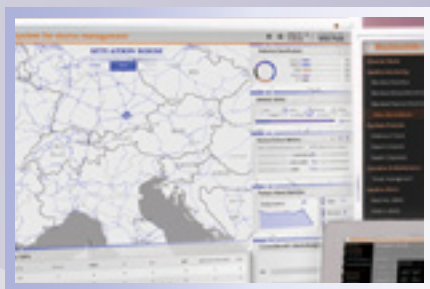# Smart Machine

Making Machines Intelligent

Application Story

MachineUnite solution empowers EFORT through remote operation
P.15

Smart air compressor management solution enables rapid edge-to-cloud connectivity
P.20

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Application Story

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The Easy Way to Smarten Your Machine

1 **What Do Contemporary Machine Makers Need?**

- Keep pace with market trends
- Compete against competitors
- Increase ROI
- Control budgets
- Measure equipment performance
- Secure service revenues
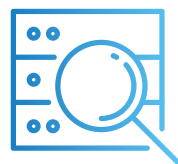
2 **Smart Machine Turnkey Solutions**

- Real-time dashboards
- Predictive maintenance
- Online access manuals
- Work tickets dispatching

CLOUD

EDGE

- Data acquisition
- Edge computing
- Wireless connectivity
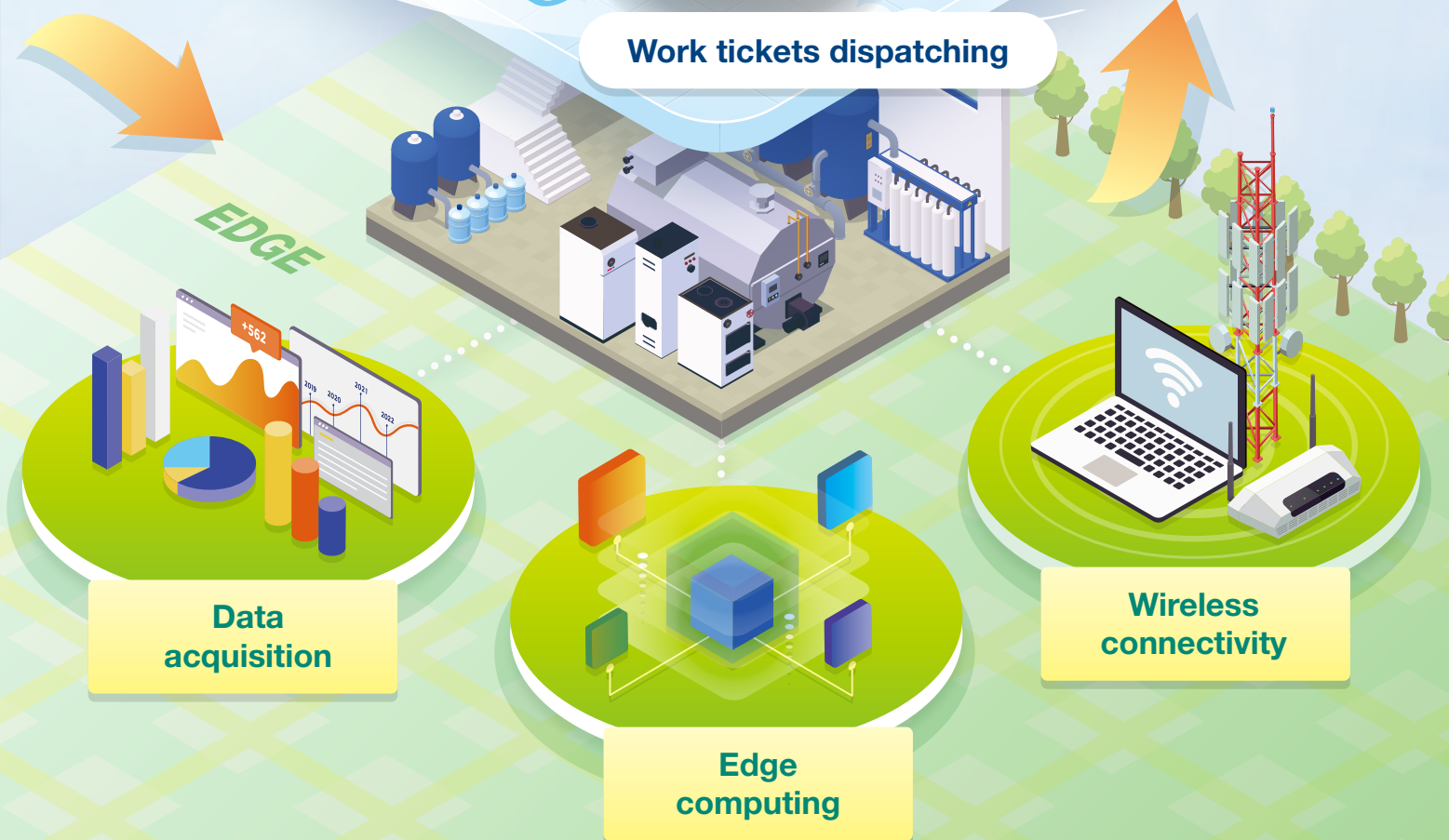
3 **Benefits**

- Low-Risk Product Development
- Accelerated Time to Market
- Increased Service Revenue Streams

Advantech Pushes Intelligent Transformation of Machine Industry

Photos provided by Advantech
Interview with Daniel Liu, Senior Manager of Advantech; Sam Chuo, Senior Business Development Manager of Advantech

The majority of multinational machinery equipment makers have undergone digital transformation, successfully transitioning from traditional manufacturing to intelligent equipment and production lines with smart solution services. However, while larger companies have embraced this trend, many small and medium-sized machinery equipment manufacturers have yet to initiate transformation strategies. As a result, these manufacturers have encountered operational bottlenecks and declining competitiveness due to the absence of smart features and networked connectivity in their products.

