BROCHURE

Smart Factory Solutions on Azure: Accelerating Manufacturing

Improve Efficiency and Create Breakthrough Value in Manufacturing

Accelerate your digital industrial transformation with Hitachi Digital Services' solutions for manufacturing. Hitachi manufacturing know-how is delivered on your instance of Azure using standard Azure tools to improve production, quality, maintenance, supply chain, and health and safety. Start with a high-value project and build incrementally. Hitachi's Smart Factory frameworks and services deliver value right away and expand as you grow. Gain insight into your entire manufacturing value chain in real time so that operators can optimize results.

Azure

Digital Solutions and Services Focused on Business Outcomes

As a manufacturing company, our solutions are shaped by 100 years of getting it right in our own factories. Unlike most IT consulting companies, we have learned how to increase manufacturing velocity while maintaining and even reducing the cost of quality; and while building in flexibility to meet the needs of demanding customers.

Our engagements are different. We don't waste your time telling you what you already know. Our LEAN consultants and process engineers bring their experience to tell you what you don't know, shaping your process improvement plan. And unlike other systems integrators, we bring IT and OT together to build solutions that deliver sustained traction. Working with you and your teams, we recommend technology solutions to support your improvement goals and digital transformation.

We Have Packaged 100 Years of Know-How For You

More than 30 years ago, Hitachi invested in IT services because it recognized that technology could be used to capture operations know-how and spread best practices throughout its factories.

Hitachi continued to document its learnings, and IT codified those, ultimately into a set of supported, reusable code, that has been customized and improved with each new application. These "accelerators" are at the heart of Hitachi's Smart Factory offering.

Now, the lessons learned at Omika Works and other Hitachi factories have been codified in common programming languages and form the basis of our IT and OT Smart Factory solutions.

Omika Works Recognized as an "Advanced 4th Industrial Revolution Lighthouse Factory"

Tokyo, January 10, 2020 — Hitachi, Ltd., announced that the Omika Works, which manufactures information control systems for social infrastructure systems, trains, and power plants, was recognized by the World Economic Forum (WEF) as a Lighthouse advanced factory, and has opened its doors to benchmarking.

Hitachi Has Generated Double-Digital Improvement Across Its Operations

Workers at cells throughout our factories use dashboards enabled by sensors and self-reported measurements to rapidly adjust to changing conditions, continuously improving measured outcomes.

Safety
- ▼ **50%** Safety Incidents
- ▼ **80%** Unsafe Behavior

Quality
- ▲ **40%** Right First Time
- ▼ **50%** Customer Complaints

Maintenance
- ▼ **10%** Maintenance Cost
- ▼ **25%** Downtime

Production
- ▲ **20%** Productivity Improvement
- ▼ **47%** Cycle Time Reduction

Supply-Chain
- ▲ **20%** Productivity
- ▼ **50%** Lead Time

Sustainability
- ▼ **38%** Energy Cost
- ▼ **16%** CO_2 Emission

Hitachi Is Committed To Sharing Best Practices

In 2020, Hitachi's Omika Works factory was recognized by the World Economic Forum as an advanced manufacturing center. As part of that commitment, Hitachi opened its doors to benchmarking by global manufacturing organizations. Since that time, Hitachi has hosted dozens of companies at locations throughout its global network to share lessons learned and collaborate for mutual benefit.

Hitachi is focused on Manufacturing Expertise; Now leveraging the Microsoft Azure platform

In 2022, Hitachi made the decision to focus its digital expertise on its manufacturing know-how, and leverage open-source and other tools available on hyperscaler's platforms. By focusing on its expertise, Hitachi would offer the deepest domain knowledge supported by the broadest, most scalable platforms.

Hitachi Digital Services spreads best practices by providing implementation and support within Hitachi's factories and for clients around the globe. As part of its commitment to sharing best practices, no licensing fees would be assessed for use of Hitachi's manufacturing accelerators. Clients would always own their own implementations, royalty-free.

