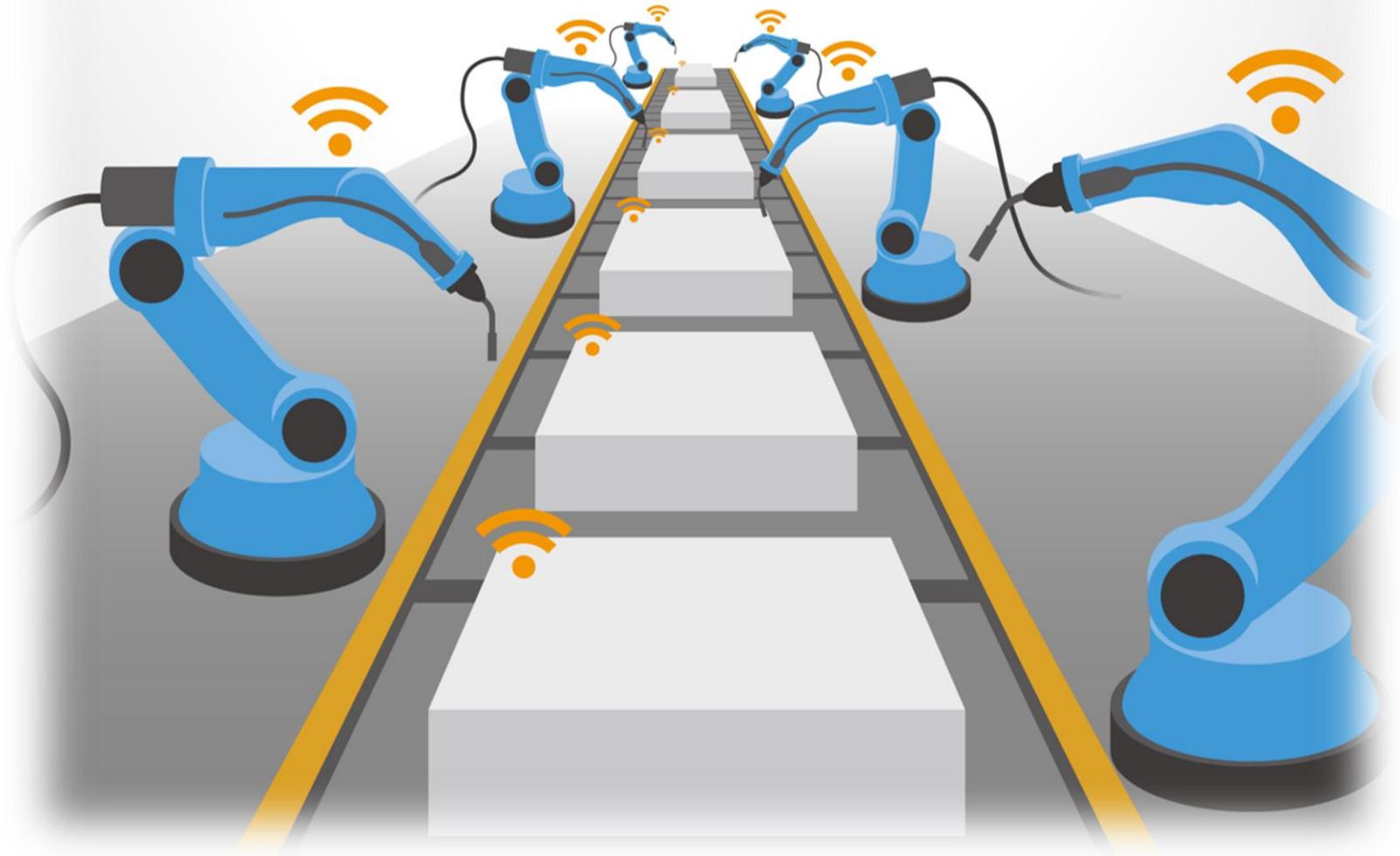
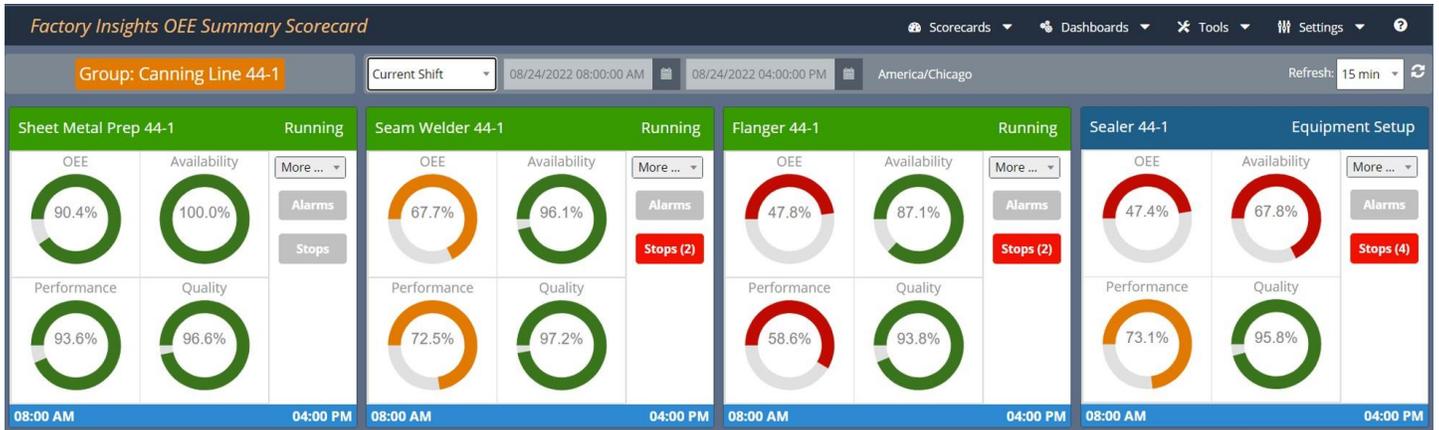


