Guide to Sight Machine for IT

Getting business value from factory floor data

SIGHT MACHINE

The IT Challenge

Integrating new software in the enterprise manufacturing world is no small task. Even if the technology is proven to provide business value, adding a new technology to an existing architecture can be complex, risky and costly. Many IT leaders are left asking the same questions when business stakeholders lobby for the integration of a new technology:

→ How will this technology affect my IT resources and the consumers of data in my organization?

→ How will it augment my data efforts?

→ What is the technology's level of data security and system security?

→ How will the technology integrate with our existing technology infrastructure and systems?

→ What data connectivity will we need to put in place to accommodate this new technology?

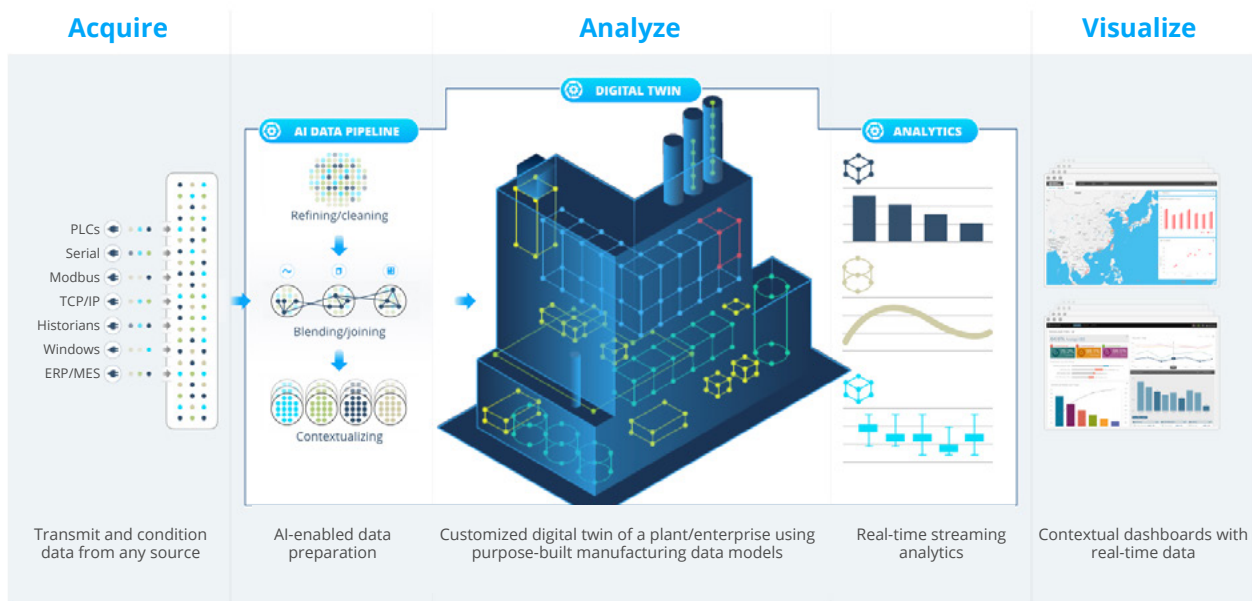→ How much effort and training will be required for my team to support it?

When assessing and preparing to use a digital manufacturing platform, these are ever-present challenges that Sight Machine seeks to address head on.

Sight Machine's Approach

In a manufacturing enterprise, the demand for data to be extracted from original sources in many different purpose-specific formats falls largely on the shoulders of IT leaders and their available resources. IT has the significant task of extracting, conditioning and structuring data appropriately for consumption by business users. The start-to-finish process is frequently time consuming and re-source intensive, and the application for the data is rarely re-usable. More often than not, requested modifications and new iterations require a repeat of the process and additional coordination from stakeholders within the enterprise.

Sight Machine's approach helps IT groups bridge the gap between raw data sources and insight-producing analytics in the shortest amount of time with the least amount of pain. At Sight Machine, we've developed frameworks and patented IT automation techniques to reduce the headache of data acquisition and preparation while ensuring all end-product analytics are cross-functional, reusable and purpose-built for manufacturing.