Challenges on the path to digital transformation

Daniel Liu, Senior Manager of Advantech, cited car sales as an example. "After a car is sold, the manufacturer must provide professional, high-quality after-sales services to improve customer satisfaction and gain additional revenue. The same is true in today's machinery equipment industry. Manufacturers must shift from the traditional business model of simply selling equipment to a new model that can provide high-quality after-sales maintenance services to meet the needs of customers who

are keen to promote smart manufacturing and bolster market competitiveness."

Transformation for machinery equipment manufacturers is a phased process. The first step is to equip machinery and equipment with networking capabilities. In this way, personnel can remotely manage equipment, reduce maintenance overheads, and provide customers with more immediate and effective services. The next step is to implement new technologies such as AI and edge computing so that managers can perform preventive maintenance to minimize downtime.

However, despite the development of connected and smart machines, many manufacturers still lack the ability to make such dramatic

"With standardized solutions and customized services, Advantech can promptly assist machinery equipment manufacturers in completing the implementation and launch of their solutions."
- Daniel Liu, Senior Manager of Advantech

changes. Sam Chuo, Senior Business Development Manager of Advantech, pointed out that manufacturers are often slow to make changes because traditional business models have constrained their thinking. Also, many manufacturers lack IT engineering expertise and are therefore unable to integrate software, hardware, so it's no surprise that many manufacturers are still hesitant about embarking on a path toward digital transformation.

One-stop solution enables fast deployment

Advantech understands the bottlenecks faced by manufacturers in adopting digital transformation and has integrated software and hardware to create a one-stop smart machine solution (a turn-key smart machine solution). With its ability to integrate OT and IT, Advantech can assist machinery equipment manufacturers from all sectors of the industry, to quickly get started on their digital transformation strategy

with minimal costs.

Liu emphasized that Advantech has over 40 years of experience in the field of industrial automation. It has powerful hardware products and has mastered OT at the edge. Additionally, as early as 2011, Advantech commenced developing smart machines in response to the trends in IoT. Since then, the software development and system integration experience and capabilities accumulated over the past decade have enabled Advantech to develop smart solutions for many different types of equipment.

Advantech's one-stop smart machine solution includes Smart Machine Builder and MachineUnite software, both of which boast a high degree of standardization, rich features, and excellent versatility. Smart Machine Builder is a modular solution, providing small and medium-sized equipment manufacturers with a choice of different apps and various functions. MachineUnite integrates equipment management functions in one app, providing equipment manufacturers with a complete device networking solution. Machinery equipment manufacturers can choose which solution to use according to their industry sector and digital transformation strategy.

Developing equipment models based on successful experience

Advantech has assisted many manufacturers with implementing solutions and launching smart machine products and services. For example, Advantech helped integrate MachineUnite for an air compressor equipment manufacturer to create a remote equipment maintenance

"Advantech's one-stop smart machine solution boasts a high degree of standardization, rich features, and excellent versatility. Machinery equipment manufacturers can choose which solution to use according to their industry sector and digital transformation strategy."
- Sam Chuo, Senior Business Development Manager of Advantech.

application. They also assisted a renowned international water boiler manufacturer with the implementation of a Smart Machine Builder Solution to realize a remote boiler management solution that monitors energy consumption.

Based on its rich experience in implementing systems for various manufacturers, Advantech established a comprehensive equipment model library and a one-stop shop smart machine software solution. For example, water pumps, stackers, smart street lights, fans, air compressors, gantries, robots, gas valves, furnaces, boilers, and other equipment types all have a corresponding model. The idea is that machinery equipment manufacturers from different sectors can source, choose, and apply the

models directly. Even if the manufacturer has no IT engineers, they can still pick and choose according to their needs and implement a system solution that suits their unique requirements.

More importantly, if they have customization needs, Advantech's R&D team can assist in them in rapid modifications. Advantech's service team is well versed in domain knowledge for different kinds of machinery and equipment and can cater to the needs of most manufacturers. With standardized solutions plus customized services, Advantech can assist machinery and equipment manufacturers in system integration and the development of services.

Promoting solutions according to different market conditions

Currently, Advantech is investing significant resources to promote smart machine solutions based on customer demands in different regional markets. In advanced manufacturing markets such as Europe, America, and Japan, Advantech is involved with manufacturers at the proof of concept (PoC) stage to provide solutions for the integration of software, hardware, and services. In the Greater China market, it has provided solutions to manufacturers directly, while also connecting with many ecosystem partners such as domain focused solution partners (DFSP) to jointly assist manufacturers in promoting digital transformation together.

