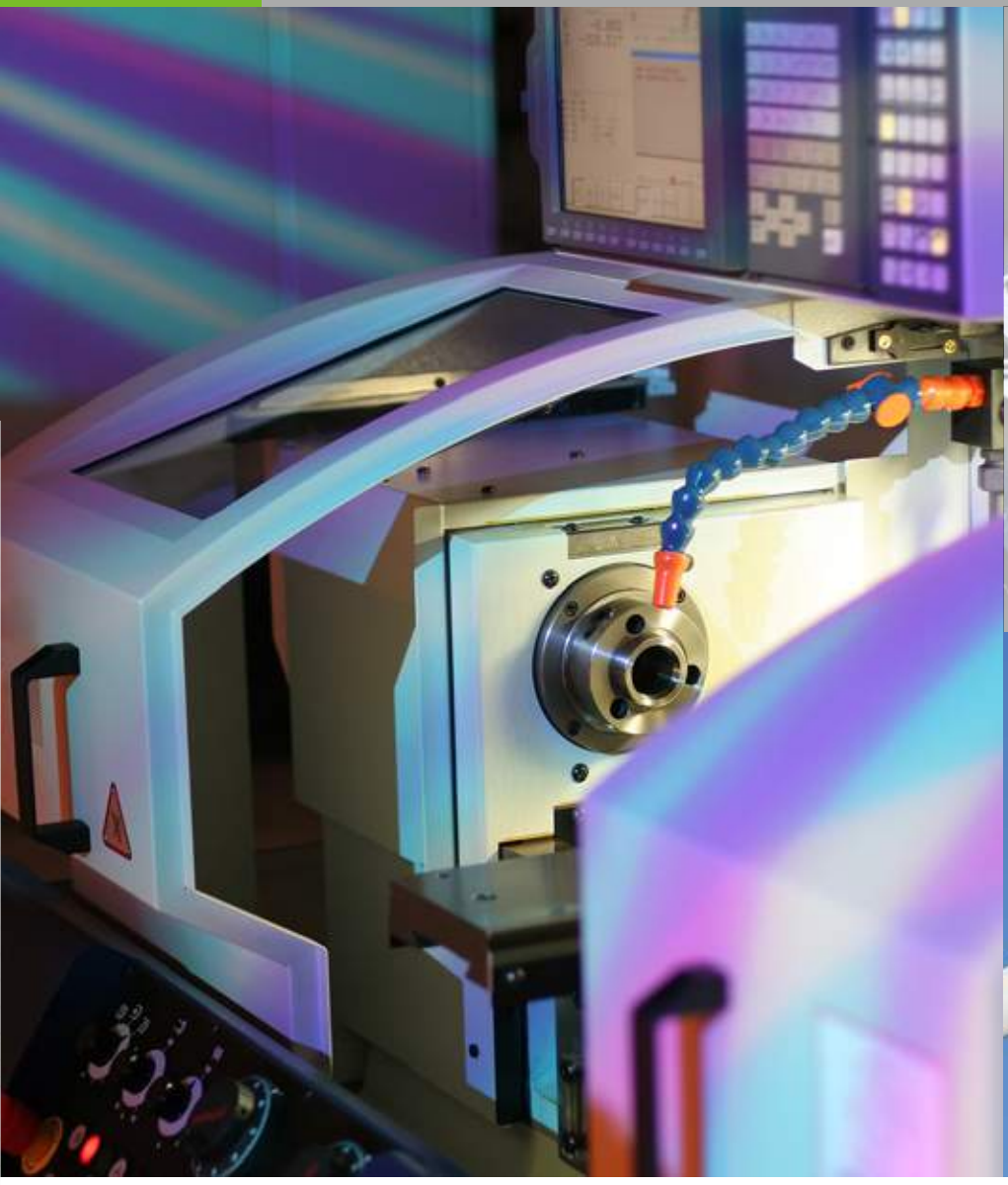
Smart Monitoring and Diagnostic & Predictive Maintenance Solutions for the Key Components of Machinery

Intelligent equipment management for increasing the performance and life of machinery

Effective use of monitoring and diagnostic solutions, not only to prevent equipment failure for enhancing the capacity stability, but also to greatly save maintenance costs.