Begin Where You Are, Build Incrementally

Hitachi has documented its factory experience, and IT codified it, represented here by 69 analytical operations. These have been documented in common programming languages, are supported, reusable and improved with each new application. These "accelerators" are at the heart of Hitachi's Smart Factory offering.

M1	M2	M3	E1	E2	E3	C1	C2
Digital Ishikawa **2** ◆	Quality Trends **1** ◆						
Takt Time **1** ◆	Model Based Yield Prediction **3** ◆	Process Validation (Audit) **1** ◆	Critical Event Command Center **2** ◆		Command Centre - AI Assistant Module **2** ◆		
Assembly Performance Assurance **1** ◆	Digital Heijunka **3** ◆	Dynamic Scheduling **3** ◆	DER Performance Optimization **3** ◆	HIIM – APM Integration **1** ◆	Energy Forecast & Consumption **2** ◆		
Digital Value Stream mapping **3** ◆	Digital FMEA and iRCM **2** ▲	Final Inspection Check **3** ◆	Renewable Monitoring Command Centre **2** ◆	CC – Intelligent Work Prioritization **1** ◆	2nd Life Battery Diagnostics APM **2** ◆	Intelligent Asset Management System for Rail **3** ◆	Reliability Model for Electric Locomotives **3** ◆
Performance Trends **1** ◆	Production Volume Trends **1** ▲	Volume Sizing for Supply Chain **3** ◆	DER Forecasting Models **3** ◆	Distributed Energy Monitoring **2** ▲	HIIM – Thermal Radiometric Imaging Preset **2** ◆	Opportunity Management for Rail Assets **2** ◆	Passenger Wagon Capacity Marker **2** ◆
Digital Gemba **3** ▲	Track & Trace Solution **3** ▲	Tool Traceability **2** ▲	CC – Auto Workorder Creation/Trigger **1** ▲	Threshold Detection **1** ◆	CC – Single Pane View for Inspection Alerts **4** ▲	Asset Failure Prediction **3** ◆	Digital Job Aids **1** ◆
Defect Trending **1** ◆	Energy Management **3** ◆	OOE, OEE Monitoring **3** ▲	Emission Tool **2** ◆	End of Life Battery Management **3** ◆	Substation Image Analytics **12** ▲	Job Plan Templates **1** ▲	Asset Investment Planning **2** ◆
Availability Trends **1** ▲	Video Intelligence **3** ▲	Asset Performance **2** ▲	Asset Quality **2** ▲	Energy Emissions **2** ◆	Predictive Health Monitoring **3** ◆	Predictive Maintenance **3** ◆	Restricted Area **2** ▲
Asset Availability **3** ◆	PPE Compliance **2** ▲	Asset Association & Mapping **3** ▲	Device Configuration **3** ▲	Carbon Counting **3** ◆	Anomaly Detection **3** ◆	Asset Upload' Templates **2** ◆	Asset Model **3** ▲
Data Ingestion **1** ◆	Event Configuration **2** ▲	User Management **1** ▲	Collision Detection **3** ▲	Asset Hierarchy **2** ▲	Asset Configuration **3** ▲	Data Transformation **3** ◆	Standardized Data Model **2** ▲

Domain
- Manufacturing
- Mobility
- Energy
- Common (at least across 2 industries)

Complexity
- **1** Scalability, Performance
- **2** More than one type of detection
- **3** More than one type of deployment
- **4** Multiple configurations (expansion of feature)