With a one-stop solution that can be implemented quickly, as well as promotion strategies suitable for different markets, Advantech has every confidence that it will grow further to become a key player in the global smart machine business. ∎

Smart Machine Builder Solution
A Turnkey solution for low-risk innovation
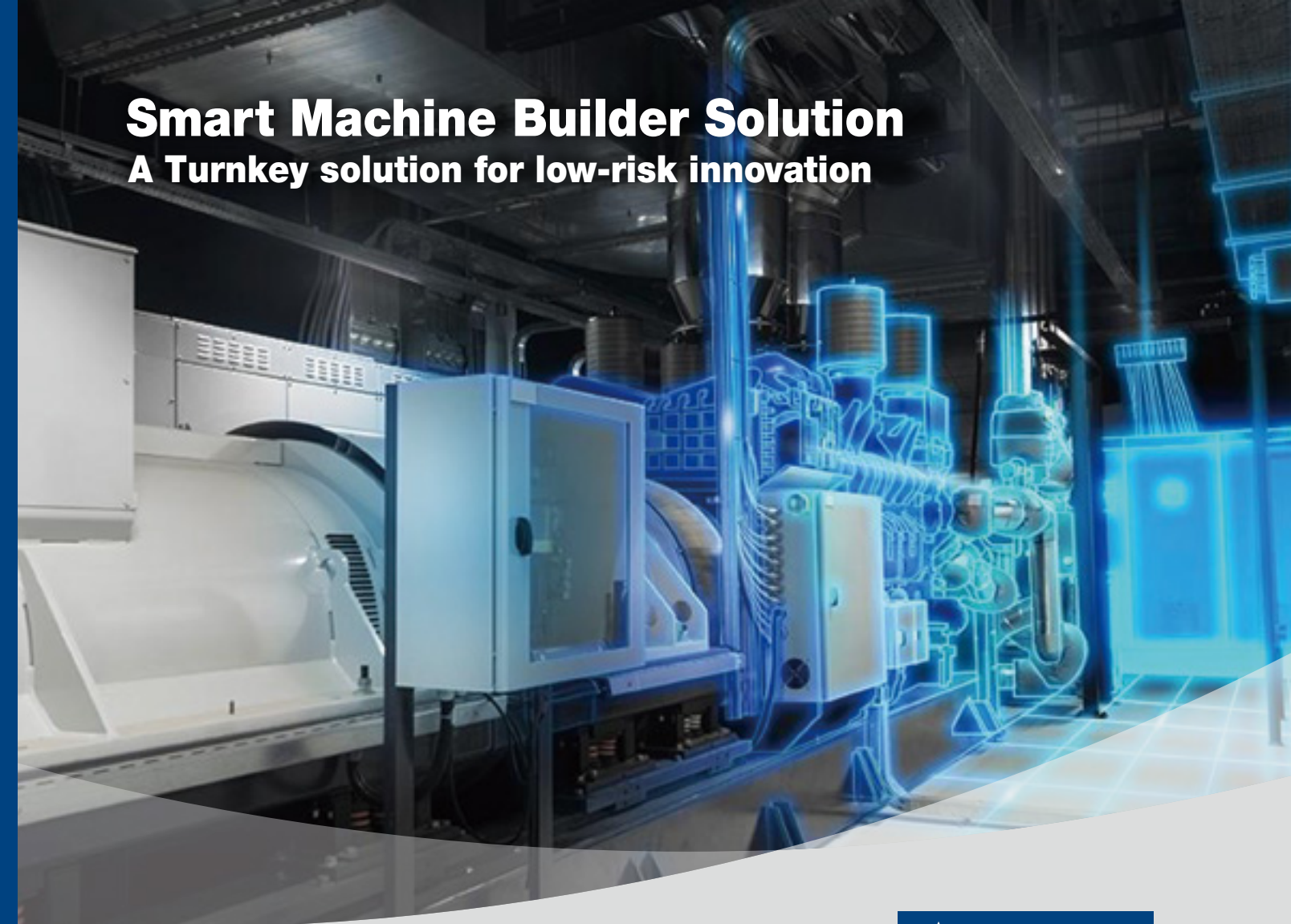
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Accelerate Time to Market and Maximize ROI

To streamline smart machine creation, Advantech's solution offers machine data capture, KPI dashboards, and service dispatch. Together, these features enable machine manufacturers to efficiently leverage data to increase profitability without risk. We give you the means to digitally transform your business model from pure hardware solutions to a more service-focused model.

Low-Risk Product Development

Expedited Proof-of-Concept

Streamlined Migration

Accelerated Time to Market

Increased Service Revenue Streams

Learn more ▶

Smart Machine Builder Solution

Overview

To enable smart machine creation, Advantech's Smart Machine Builder Solution offers machine data capture, KPI dashboards, and easy service dispatch. Together, these features enable manufacturers to efficiently leverage data to boost productivity and profitability.

Application Scenario

TA1: For OEM machine makers

Do you know how to reduce investment risk? Need help assessing the ROI on building a smart machine? Advantech's Smart Machine Builder Solution includes fully-compatible hardware and software elements. Together, they decrease business risks while providing innovation, accelerate time to market, and increase service revenue streams.