ADVANTECH

Enabling an Intelligent Planet

WebAccess+ Alliance

waplus.advantech.com

Smart Monitoring and Diagnostic & Predictive Maintenance Solutions

Improving production efficiency

Increasing the life of the machine effectively

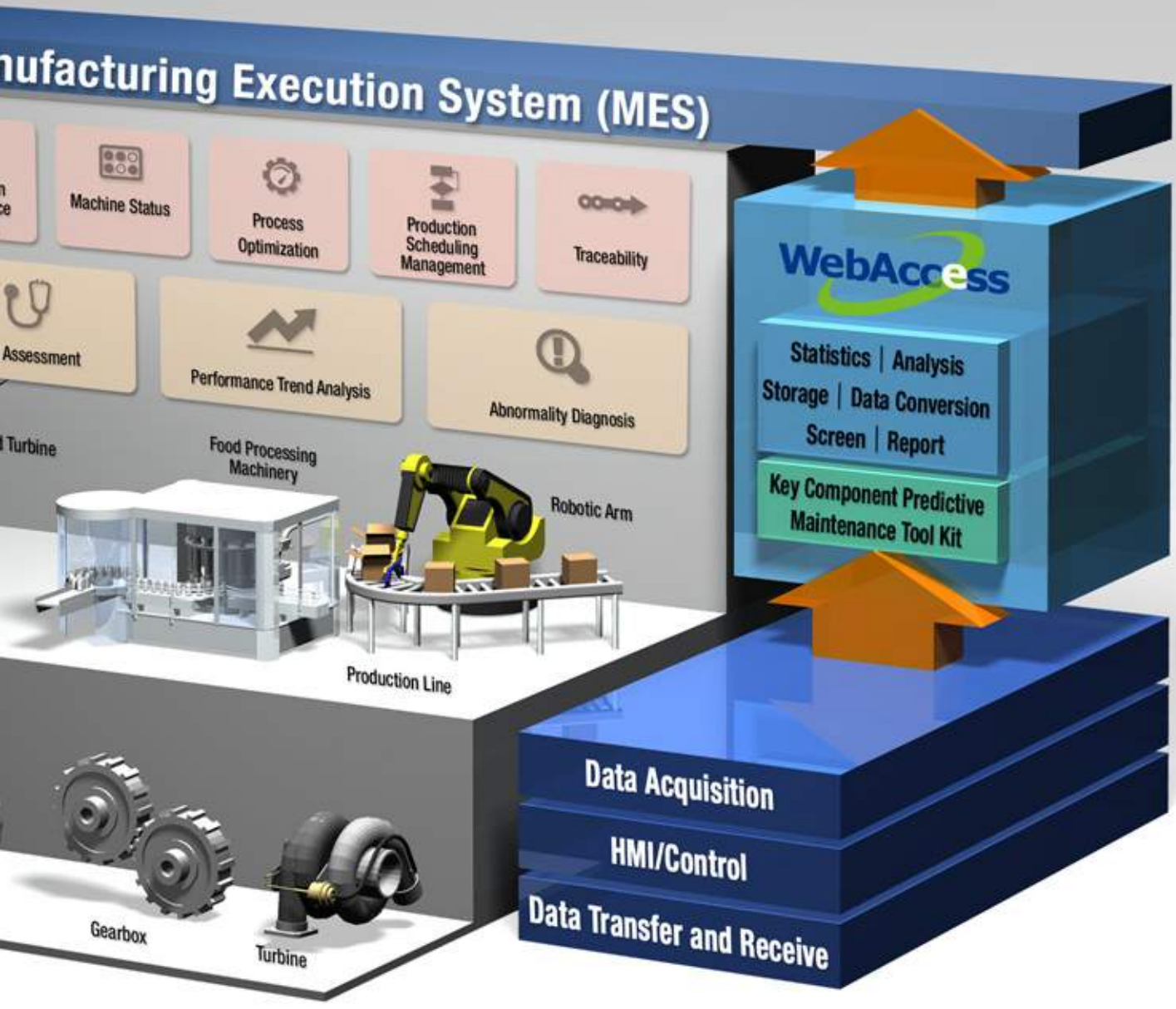
Reducing maintenance costs significantly

