looks the same and can provide a baseline for later analysis. Along these same lines, the data then needs to be codified, or given a structure or categories to be able to facilitate this analysis. This typically means putting it in a format that is suitable for computer-aided analysis such as statistical process control (SPC) software. There must be a "semantic vocabulary" that provides structured, contextualized data with no proprietary format.

Imagine as an example, a Quality Manager oversees the manufacturing process on the shop floor where a CMM machine, several gages and probes, and also several portable data collectors are in use. The challenge is that each machine or tool comes with its own software and interface and, ultimately, there is a need to pull together different data sources to evaluate performance. This evaluation, without a formal data collection solution, can sometimes result in time-consuming, manual processes using spreadsheets.

The objective is to collect data from all of these sources into either a single database or a group of databases that act as a cohesive integrated single unit of data storage. Instead of storing paper in locked cabinets, data collected can be digital, traceable, actionable, and high integrity. Now, the Quality Manager can be assured that the entire shop floor process is being monitored and data integrity is maintained.

Processing the Data

4 Once the collected data is harmonized, it is now ready to be put to work to best understand its impact, which can take many forms. Data collection hardware and software solutions process the information to produce reports, analytics, notifications, escalations, and alerts. Tools, such as dashboards, summary information reporting, and email alerts and notifications, facilitate communication. Some tools allow users to visually explore data. Other tools allow users to access the most recent data and history, enabling auto-generated alerts and reminders for machine items. Data can be immediately analyzed and controlled for real-time activities; or stored in the Cloud or central storage for further examination.

Plant operators, process and equipment engineers and managers can monitor incoming data through HMIs on the factory floor, computers on and offsite, and mobile devices. SPC Software is an effective tool to produce a number of important reports such as calculate Cp and CpK for a given process. Web- based reporting provides real-time, accessible audit status to specified users anywhere in the world via the Internet.

Today's companies rely on data collection solutions and IIoT features for immediate and continuous improvement through real-time corrective action. By implementing data-driven decision making based on consistent, automated performance metrics, management can respond to a fast-moving marketplace and, potentially, outpace their competition. Down the line, manufacturing operations will continue to move to paperless processes, unattended production, increased robotics usage, and other capabilities limited only by the breath of imagination, power of the algorithm, and organizational support.

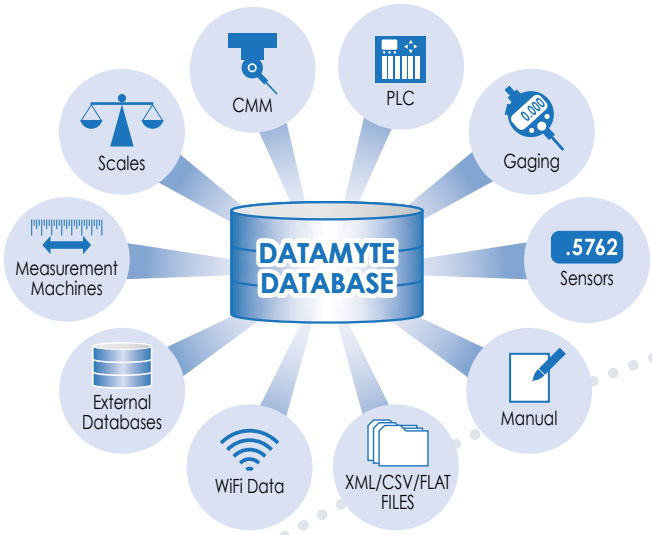
Because of these data collection challenges and unique plant requirements, companies seek an external partner to understand the scale and scope of IIoT data integration and help them set up and run their data collection activities. One such vendor is DATAMYTE.

Facilitating Data Collection for IIoT

DATAMYTE works to enhance quality initiatives on the manufacturing shop floor, and to augment decision making and risk mitigation in manufacturing by developing IIoT enabling technology. These products build upon a closed-loop suite of quality management functionality that integrates planning, data collection, analysis and reporting. DATAMYTE's solution portfolio is designed around data collection, information management, analytics and the overarching tenet to drive action at very core of each offering.

CHALLENGE #1
SOLVED
COLLECT
ALL THE DATA

One of the company's strengths is the ability to agnostically collect data from hundreds of gages, sensors and machines, making that data accessible in a single repository for analysis, reporting, alerts, and notifications to improve quality efforts. Whether it be legacy data silos, fixed operator station data, a machine sensor, PLC, or data collected with a device such as a data collector, tablet or phone; the DATAMYTE solution enables the collection and aggregation of this data under its DataMetrics platform, creating a high integrity database with traceability to processes and a full line of reporting tools. The benefits of data integrity are clear: increased accuracy, consistency, and traceability of product and process data over its lifecycle.



CHALLENGE #2
SOLVED
CONNECT TO 100'S
OF MACHINES, DEVICES
AND INTERFACES

The DATAMYTE solution facilitates and enables data collection through its hardware and software solutions, allowing for seamless connectivity to hundreds of machines, devices and interfaces. Robust software interfaces and set ups simplify the complex network of data to be collected from production or audit. Bluetooth devices, such as the "DataMyte" data collector or the LightStar™ Torque Wrench, create a strong mesh network of solutions to effectively collect data.