Availability
- ▲ Ready
- ◆ Pipeline

Quickly Build Edge-to-Operator Dashboards With Smart Factory Accelerators

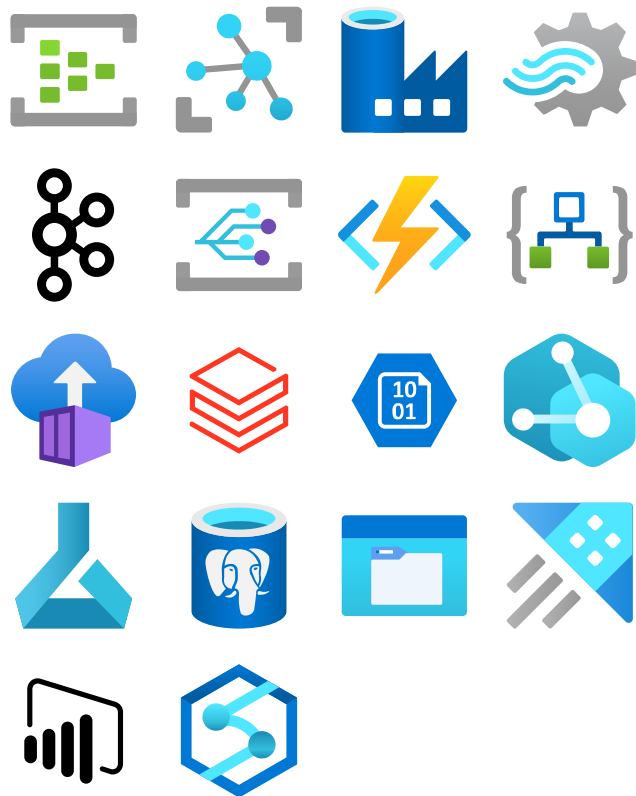**Smart Factory Accelerators Are Assembled Into Solutions Answering Questions Like 'How is Production Impacted?'**
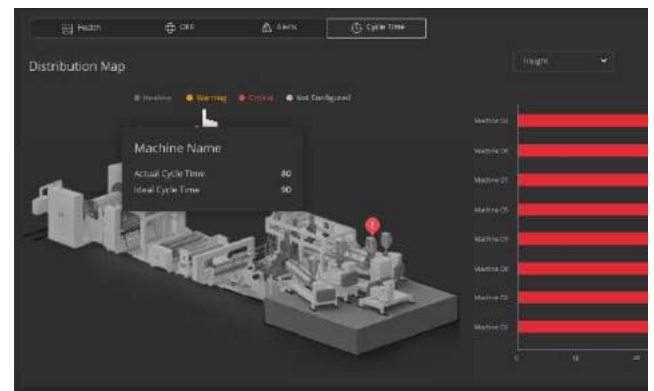
Hitachi Accelerators

Defect Trending	Production Volume Trending	Defect Trending

Smart Factory Accelerators built on Azure to minimize time to value

+

Microsoft Azure Services

Analytics & Insight

Plant Manager

Plant View

Line Manager

Line View

Use Cases

Hitachi has codified its manufacturing know-how gained through 100 years of experience building low-volume, highly customized systems like bullet trains, nuclear reactors, and power generation infrastructure.

Following are the most popular use cases in aerospace:

- **Process Efficiency**
- **Cost of Quality**
- **Overall Equipment Effectiveness**
- **Energy Management**
- **Worker Safety**

The following pages detail the analytical components of each use case.

User Benefits

1. Hitachi's Smart Manufacturing accelerators run in Azure Cloud. Manufacturing clients can implement a process scenario supporting just one manufacturing line, and scale as their needs grow. Solutions are fully customizable and can be scaled by adding sensors, process measurement points and Azure usage. All accelerators are built on Azure services found in Azure Public, Private and GovCloud instances.

2. As a World Economic Forum Lighthouse company committed to continuous improvement for all organizations, Hitachi does not charge for use of its Smart Factory accelerators; clients own their IP and implementations. Hitachi maintains and continuously improves all Smart Factory accelerators based on its evolving manufacturing know-how.