Real-time Equipment Information

Through Advantech solutions, users can immediately monitor the real-time machine status through the easy-to-use graphical control interface.

Instant Handling Abnormal Statuses

When an object in production or a machine develops an unexpected condition, users can respond quickly and effectively through the system, and decide to stop and repair the problem.



Complete Production Information Analysis

Keeping complete records of all types of production information can not only display the analysis of production efficiency and traceability, but also details of the manufacturing execution system utilizing useful information for process optimization and production scheduling management.

Smart Predictive Maintenance Solution

According to the real-time operational status of the machine, building an effective dynamic preventive maintenance solution ensures stable functioning and increases equipment reliability.

Monitoring and Diagnostic & Predictive Maintenance Platform for Key Mechanical Components

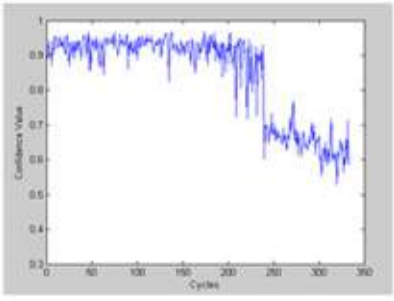
In order to ensure the “Near-Zero Breakdown” of equipment, Intelligent Maintenance Systems (IMS) actively implement predictive maintenance and health management techniques in industrial production. The center predicts and evaluates the performance degradation process of equipment and product. Different from the early diagnosis of malfunction, the intelligent maintenance focuses on predicting the entire performance degradation process of equipment and product, rather than diagnosing the performance at some points. When analyzing the data, IMS center introduced Peer-to-Peer concept investigating the health condition by comparing similar instruments for adjusting the data type and quantity to meet demands, rather than uses simple data sampling, transmission, and analysis in the traditional way. It improves the accuracy of prediction and maintenance decisions.

Visual Tool

The kit includes a variety of visual tools which demonstrate the health of equipment.

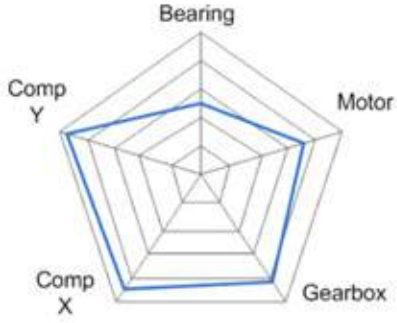
Confidence Value (CV) Trend

The Confidence Value (CV) trend is a good indication of the health status of the device. If CV value gets closer to 1, the health of the equipment is closer to the standard condition. On the contrary, if CV value is closer to 0, the equipment undergoes more severe performance degradation.



Health Radar

The CV values of several components are shown on the multi-axis radar chart at the same time. Users can see which components need more concern intuitively.

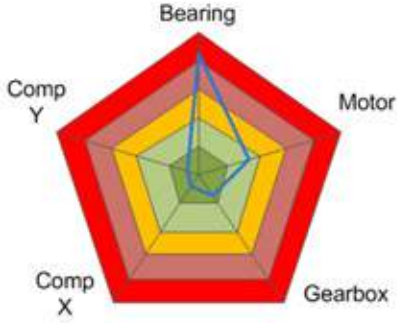


Distribution of Health Status

The distribution of health status is mainly used for troubleshooting. This multi-color distribution utilizes the data of several failure modes, and the real-time data projection can help diagnose the failure modes of equipment or components.