Driving Operational Improvements with Edge2Web[®] Factory Insights



This white paper introduces Edge2Web Factory Insights, explains how the application is provisioned and configured for your AWS environment, and summarizes the benefits provided by the solution. For further information, please contact sales@edge2web.com.



“ If you can't measure it, you can't improve it.
Peter Drucker

Nowhere is this credo more relevant than discrete manufacturing, where efficient and effective execution are the foundations on which market leaders thrive. Although discrete manufacturers prioritize a variety of metrics based on the nature of their products and markets, three core KPIs are common to all factory operations:

1. **Availability** – Are our machines and related assets available when we need them? What is our downtime profile by asset, line, site, etc.? What are the root causes of downtime?
2. **Quality** – Are we producing consistently good products? Which are our best/worst producing assets?
3. **Performance** – How are our factory assets performing relative to their design speeds? What causes poor performance? Do we have excess capacity that can be tapped to grow the business?

Overall Equipment Effectiveness (OEE) is a manufacturing best practice that quantifies the above KPIs and provides a data-driven foundation for continuous measurement and improvement. Most discrete (and many process) manufacturers have OEE on their OT/IT project planning shortlists. And industrial cloud service platforms like AWS IoT SiteWise, which can be used to acquire and store the data needed to compute critical manufacturing metrics, are accelerating the implementation of OEE applications.

Historically, commercial OEE solutions required “forklift” implementation projects spanning many months (or more). And scaling application usage across sites required significant customization to accommodate operational and regional differences. Although

OEE KPIs are, themselves, fairly simple to compute, the underlying variables – shift schedules, reason trees, asset groupings, performance thresholds, and the like – are highly specific to each organization (and even different sites within the same organization). Thus, scalable OEE solutions must be configurable by plant data engineers if the resulting KPIs are to have meaning for floor operators, supervisors, and managers.

In this paper, we identify the tasks required to stand up an instance of Edge2Web Factory Insights on AWS IoT SiteWise. Factory Insights is a new, IoT-based manufacturing intelligence solution that reduces OEE implementation timelines from months to a few weeks and greatly simplifies solution scale-out across multi-region, multi-site operations.