TA2: For engineers of OEM machine makers

As an engineer, you might need to source software and hardware components for edge and cloud integration. However, attempting to assemble a full working system from scratch is not straightforward. What if the components don't work together seamlessly and cause project delays? Advantech's Smart Machine Builder Solution solves these compatibility problems with its fully-compatible hardware and software package, decreasing development risk and speeding up integration.

Solution Suite

Advantech's Smart Machine Builder Solution is modular, making it ideal for smaller installations. It includes two cloud apps, one mobile app, and recommended edge devices, such as computing and protocol gateways, programmable automation controllers (PAC), and I/O modules.

Software
RTM I.App, iMobile Services I.App, Maintenance App

Hardware
SRP-IFS420-E12TAE, SRP-IFS420-E14TAE, SRP-IFS420-E16TAE, RTM series gateways, ADAM-6200 series, ADAM-6000 series, ADAM-4000 series, ADAM-6700 WISE-EdgeLink series, SRP-IFS210-D36TAE

Benefits

- Low-risk product development
- Expedited proof-of-concept
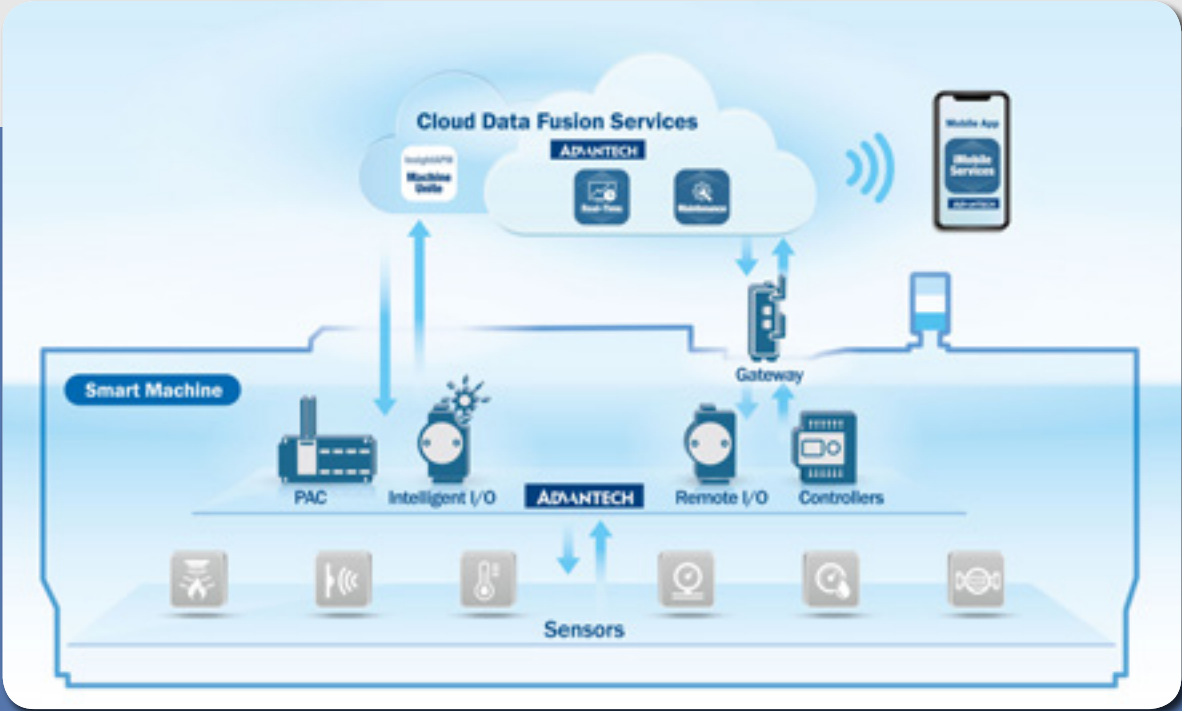- Accelerated time to market
- Increased service revenue streams

Customer Testimonials

Advantech's Smart Machine Builder Solution helped us take our first step into realizing smart machinery.

- General Manager, shoe manufacturing machine maker.

Solution Page

MachineUnite Solution

Overview

MachineUnite is an all-in-one solution for large scale deployments which provides strong edge hardware capabilities that help companies connect their equipment quickly, enabling them to start extracting industrial field data and employing data resources to benefit their business.

Application Scenario

TA1: For machine builders

MachineUnite solution is designed to assist machine builders to create value-added products and transform their business from a traditional manufacturer to a service provider. It helps customers master equipment abnormalities using real-time alarms and dispatch tickets to improve responsiveness during accidents. In addition, it delivers machine diagnosis services with remote operation and AI applications to clients.

TA2: For station systems

Station system operators might find it difficult to integrate and analyze all the information from the many remotely scattered stations, which forms data islands and silos of information. In addition, there are many necessary safety inspections which cost time and money. MachineUnite helps operators to visualize and monitor all their equipment data on 2D/3D displays and provides remote control functions for efficient operation and maintenance.

Solution Suite

All-in-one solution for large-scale deployments Provides VPN connectivity for remote 3rd party device troubleshooting, 2D & 3D war rooms and machinery maintenance.