Risk Radar

The risk radar combines the CV values of components and their importance in the whole system, to show decision makers or management personnel the risk distribution of each component.



Integrated Technology Solution

After more than ten years of technology development, IMS creates this predictive maintenance platform of mechanical component. The platform integrates more than 20 kinds of algorithms and algorithm selections of data analysis, and the knowledge of adjustment. It obtains raw data from equipment, analyzes, and demonstrates the health of equipment. At the same time, the platform also realizes the performance prediction and failure diagnosis of equipment.

The predictive maintenance platform can be divided into four parts:

Signal Processing and Feature Extraction

After data processing, the vibration, sound, temperature, and other raw data obtained from equipment can be extracted to several effective features. The information of these features is closely related to the health of equipment. Therefore, a large amount of data is reduced to a feature set. The main tools are time-domain analysis, frequency domain analysis, time-frequency domain analysis, wavelet analysis, and so on.

Quantitative Assessment of Health Status

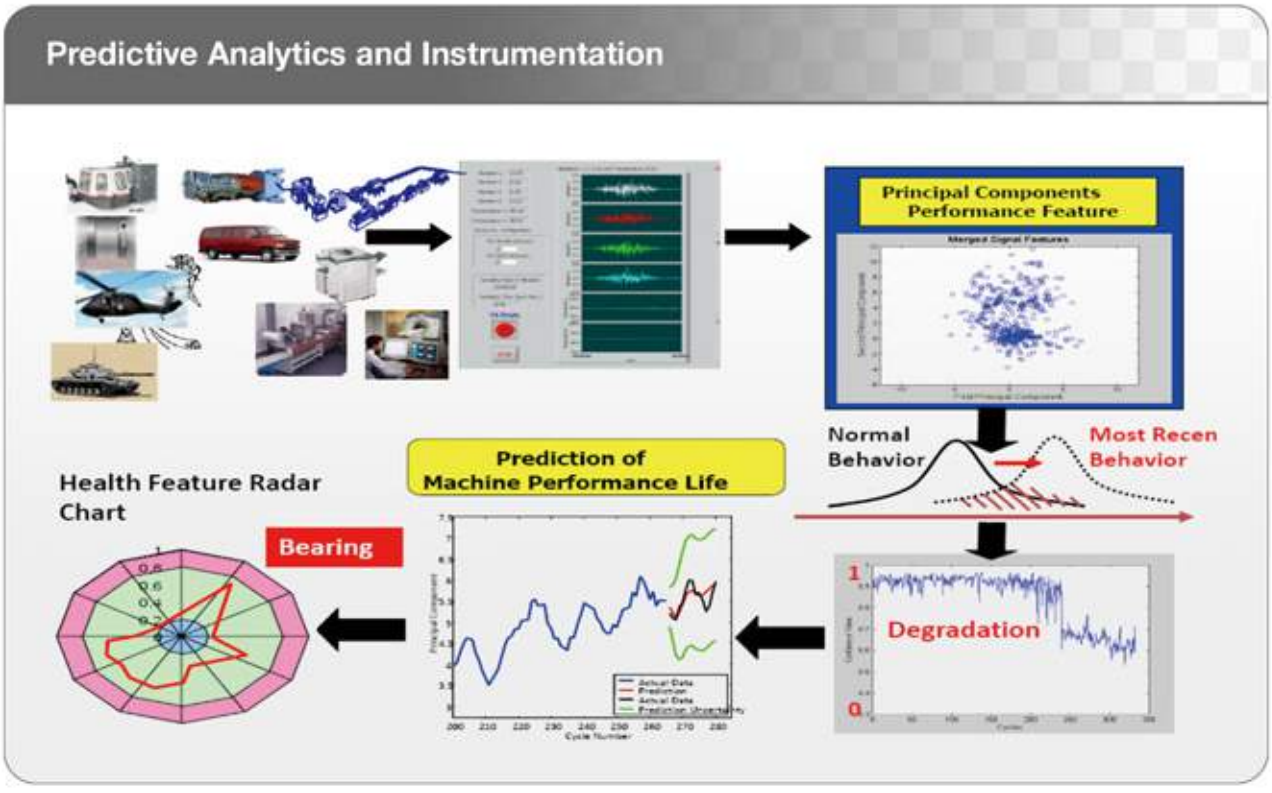
The extracted features are used for the analysis and evaluation of health status. The health of the equipment is concluded by comparing the initial condition, standard condition, and the current situation. The main analytical tools are the logistic regression, Gaussian mixture model, and so on.