First, a few words about us. Edge2Web delivers low-code application development tools and solutions to the industrial IoT (IIoT) market. Our solutions enable customers to rapidly deploy game-changing apps that run on open IIoT platforms such as AWS IoT SiteWise and Siemens MindSphere.

Easy OEE with Factory Insights and SiteWise

As summarized in the table below, implementing Factory Insights on SiteWise requires a few different activities, some of which are performed by Edge2Web and others by you and/or your chosen systems integration (OTSI) partner. The steps are roughly sequential:

Factory Insights Solution Set-up

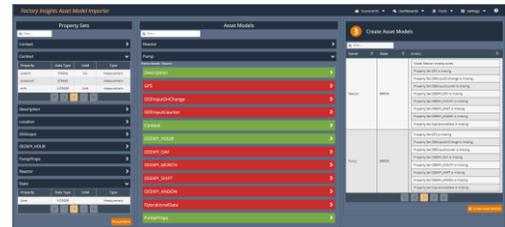
Activity	Provision	Model	Ingest	Configure	Extend
Description	Provision Factory Insights application into your AWS account	Model plant assets in SiteWise and onboard them at scale	Acquire asset and process data and ingest into SiteWise	Configure Factory Insights application settings	(optional) Add custom app extensions to Factory Insights
Tools	E2W-provided AWS CloudFormation Template, E2W connection tester	Commercial asset management apps, Factory Insights Asset Utilities	Connectivity (Kepware, etc.), OPC, AWS Greengrass	Factory Insights Settings consoles	Edge2Web Director, Menu Editor

Provision. You (the Factory Insights customer) subscribe to AWS IoT SiteWise and Amazon S3 via your AWS Management portal and acquire a Factory Insights subscription via the [AWS Marketplace](#). We (Edge2Web) provide your AWS administrator with an AWS CloudFormation template that links your AWS SiteWise and S3 services to the Factory Insights application. Once access has been provisioned and you have verified a few

connections, your admins and/or consultants can use Factory Insights tools to complete asset modeling and app configuration activities.

Model. Before factory data can be used in SiteWise, you must create an asset model. The asset model is typically a hierarchical representation of factory asset types. A commonly used asset model is the [ANSI/ISA-95](#) equipment model.

Factory Insights includes Asset Utilities to assist in creating SiteWise asset models, and then rapidly populating those models with asset instance data. If you are already using a commercial asset management application – for example, the [OSI PI Asset Framework](#) – your plant data engineer (or OTSI consultant) can export asset model metadata and asset instance data into csv-formatted files. Factory Insights' Asset Utilities can absorb the csv-formatted asset data and automatically build and populate the equivalent SiteWise hierarchies – a huge time savings! Similarly, you can provide csv-formatted files to load your asset instances and build hierarchical relationships for some or all assets. This process can be repeated to add new asset models and instances as usage scales across your enterprise.



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Ingest. Having acquired the requisite AWS and Factory Insights subscriptions, and created/populated a SiteWise asset model, the next step is to acquire plant data (machine operating states, product quality counters, part numbers, etc.) and ingest them into SiteWise. This is the raw data Factory Insights uses to compute and visualize OEE (and related) KPIs.

To address the data acquisition requirement, customers typically combine [AWS IoT Greengrass](#) with factory gateway solutions from Kepware, Inductive Automation, or other leading providers. A gateway solution retrieves data directly from a plant's automation infrastructure (PLCs, historians, SQL databases, etc.). Greengrass connects to the gateway and drives the data into SiteWise by matching asset tags in the data stream with SiteWise asset measurements. The data ingestion task is typically performed by your plant data engineer or OTSI consultant.