Designed for scalability and repeatability across plants, floors, machines, batches and parts, Sight Machine's approach to digital twin building requires access to all data assets dealing with parts and process within a manufacturing enterprise. Once Sight Machine assists with conditioning data, this data is funneled through the AI Data Pipeline, which is set up for continuous joining and processing for real-time digital twin applications. The value of this level of data connectivity is in the end-to-end visibility manufacturers gain across their entire operation.

Acquire	Analyze		Visualize
Transmit and condition data from any source	AI-enabled data preparation	Customized digital twin of a plant/enterprise using purpose-built manufacturing data models	Real-time streaming analytics	Contextual dashboards with real-time data

Laying the Foundation:
Data Acquisition & Conditioning

Whether a company has already invested in a robust data collection infrastructure or has yet to even build out the physical layer—whatever the data readiness of the business—one of the more demanding up-front parts of initiating a Digital Manufacturing Platform project is data acquisition and preparation.

DATA COLLECTION SOLUTION TYPES

Sight Machine offers multiple options for data acquisition and preparation. We work with manufacturers to determine which solution type fits their organization. Options include:

→ **Solution Type I: Appliance Model, Sight Machine Managed**
A common solution used by manufacturing companies with relatively little data acquisition infrastructure currently in place, the managed appliance model allows for Sight Machine to define and manage the data collection process. This solution is low-effort for plant IT, with full service infrastructure providing the data to be collected and pushed up to the cloud. We work with manufacturing companies to implement this solution type in a hierarchy, with edge devices forwarding data to a gateway device in each plant and finally flowing to a centralized data lake in the cloud.

→ **Solution Type II: Customer Data Collection, IT Managed**
If the customer has existing data collection infrastructure, this can require no external appliances to run on-premise. Access to a data lake, "DMZ" file system, or database containing formatted data can be given to Sight Machine. IT teams may prefer this approach depending on the security policies and current level of data infrastructure in the plant.

→ **Solution Type III: Sight Machine Software, IT Managed**
The hybrid approach, with the company's IT group using Sight Machine's software, is often the best long-term solution for establishing the optimal data collection infrastructure. Sight Machine provides and helps configure its data collection software, while the data collection and ongoing system administration are managed by IT. This approach can run on customer-owned devices or on virtual machines.

SIGHT MACHINE'S THREE-STAGE PROCESS FOR CONDITIONING DATA

Regardless of your data collection solution type, Sight Machine's approach for conditioning data consistently follows a three-stage process. Refined from years of work with enterprise manufacturers, this approach elevates the importance of time-stamped machine data with appended metadata that can be consistently interpreted for future, repeat applications.

Step 1: Transfer data from original sources into an on-premise networked system. These sources can widely vary to include SQL tables, files from FTP servers, files from Windows shares, images from machine vision systems and registers/tags from a PLC. By the end of Step 1, the data should be out of the silos, and in an environment where it can be conditioned and transmitted.

Step 2: Add metadata not included in the original data payload. This frequently includes characteristics such as the asset label, its location within the plant, asset type and frequently a NIST-synchronized time stamp. By the end of Step 2, every piece of data should be in time sequence and have clear labels indicating where it came from and when.

Step 3: Record the combined payload of original machine and metadata projected onto it into a uniform, readable format such as JSON. Then, push it up to either a gateway or directly to the cloud.

Note that at the end of this process, the data may still have considerable variety. Before sending it to the digital twin, the data still needs to be contextualized and put into a coherent form. Common examples of data types may include:

→ Rich-time series of machine telemetry, which gives a complete snapshot of machine state including sensor values, positions and speeds.

→ Batch summary data, which gives a high level aggregate picture of a large timespan, retrieved from an application or database.

→ Logged events from PLCs or Industrial PCs in a plain text format.

→ Individual measurements from quality data with only an identifier such as a serial or batch number, a measurement type and a value.

ASSESSING EXISTING DATA COLLECTION INFRASTRUCTURE

A key part of Sight Machine's approach is partnering with IT leaders to understand the existing data collection infrastructure and how it works today. The following is a high-level overview of Sight Machine's method for understanding customer data collection:

→ Understand the current systems and how IT leverages edge data collecting services.

→ Evaluate the setup of control networks and IT networks, and determine how they can be connected securely.

→ Assess the best approach for collection (reference the three data collection solution types in the earlier section).