Health Status Prediction

The present health status and performance digression trend are used to predict the performance degradation and the remaining life of equipment. The main analytical tools are the fuzzy logic, neural networks, and so on.

Troubleshooting

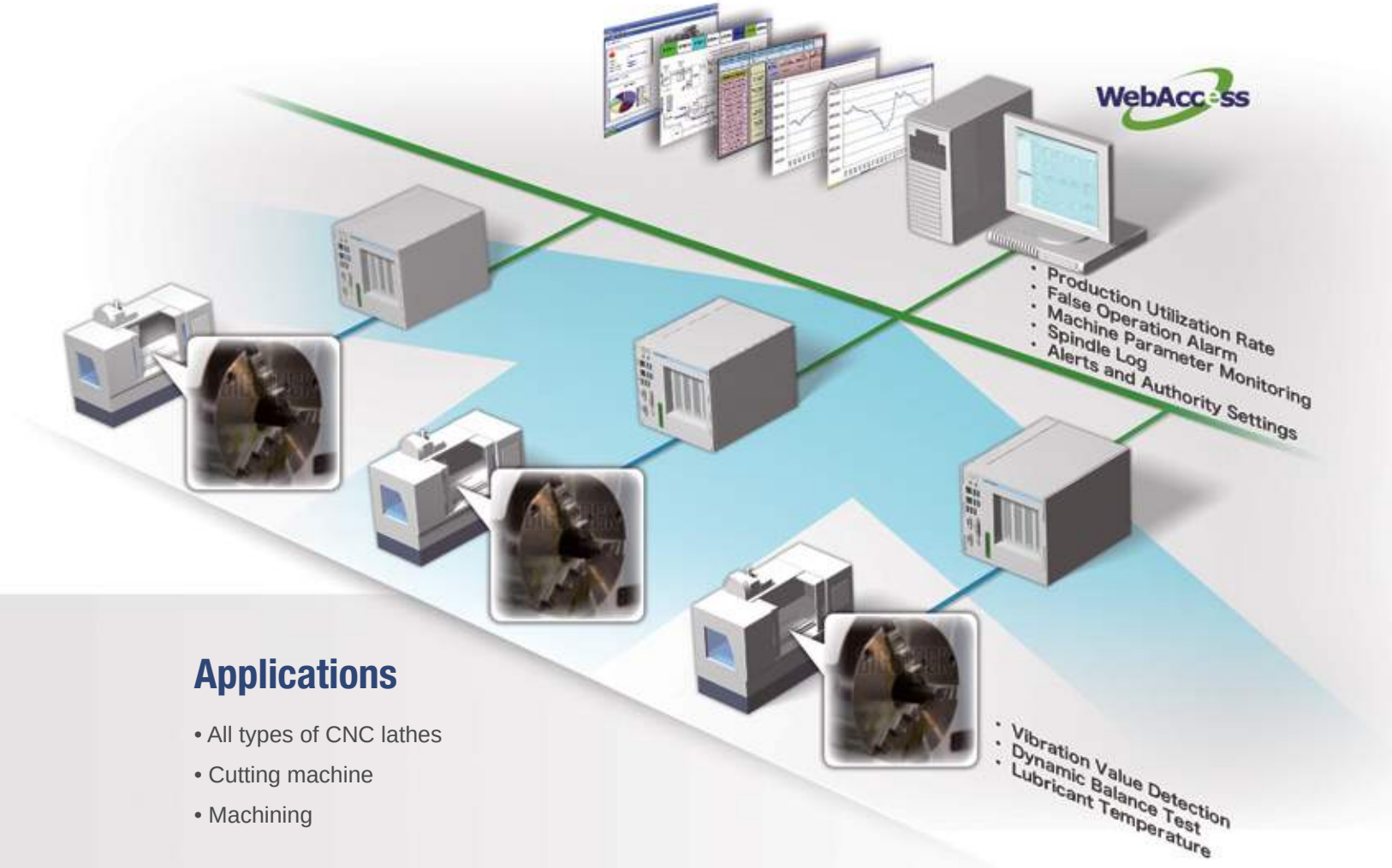
The equipment failure is accurately diagnosed in the early stage, and the future failure mode and its root cause can also be effectively diagnosed. The main tools are self-organizing feature chart, support vector machine, and so on.