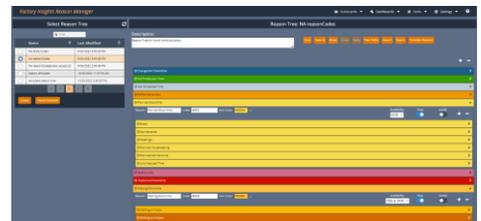
Configure. Although the math to compute OEE and related metrics is fairly simple, the practical application of OEE in a typical manufacturing organization requires deep operational intelligence. Otherwise, the resulting KPIs will have little meaning (or value) to your machine operators, floor supervisors, and plant managers. To address this critical

requirement, your plant data engineers and/or consultants can quickly configure the settings that enable Factory Insights to compute KPIs that are instantly understandable and actionable by shop floor users. Available settings include:

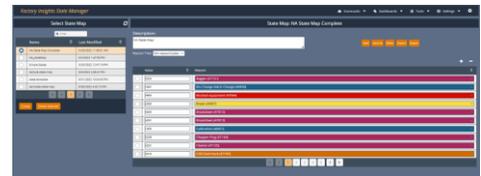
- **Shift Schedules** – a scheduling interface allows the configuration of each site’s operating schedule. Factory Insights uses the schedule settings to compute and visualize KPIs for Current Shift, Previous Shift, and other commonly-used time periods.
- **Reason Trees** – a visual UI that enables plant data engineers to define hierarchies of machine operating and downtime reasons. Factory Insights’ Reason Manager includes reason templates based on commonly-used time categories such as full production, planned downtime, unplanned downtime, waiting downtime, performance loss, quality loss, and many others.
- **State Maps** – a visual UI that enables the mapping of the codes reported by plant automation devices (e.g., machine PLCs) to user-defined Reason Trees. This mapping enables Factory Insights to automatically convert machine codes to understandable text labels when grouping and visualizing an asset’s availability metrics.
- **Asset Groups** – although some organizations prefer KPI tracking based on their assets’ defined hierarchies (e.g., ANSI/ISA-95), many also require reporting based on custom machine groupings. Factory Insights provides a visual UI for creating/maintaining an unlimited variety of asset groups to meet this advanced requirement.



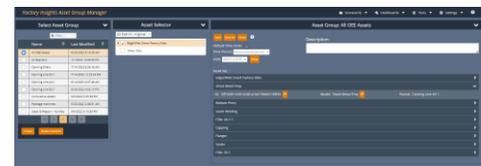
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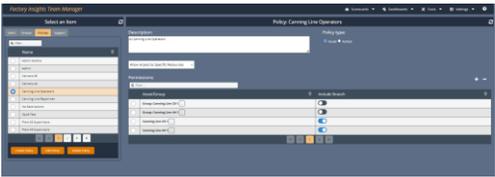
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- **OEE Configuration** – in addition to shift, state, and asset settings, plant data engineers/consultants also require functionality to set the thresholds and color schemes for KPI reporting. For example, a KPI value for machine availability above 80% can be configured to display using a green color in the Factory Insights scorecards and dashboards. Related OEE configuration settings, such as how a machine acquires quality counters and its design speed unit of measure, can also be easily controlled through the OEE Configuration in Factory Insights.



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- **Team Settings** – most organizations prefer to limit end user access to relevant assets. Factory Insights provides a settings UI that simplifies the creation of custom user groups, and the assignment of data access and action policies based on those groupings. This powerful functionality ensures that your users have visibility to all of the rich performance metrics they need while limiting access to *only* the data they are allowed to see. It also controls the actions specific user groups may perform (e.g., read-only, edit Counters and Reason Codes, change application settings, etc.).



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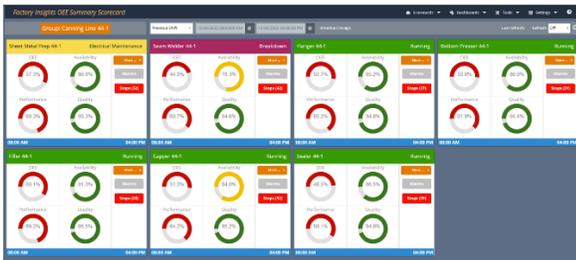
Factory Insights’ settings enable the application to be configured to compute and display performance KPIs that are instantly usable in a single plant or across a large, multi-site operation. The configuration activity can be completed by your in-house data engineers and/or with the help of an OTSI consultant.

Extend. Although Factory Insights provides critical KPI reporting, you may need additional functionality that is unique to your operation. For implementations requiring custom functionality, Edge2Web provides a bundled solution that includes the Factory Insights application and [Edge2Web Director](#), an advanced low-code industrial application development solution. Factory Insights is, itself, a native Director application.