Software
MachineUnite I.App

Hardware
- Suggested gateway: ECU-1051, ECU-1251, UNO-2484G, EI-52
- Suggested server: WISE-STACK Edge 110 with Xeon Silver 4216(16Core, 2.1~3.2Ghz) 100W*1, 32G DDR4 2933 *4(128G), 2.5"240GB SSD SATAIII *4, 3.5" 4TB HDD 7KRPM SATA *4

Benefits

Increased equipment utilization efficiency
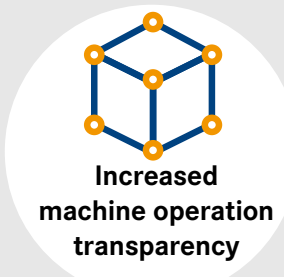
Increased machine operation transparency
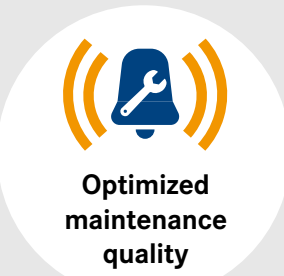
Optimized maintenance quality

Facilitates zero equipment downtime

Customer Testimonials

Through cooperation with Advantech, Tong Cheng developed an intelligent air compressor that met specific customer needs. The temperature, pressure, and other data from the air compressor were made available and easily shared with customers and agents via cloud management services.

- George Lin, senior marketing manager at Tong Cheng Iron Works.

Solution Page

InsightAPM
Machine Unite

MachineUnite Solution: Turns Machines into Smart Management Platforms

Remote Machine Management and Maintenance Responsiveness

MachineUnite is capable of connecting to diverse general-purpose industrial machines and large-scale equipment. It enables equipment management via a dashboard which gives a clear overview of all operations and triggers fault alarms on the status of individual equipment if issues are detected.

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Get more info!

Situation room
Monitors overall equipment operations

Abnormal warnings
Sets alarms and sends personnel for maintenance

MachineUnite Solution Empowers EFORT Through Remote Operation

With the growing prevalence of smart machines worldwide, EFORT Intelligent Equipment, a leading robot manufacturer in China, continues to innovate its manufacturing robot products and cross-industry intelligent manufacturing solutions to assist in driving a wide range of industries toward intelligent automation, including businesses involved in automotive and parts, consumer electronics, home appliances, rail transit, aerospace, construction machinery, photovoltaics, foundries, and more.

High costs in management and maintenance

EFORT's robot products are widely marketed in China and also in many countries and regions in Europe, Asia, and Africa. This requires the company to send its staff to various locations around the world to provide technical support to customers. In addition to managing their human resources, their support and maintenance services generate immense business expenses due to them visiting their clients overseas.

To solve these problems, EFORT has implemented an Advantech MachineUnite solution to establish an intelligent machine service mechanism for the remote monitoring, management, and maintenance of robots. Advantech's solution architect Yong Sheng Zhao pointed out that their MachineUnite services integrate Advantech's intelligent predictive maintenance AI solution (AIFS/PHM), which is based on AI technology that can perform fault prediction, health status analysis, and root cause analysis for specific production equipment. For example, PHM monitors the production signal of machines in real time, so that in instances where machine performance declines over time, appropriate maintenance measures can be quickly taken to avoid malfunctions or even prevent them from occurring. This ensures the complete

protection of assets while improving equipment utilization, efficiency, and effective working.

Reduced cost and improved service through remote operation and maintenance

After MachineUnite was implemented with EFFORT's equipment, the system will immediately notify management personnel of any equipment malfunctions via communication software or email through MachineUnite's monitoring and alarm notification functions. Staff can remotely fix a malfunction with the software and make repairs and maintenance arrangements in advance—even before customers initiate a scheduled repair and maintenance order. This can significantly reduce operating costs by up to 45% while also solving customers' problems in advance, shortening equipment malfunction response times to almost zero, and improving service quality. The interface for remote maintenance and debugging also means that management can remotely adjust and control a robot's parameters, as well as write and modify its program, which demonstrates the management capabilities of the smart machines.

In the smart machine era, most machinery and equipment manufacturers have moved from simply selling products to a new business model that provides after-sales maintenance services. Like EFORT, equipment manufacturers desperately need MachineUnite technologies to help them manage equipment across different locations. Ultimately, this enables the monitoring and maintenance of hundreds or even thousands of pieces of equipment, allowing staff to maintain, repair, and regularly back up equipment remotely without having to travel to different locations. This significantly reduces operating costs and improves the efficiency and service quality of daily operations and maintenance. ■

MachineUnite integrates Advantech's PHM model, which can perform fault prediction, health status analysis, and root cause analysis for specific production equipment, thus achieving the goal of almost zero malfunctions.

Case Study Benefits

1. Reduces operating costs by up to 45%.
2. Shortens equipment malfunction response times to almost zero and ensures prompt service.

EFORT

WISE-DeviceOn
End-to-End Solution for Edge AI

An Edge Orchestration Platform for AI/ML Apps

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Edge AI with Power and Scale

Advantech offers the end-to-end solutions for device management and edge orchestration for Internet of Things (IoT) and industrial applications. Deploy Artificial Intelligence (AI) and Machine Learning (ML) apps to thousands of inference devices in production, allowing you to focus on what they do best - AI and ML development.