→ Determine the current and desired state of data security practices, such as firewall rules, network access and encryption at rest and encryption in transit.

It is not uncommon for IT leaders to uncover obstacles to a successful digital manufacturing platform deployment when assessing their existing infrastructure, resources and machine data availability. Some of the most common friction points we encounter include:

→ Limited access to data within legacy or proprietary systems.

→ Lack of expertise with the contents and structure of data payloads.

→ Physically disconnected data sources.

→ Restrictions on accessing the Internet and using plant networks to move data at volume.

→ Network and data infrastructure changes that aren't coordinated with a data collection effort, and the unintended downstream effects.

Understanding the spectrum of readiness for a plant or an IT environment ensures that the proper foundation is laid for a successful implementation of Sight Machine's digital manufacturing platform.

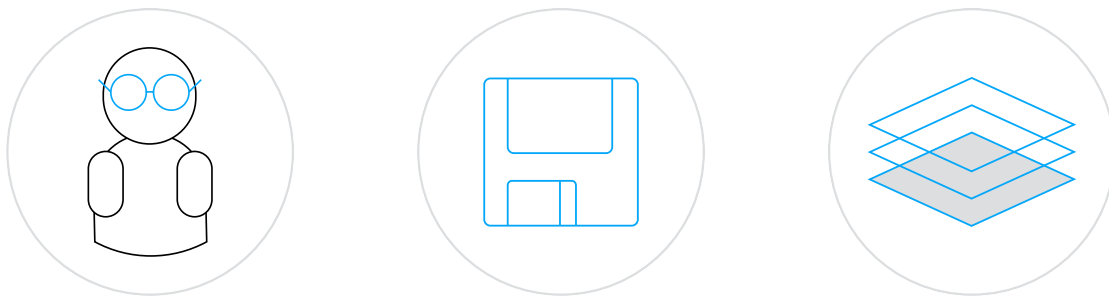## DATA CONTEXTUALIZATION FOR DIGITAL TWIN BUILDING

Connecting multiple data sources and making sense of various types of data are the fundamental principles behind Sight Machine's AI Data Pipeline, which establishes a platform for data processing unique to manufacturing. The critical role of IT leaders is played in the steps preceding this data pipeline and digital twin creation, by ensuring there is access to quality, synchronized, time-stamped data. Without this data foundation layer, there are limitations to what can be modeled, restricting the value that the twin can provide to the rest of the stakeholders within the business.

Increasing Operational Visibility by Analyzing and Visualizing Data

A core benefit of Sight Machine's implemented digital manufacturing platform is that it uses a rolling stream of collected data from all sources to provide continuous, sophisticated operational insights. As these insights are pulled into visuals and applied dashboards for end users, manufacturers are elevating the base level of performance and enabling shared tacit knowledge to be made available throughout their distributed enterprise.

Other approaches do not provide a full analytics view into manufacturing operations, offering at best a one-off project-based solution (see Figure 1). With Sight Machine, manufacturers can know how and why things are happening, increasing their visibility across the factory and helping them pinpoint solutions to multivariate problems. Increased operational visibility, a goal shared by IT and all other stakeholders, will position manufacturers to address productivity and quality challenges to become more competitive.

Figure 1: Manufacturing analytics: Incumbent approaches

	Tailored data science projects	Legacy vertical-specific software	IoT "platforms"
GOOD FOR	✓ High return / high effort local and idiosyncratic projects requiring deep subject matter expertise ✓ Extension upon a unified architecture	✓ Closed loop on premises controls feedback ✓ Desktop computing	✓ Transmission / security / storage infrastructure ✓ A framework upon which to write tailored applications
CHALLENGES	✕ Labor intensive. Does not scale to enterprise level for areas with highly variable asset types (manufacturing) ✕ Access to remote data is often challenging	✕ Cannot handle big data processing, or employ modern modeling techniques for handling manufacturing variety ✕ Does not scale to geographically diverse sites	✕ Too generalized to provide out of the box ROI ✕ Often expensive, especially for Big Data initiatives ✕ Constrained data structures severely limit analytical power and future flexibility

To learn more about Sight Machine's digital manufacturing technology, contact us at
info@sightmachine.com