3. Hitachi manufacturing and technology engineers are available under statements of work to help clients implement process efficiency and other usage scenarios. Some scenarios are available at a fixed price sized according to the number of sensors and measurement points.
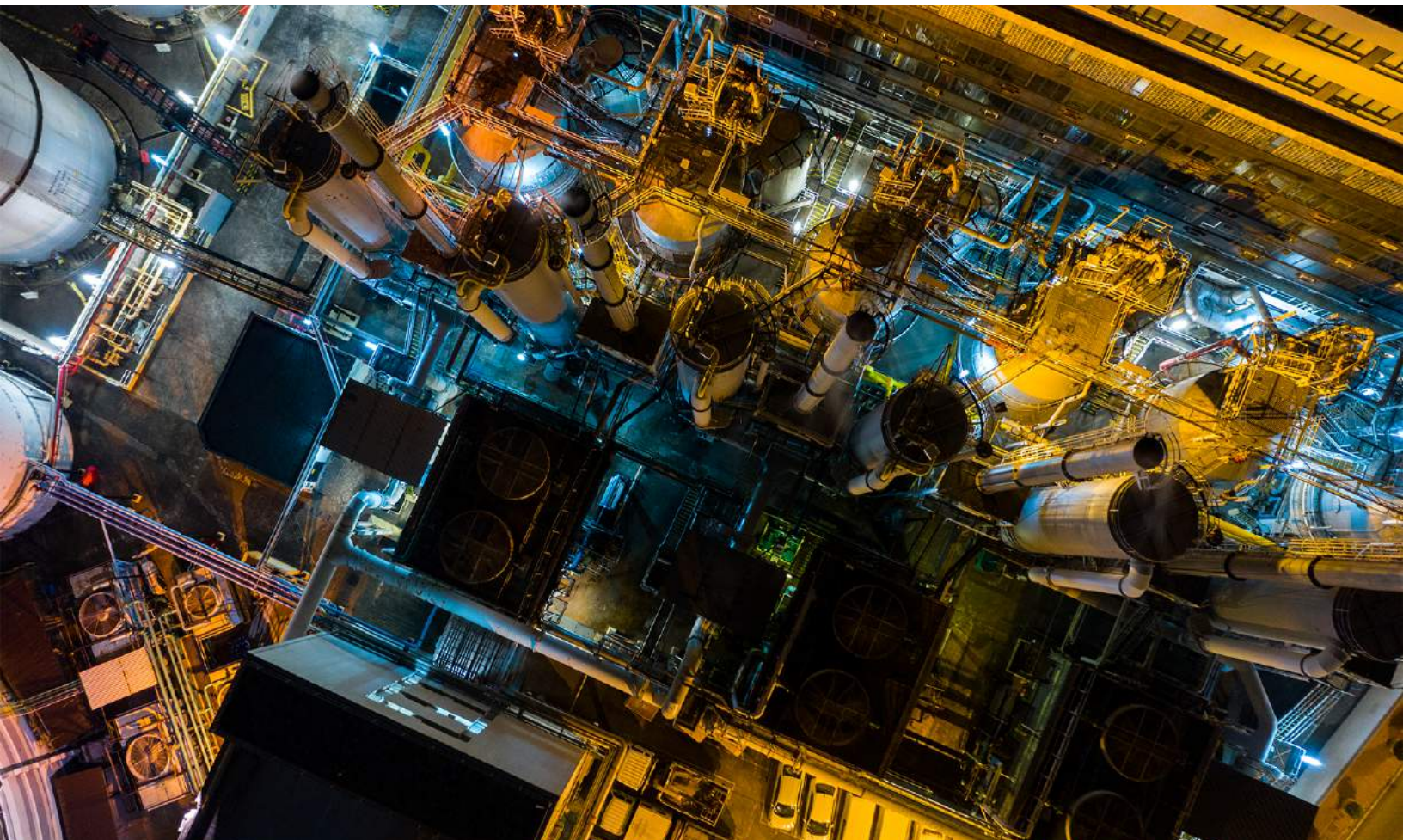
Process Efficiency

- Takt Time: Measures and reports the average time interval between the start of production of one unit and the start of production of another unit when items are produced sequentially. This helps in optimizing inventory to reduce costs.

- Digital Gemba: Collects, quantifies, and reports process metrics in near-real time, usually in the context of established process limits, to better communicate with the rest of the factory.