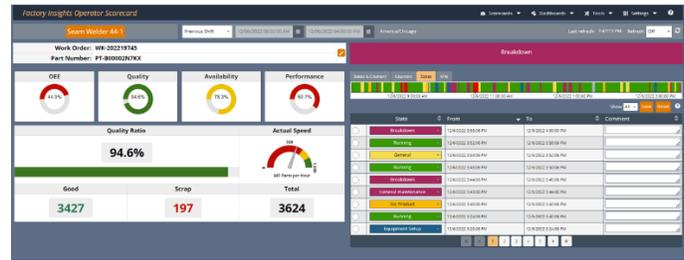
Using the Director bundle, developers can rapidly add custom application modules to Factory Insights’ core functionality. The Director bundle includes a visual menu editor that enables custom app extensions to be added to the Factory Insights menu, providing your end users with a seamless, integrated user experience.

Scorecards and Dashboards

Edge2Web scorecards and dashboards put manufacturing intelligence at your fingertips. Your supervisors have instant access to machine, quality, and performance metrics for the lines they manage. Operators can track all KPIs for their machines and, importantly, they can manually adjust product quality counters, downtime reason codes, and other performance-critical data. All manual inputs are automatically timestamped and logged, and operators can include comments to document their changes.



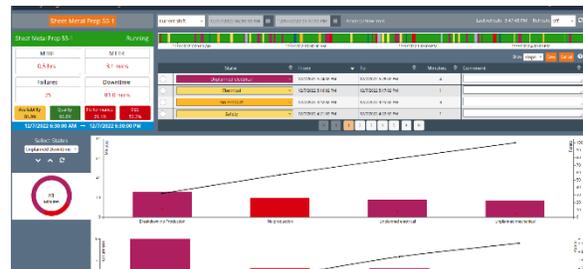
Click to view OEE Scorecard in browser



Click to view Operator Scorecard in browser



Click to view Pareto Dashboard in browser



Click to view MTBF Dashboard in browser

Benefits

Edge2Web Factory Insights provides advanced manufacturing intelligence based on an open IoT architecture. The solution can be implemented in a fraction of the time/cost of traditional MES and MOM applications, and delivers critical KPIs to your plant operators, supervisors, and managers in a form that is instantly understandable and actionable. Key benefits include:

- Computes and visualizes popular KPIs: OEE, OOE, TEEP, MTBF, MTTR, and more.
- Improves machine availability by quickly identifying downtime patterns and root causes.
- Improves product quality across machines, lines, areas, and sites, and enables operators to manually adjust quality counters.

- Tracks manufacturing performance by asset, shows the impact of planned downtime, and identifies hidden production capacity.
- Reduces time-to-deployment from months to weeks.
- Leverages AWS IoT SiteWise for plant data acquisition and storage, combining advanced application functionality with an open, democratized IoT data platform.
- Delivers insights tuned to each site's schedules, terminology, processes, geography, and more.
- Secure, fast, and highly scalable. Infinitely extendable using Edge2Web's low-code development solutions.

Summary

Edge2Web Factory Insights is a high-powered manufacturing intelligence solution that gives you instant visibility into key performance metrics such as OEE, OOE, TEEP, MTBF/MTTR, and more. Use Factory Insights to rapidly analyze machine availability, identify downtime root causes, assess and improve product quality, and uncover hidden opportunities to optimize your production capacity.

Factory insights' configurable set-up makes the solution fast and easy to deploy, and gives your users operational visibility based on terminology, schedules, and practices already in use at your shop.

Factory Insights runs on AWS IoT SiteWise and related AWS platform services, giving you a highly-secure IoT data platform that scales from a single site to global, multi-site operations.

Next Steps

[Schedule a Factory Insights Demo](#)

[Try Factory Insights for Free](#)

Additional Resources

[Factory Insights Intro Video](#) (6 minutes)

[Factory Insights Web Page](#) (8 minute read)

[Factory Insights Webinar Replay](#) (43:30 minutes)

[Factory Insights on AWS Marketplace](#)