Process Control and Damage Identification System for Machine Tool Spindle

In industrial machinery, bearings are widely used, basic, and demanding components and are the supporting components of rotating or moving shafts of various machine tools. With the increasing spindle speed, bearings can be regarded as the key components affecting the spindle speed. Under high speed, bearings may be damaged from abnormal lubrication, abnormal preload, and pollution. Through sensor measurement, the system closely monitors the physical phenomena of bearings, including vibration value, dynamic balance, lubricant temperature, and so on, and transforms into signal feedback so that the machine can automatically stop or the system can alert the operator to response appropriately, to avoid machine breakdown due to human negligence, and to increase the life of bearings and spindle and safety substantially. Meanwhile, the system also monitors data like the utilization rate and the spindle log, providing useful information for manufacturing systems.

System Architecture



Applications

- All types of CNC lathes
- Cutting machine
- Machining

System Specifications

The Process Control and Damage Identification System for Machine Tool Spindle			
Monitoring Project		Major monitoring items include: • Production utilization rate • False operation alarm • Machine parameter monitoring • Spindle log • Alerts and authority settings	The machine diagnosis tool kit includes: • Vibration value detection • Dynamic balance test • Lubricant temperature • Health status trend
Edition		**Standard**	**Professional**
System Architecture	SCADA Software	WebAccess 300 tags	WebAccess 300 tags
	SCADA Server	1 x UNO-3073GL Fanless Industrial Computer	1 x UNO-3073GL Fanless Industrial Computer
	Industrial Communication Card	1 x PCI-1610B	1 x PCI-1610B
	Intelligent Service Module		Advantech Machine Diagnostic Tool Kit
	Vibration Data Acquisition Card		1 x PCIE-1802
	Axial Accelerometer		1 x IEPE Vibration Sensor
	Vibration Accelerometer		1
	Pressure, Oil Pressure Sensor		2
	Lubricant Temperature Mete		1