High compatibility of hardware

Batch control for ease of fleet management

Open for 3rd-party system integration for single point of operation

Real-time monitoring and troubleshooting reduces system down-time

Learn more ▶

Machinery Equipment Factories Move Toward Servitization

Photos provided by Advantech
Interview with Yong Sheng Zhao, Solution Architect of Advantech

Networking machinery together is the first milestone in realizing smart manufacturing. To achieve this goal, which is primarily aimed at improving service quality and competitiveness, machinery equipment manufacturers are actively promoting digital transformation and incorporating smart technologies into their products to reduce operating costs to better meet their customers' needs. A few years ago, a renowned machinery equipment manufacturer in China started out on the path to smart manufacturing and has since accelerated the pace of their digital transformation.

Adding networking functionality to more than 2000 devices

The machinery equipment factory in this case was established more than 60 years ago. Sold in over 50 countries and regions worldwide, their main products include numerical control turret punch presses, CNC bending machines, CNC laser cutting machines, robots, and various other types of high-end machinery and equipment. However, the traditional method of relying on human resources to manage and maintain the machines and equipment they sell was both costly and inefficient from an operations and maintenance perspective. Thus, they partnered with Advantech to leverage their deep experience in machine networking in order to drive forward their digital transformation.

Case Study Benefits

1. Considerable reduction in human resource costs.
2. Successful transformation into a smart factory digitalization solution provider.

Advantech's Solutions and Application Benefits

MachineUnite includes features such as equipment data and status monitoring, fault alarm monitoring and preprocessing, remote configuration and scheduling, and data analysis and reporting, all of which enable the remote operation and maintenance management of various types of industrial equipment.

Yong Sheng Zhao, Solution Architect at Advantech, pointed out that with the implementation of MachineUnite, which is based on Advantech's WISE-PaaS industrial cloud platform, the factory has so far been able to add networking functionality to over 2000 devices they have sold. This move has made the remote maintenance and operation of their equipment a reality while reducing the human resource burden of equipment maintenance and management. It has also significantly improved their competitiveness by helping them transform their business from being a manufacturer that just sells equipment into a smart factory solution provider that can supply additional maintenance and operation services.

MachineUnite manages all-round remote maintenance and operations

MachineUnite solution delivers features such as equipment data and status monitoring, fault alarm preprocessing and monitoring, remote configuration and scheduling, and data analysis and reporting, all of which enable full control of machine operations and maintenance management from remote locations. The factory can now monitor their customers' equipment use at any time and schedule immediate maintenance, thus improving their service quality. For example, the 3D graphic reports generated by MachineUnite's digital twining technology allow the factory's operations and maintenance personnel to utilize simulation technology to effectively monitor and analyze their equipment remotely, all through a simple visual interface.

In addition, the number of machines that implemented MachineUnite can be flexibly expanded through WISE-PaaS platform's microservice framework. In the present case, the factory did not implement MachineUnite for all 2000 devices at once, but gradually increased the number over time in accordance with their sales status. Mr. Zhao pointed out that in expanding the number of machines, they were able to accomplish implementation updates simply through the management interface at the backend. Advantech's ongoing assistance has dramatically helped them reduce business costs during their digital transformation journey. ∎

Smart Air Compressor Management Solution Enables Rapid Edge-to-Cloud Connectivity

Photos provided by Advantech

In the manufacturing industry, businesses transitioning to service providers through digital transformation has emerged as a real trend over the past decade. However, a lack of flexible and expandable development tools is a barrier to building connectivity services and managing disparate equipment during transformation.

To solve these challenges, Advantech developed MachineUnite iApp, an intelligent industrial machine management solution. In collaboration with Advantech, a renowned air compressor manufacturer looking to trans-

form into a service provider has utilized Advantech's WISE-PaaS cloud platform to develop a competitive smart air compressor management solution based on MachineUnite. This innovative solution supports real-time air compressor operation management and fault detection with alarm features to enable remote monitoring, predictive maintenance, and parts replacement.
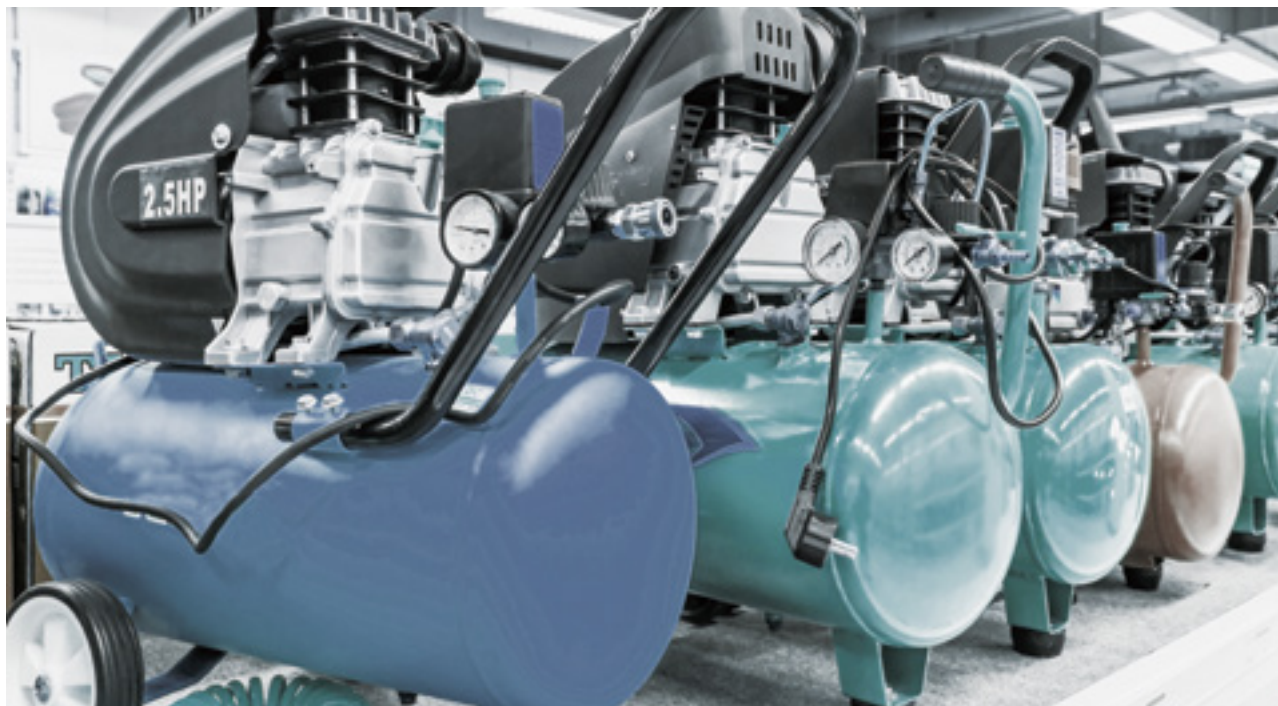
Advantech's Solutions and Application Benefits