According to multiple published reports, one of the most impactful IoT trends in 2019 is trusted hardware and operating systems. DATAMYTE's hardware solutions provide the highest level of accuracy and data integrity. Tied into our software systems, they provide a reliable solution in an overwhelming digital environment.

Bi-directional communication between solutions also enhances the benefits from IIoT. Send your inspection plan directly from Quality Planning to the wireless data collector or to your SPC inspection plan. Update information from manufacturing processes around tolerance limits and CpK values back to the control plan without stepping foot on the production floor. Manage your tool library and Gage R&R studies directly from Quality Planning. If you update one area, that change is reflected across the landscape automatically without the need to manually update connected systems when that change is made. It is easy to understand how these synergies can help promote data collection as well as better quality management overall.

DATAMYTE, which began in the 1960's as part of Rockwell International/Allen Bradley, was the first company to launch a portable, handheld data collection system, known as simply the "DataMyte."

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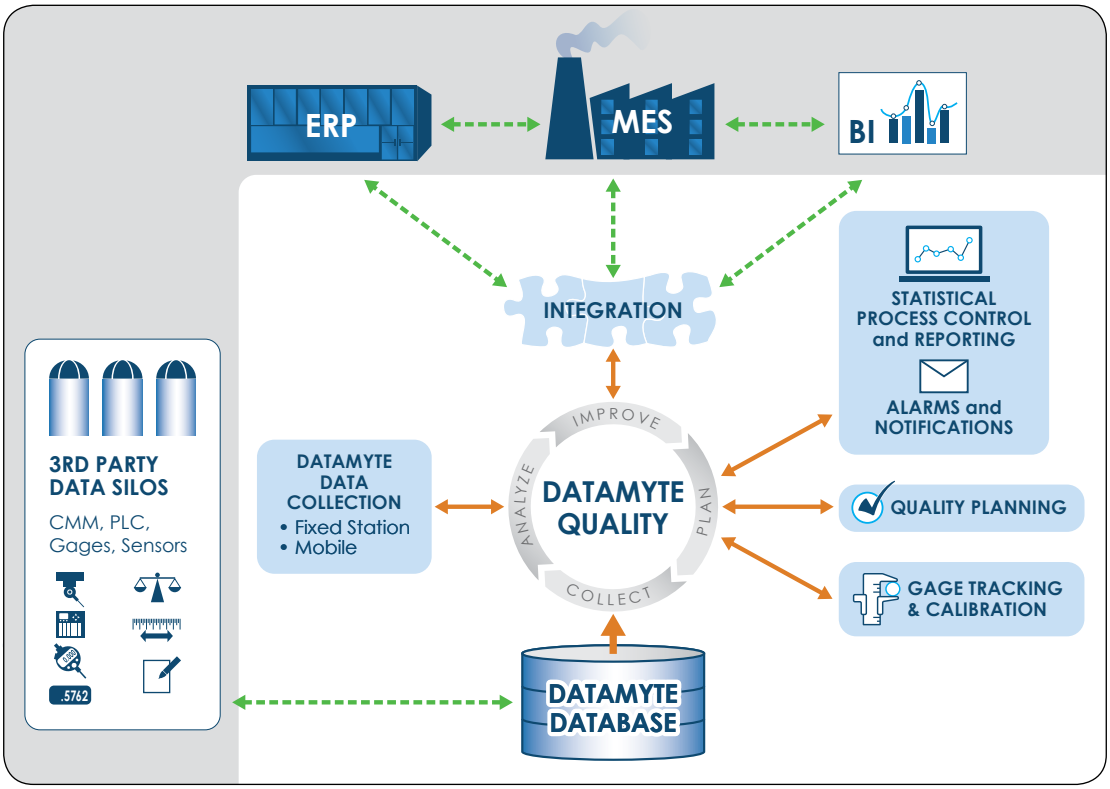
CHALLENGE #3
SOLVED
HARMONIZE THE DATA

Once the data is collected through a trusted mobile device or a disconnected fixed station, we connect to external platforms such as BI, ERP, or MES. DATAMYTE's solution allows these platforms to communicate through interfaces that push or pull information between various enterprise systems and the Cloud or central repository. This bi-directional associativity is enhanced through the company's strong ability to collect data from hardware, automatic process or fixed stations. The DATAMYTE solution can connect to hundreds of device drivers in the market through the use of serial and file parsing codification that facilitates data collection and eliminates data silos. This universal ability to collect data and make it available to all levels of an organization helps to guide a company along the IIoT path.

CHALLENGE #4
SOLVED
PROCESS DATA: UNDERSTAND THE IMPACT OF THE COLLECTED DATA

Smart collection devices and interfaces, backed by robust software, collect data and direct it to the DataMetrics SPC database. From here, alerts & notifications, timely and hierarchically-appropriate reporting can be put into action; and richer BI/ERP/MES integration can be shared. Full wall dashboard views of the entire manufacturing process or custom web reports can be set up to visually enhance what the data is indicating.

The DATAMYTE solution can help integrate the Industrial Internet of Things into a manufacturing facility. Its products build upon a closed loop suite of quality management functionality that integrates quality planning, data collection, gage & tool management, analysis and reporting.



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