- Digital Heijunka: Includes analytics used to smooth production flow to better match production to customer demand, thereby reducing waste while establishing a sustainable rate of production.

- Process Validation: Parameters can be set to pass or fail a test to confirm that a manufacturing process can reliably output products to a determined standard.

- Anomaly Detection: Data points from machine sensor data, process measurements, subassembly and product characteristics are monitored and alerted when losses within set limits are likely to occur.

- Digital Value Stream Mapping: Digital Value Stream Mapping is a technology-enabled approach to visualize, analyze, and optimize the flow of materials, information, and processes within your manufacturing operations, helping identify opportunities for efficiency improvements.

Cost of Quality (CoQ)

- Defect Trending: Track and analyze defects in production to identify patterns and root causes, to make informed decisions for process improvement and quality assurance.

- Model based Yield Prediction: Use advance ML algorithms to predict yield and make informed decisions to manage resources and optimize operations.

- Final Inspection Check: Testing, measurement, and inspection by optical or machine vision to ensure quality assurance.

- Digital Ishikawa: Digitizing traditional Ishikawa diagram to promote collaboration for problem solving and performing root cause analysis (RCA).

- Quality Trends: A comprehensive solution to monitor and analyze quality KPIs, enabling organizations to make data-driven decisions to improve product quality and operational efficiency at various levels (machine, line, factory, and process).

- Anomaly Detection: Data points from machine sensor data, process measurements, subassembly and product characteristics are monitored and alerted when losses within set limits are likely to occur.

- End-to-End Traceability: Track and historize the journey of products throughout the lifecycle, from raw materials to finished goods to promote optimized operations and positively impact CoQ.

Overall Equipment Effectiveness (OEE)

- Availability Trends: Analysis of historical data to track and visualize the availability of assets over time, to identify patterns and opportunities for minimizing downtime.

- Asset Availability: Measure the percentage of time that a particular asset is operational and ready for production, provide insights into equipment reliability and uptime.

- OEE Monitoring: Track and analyze how well assets are performing to help and optimize production and maintenance.

- Asset Performance: Track and analyze how well an asset is performing to help and optimize production and maintenance.

- Asset Quality: Track and analyze quality at an asset level to reduce defects and rework.

- Asset Hierarchy (ISA-95): Accelerate asset onboarding based on ISA-95 standards for managing production assets.

- Anomaly Detection: Use data analytics and machine learning to identify unusual or unexpected patterns in manufacturing data, helping to detect and address issues promptly.

- Asset Configuration: A Single pane view to accelerate onboarding of assets across multiple gateways.

- Standardized Data Model: A common data structure and format for collecting, storing, and sharing data across various systems and departments, promoting data consistency and interoperability.

Energy Management

- Smart Metering: Utilize advanced metering technology to monitor and manage energy consumption more efficiently, contributing to energy cost reduction.

- Energy Emissions: Quantify Scope 1, Scope 2, and Scope 3 GHG (Green House Gas) emissions to help meet organizations' sustainability goals.

- Carbon Counting: Calculate and record the carbon footprint of the entire manufacturing operations to meet organizations' sustainability goals.

Worker Safety

- PPE Compliance: Personal Protective Equipment (PPE) Compliance uses IoT solutions to ensure that workers adhere to safety protocols by monitoring the proper use of protective gear.

- Worker Health Monitoring: Gather data from wearables and sensors to track employees' health and safety, reducing injuries and near misses.

- Smoke & Fire: Gather data from smoke and fire sensors to identify risk-prone areas and use it to build ML models for geofencing.

- Slip/Fall and Slip Detection: Utilize sensors and alerts to identify and prevent slips and fall accidents in the workplace, enhancing worker safety.

- Restricted Area: Digital access control and monitoring to ensure that only authorized personnel enter designated secure zones, improving security and safety.

Hitachi Smart Factory Acceleration

Increase Velocity and Efficiency with Smart Factory Acceleration on Azure

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