The MachineUnite solution is a one-stop development tool based on WISE-PaaS cloud computing technology. Managers can leverage the user-friendly platform to activate different development templates, which deliver a variety of features, including multi-cloud data, multi-tenancy, edge node management, dashboard visualization, equipment alarms, and report generation.

Case Study Benefits

1. Stand out from competitors by using services and solutions to overcome pain points.
2. Record power consumption and optimize efficiency, saving up to 30% more energy.

Enabling rapid edge-to-cloud connectivity

Since the manufacturer's equipment network management system for the air compressors needed to be established across multiple factories, a public cloud solution was required for global implementation. Thus, the manufacturer utilized Advantech's WISE-PaaS cloud platform as its public cloud solution, allowing them to directly access data and facilitate data acquisition using MachineUnite. The solution leverages WISE-DeviceOn to pass equipment data to WISE-PaaS without needing to write programs. It also utilizes WISE-InsightAPM for equipment asset performance management, WISE-IoTSuite/Dashboard for data analysis and visualization, WISE-IoTSuite/SaaS Composer 3D for workflow visualization, WISE-AIFS for artificial intelligence framework services, MongoDB or PostgreSQL for database services, and other tools for daily operations of their smart air compressors.

Advantech's solution delivers competitive advantages

By implementing the solution, the manufacturer has created extraordinary value at two levels — business and operations. At the business level, while the air compressor industry generally competes on hardware specifications and price, the manufacturer differentiates itself by relying on services and comprehensive solutions to solve customer pain points and establish competitive advantages. At the operations level, the value add mainly revolves around two key components — multi-tenancy and visualization. Since WISE-PaaS supports a multi-tenant structure, it helps agents remotely monitor and manage all the equipment they sell. They can also use the same set of solution resources to allocate resources and cloud space to downstream customers, allowing them to monitor and manage their own equipment.
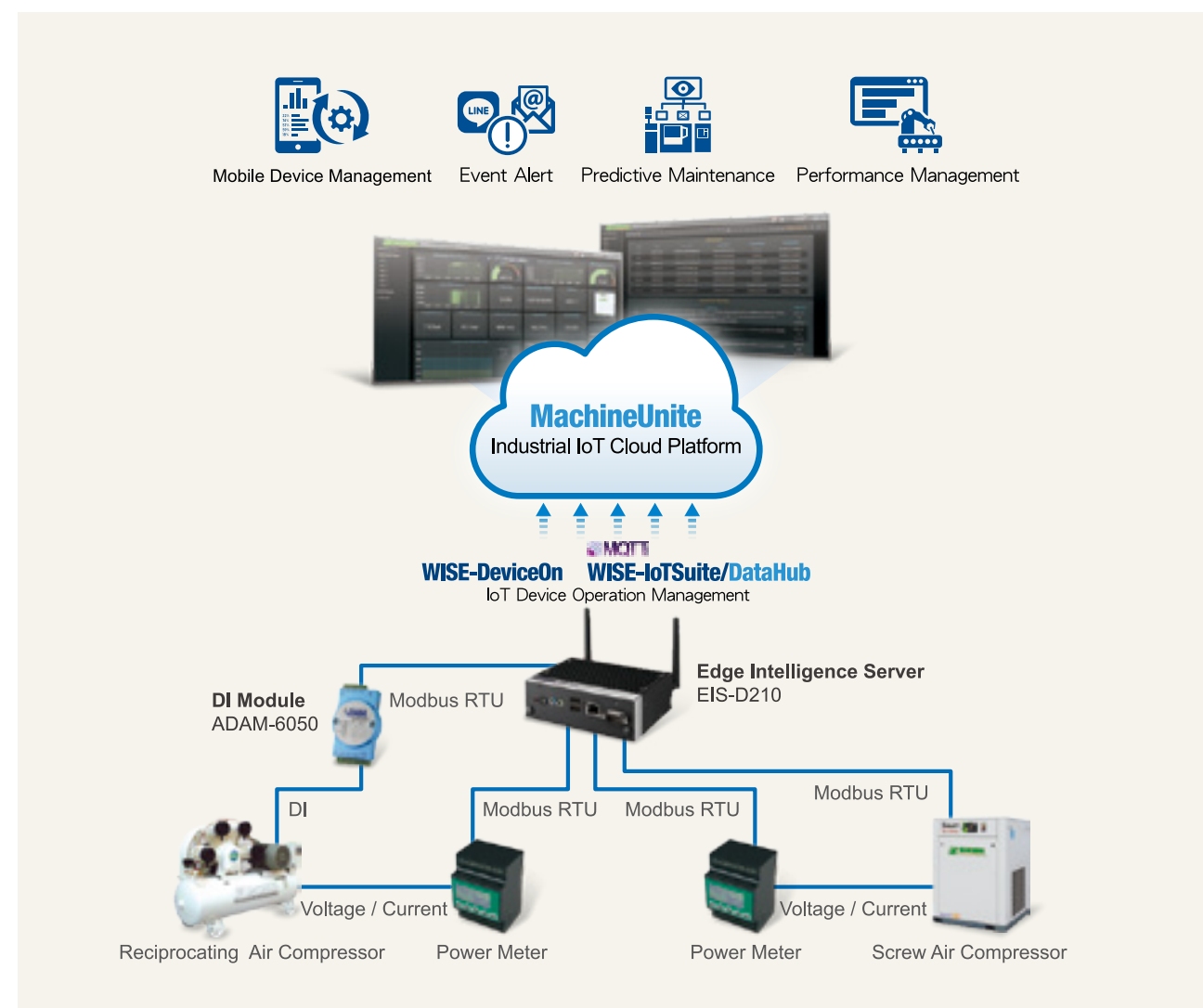
For visualization, dashboards can be used to observe trends such as equipment utilization rates and energy