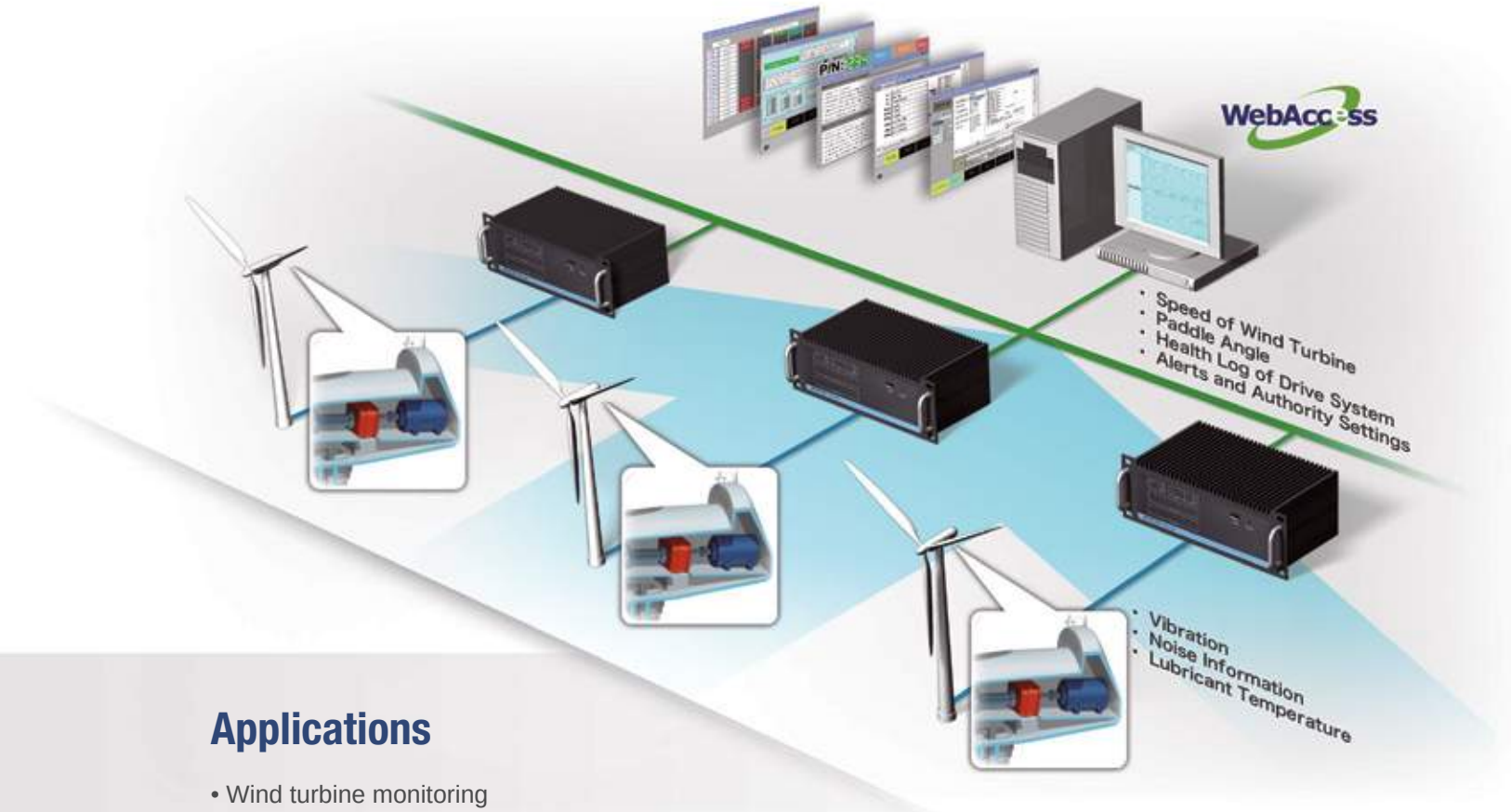
Main System Components

Component	Advantech WebAccess	UNO-3073GL	PCIE-1802	PCI-1610B
Function	Browser-based HMI/SCADA Software: • Networking and remote monitoring capabilities for rapid development of a monitoring and diagnostic software • Remote monitoring capability for users to control on-site status through the network anytime, anywhere, and to analyze and make decisions through remote connection	SCADA Server: Built-in WebAccess SCADA software, with real-time data acquisition and powerful computing capability, low power consumption, fanless design. The most durable and reliable data acquisition platform	Dynamic data acquisition module. 8-channel, 24-bit analog acquisition module. The sampling rate up to 204.8KS/s. It can be directly connected to IEPE sensor to measure vibration, acceleration, and microphone signal, and other signals	4-port RS-32PCI communication card, transferring vibration value of machine spindle and bearings, and other information
Specifications	According to the needs of different systems, providing different I/O tags. Please refer to system specification	• Onboard Intel Celeron 847E 1.1 GHz processor • 2 x RS-232/422/485 interface, with automatic data flow control and 2 x RS-232 pin head • 2 x 10/100 / 1000Base-T Ethernet port • Supports DVI-I, HDMI two independent dual graphics • Audio Mic-in, Line-out • 9 x USB2.0 interface (1 x internal USB for dongle or flash drive)	• 8 channel, 24-bit high-resolution analog conversion up to 114dB dynamic range • Sampling rate up to 204.8KS/s • AC or DC input coupling by choice • AC coupling frequency lowest to 0.1Hz • 4 mA IEPE and TEDS, applicable to the microphone and accelerometer through software settings	• Ethernet Ports: 2 • Communication interface: 10/100 Mbps • Communication type: RS-232/422/485 • Baud rate: 50 bps ~ 921.6 kbps

Monitoring and Diagnostic & Predictive Maintenance System for Wind Turbine Drive Systems

The wind turbine drive systems convert wind energy into mechanical energy and delivers it. During the energy conversion process, the drive system is affected by wind loads and grid load, so it may break down easily. To ensure the efficiency and availability of wind turbines, the key factor is to optimize the maintenance plan. The system uses failure prediction platform for close monitoring of the performance of the wind turbines, and through reliable performance information, it helps users and manufacturers determine the best maintenance strategy. The benefits of failure prediction strategy can not only ensure uptime, but also allow manufacturers to provide better and timely services, increasing user satisfaction substantially and thus bringing greater business opportunities.