efficiency at any time. Through understanding power consumption and optimizing energy efficiency, businesses can conserve up to 30% more energy while fully grasping all critical information such as equipment status of various parts and accessories, and the status of spare parts. Automated reporting and alarm procedures can also be set up through the UI with preset alarm rules to notify system administrators via LINE or SMS when an abnormal situation is detected. The solution also automatically delivers maintenance work orders to technicians as soon as an issue arises.

Currently, Advantech has developed standardized templates for visualization, reporting, dispatch inspection, and alarm rules for MachineUnite. In the next development phase, application templates will be customized for specific industrial fields, enabling more users to accurately control and manage their equipment energy consumption, output, and efficiency through modification and iteration, thus realizing Industry 4.0 transformation. ■

Mobile Device Management　Event Alert　Predictive Maintenance　Performance Management

MachineUnite
Industrial IoT Cloud Platform

WISE-DeviceOn　**WISE-IoTSuite/DataHub**
IoT Device Operation Management

DI Module
ADAM-6050　Modbus RTU

Edge Intelligence Server
EIS-D210

DI　Modbus RTU　Modbus RTU　Modbus RTU

Voltage / Current　Voltage / Current

Reciprocating Air Compressor　Power Meter　Power Meter　Screw Air Compressor

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Comprehensive Monitoring

Remote Maintenance

Operation and Maintenance

Data Analysis

Fault Diagnosis

Anomaly Warning

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WISE-PaaS
AIoT Solutions & Marketplace

MachineUnite

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MachineUnite for Low-code Configuration

MachineUnite supports template expansion and management and provides developers with a low-code interface for in-browser editing and configuration. In addition, it provides a microservice framework for users interested in self-development. By taking this course, learners will understand the settings and configuration of MachineUnite, including basic configuration, status monitoring, intelligent control, system configuration, and more.

1 Low code

2 Comprehensive Service

3 Extensible

▲
Get Started!

Empower Your Digital Transformation Journey

ADVANTECH
WISE-Marketplace

Transparent Pricing
Friendly pricing models with flexible payment methods to meet the needs of a wide variety of users.

Complete Modules
Full-range of AIoT modules with transparent information to evaluate.

Shorten Development
No need to develop from scratch by leveraging Advantech and partner's toolkits.

Increase Revenue
Domain know-how involvement to optimize solutions and increase revenue.

Support Mechanism
Full support for payments, delivery, deployment, technical training, and more.

Co-create Ecosystem
Become a partner to enjoy the best benefits and leverage Advantech's ecosystem.

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WISE-Marketplace unlocks innovation with world-class solutions from edge to cloud.

WISE-Marketplace is an open IoT platform from Advantech, a world-class leading brand in IoT intelligent systems that make shop-floor operations simple, scalable, and manageable.

We've selected ready-to-go applications, software iApps, and hardware devices to facilitate your digital transformation through IoT, networking, data analytics, AI applications and operations. You can explore our products and services online, request demonstrations, test, and deploy them in your own business.

Advantech's WISE-Marketplace and comprehensive ecosystem will empower your digital transformation!

Quickly Realize Your AIoT Digital Transformation.

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