System Architecture



Applications

- Wind turbine monitoring
- Online monitoring of health status of wind turbine
- Health diagnosis and failure warning of drive system

System Specifications

Monitoring and Diagnostic & Predictive Maintenance System for Wind Turbine Drive Systems			
Monitoring Project		Main monitoring items include: • Speed of wind turbine • Paddle angle • Paddle angle • Health log of drive system • Alerts and authority settings	Health log of drive system includes: • Vibration • Noise information • Lubricant temperature • Health status trends (Professional Edition) • System degradation assessment (Professional Edition)
Edition		**Standard**	**Professional**
System Architecture	SCADA Software	WebAccess 300 tags	WebAccess 300 tags
	SCADA Server	1 x ECU-1871 Fanless Industrial Computer	1 x ECU-1871 Fanless Industrial Computer
	Operation Data Acquisition Card	ECU-P1706	ECU-P1706
	Signal Conditioning Module		ECU-P1300
	Health Diagnostic Software Module		Advantech Wind Turbine Health Diagnosis Tool Kit
	CMS Front-End Data Acquisition Card		1
	Vibration Sensor		3 x IEPE Sensor

Main System Components

Component	Advantech WebAccess	ECU-1871	ECU-P1706	ECU-P1300
Function	Browser-based HMI/SCADA Software: • Networking and remote monitoring capabilities for rapid development of a monitoring and diagnostic software • Remote monitoring capability for users to control on-site status through the network anytime, anywhere, and to analyze and make decisions through remote connection	SCADA Server: Built-in WebAccess SCADA software, with real-time data acquisition and powerful computing capability, low power consumption, fanless design. The most durable and reliable data acquisition platform	250 kS/s, 16-bit, 8-channel synchronous acquisition card to capture acceleration, vibration, other analog values, and status of the sensor	8-channel signal conditioning board with adjustable filter and current output functions, providing power for IEPE sensors
Specifications	According to the needs of different systems, providing different I/O tags. Please refer to system specification	•Electricity IV level certification •Intel Atom D510 1.66 GHz Dual-core processor; 2GB DDR II memory • IEC 61850-3 and IEEE-1613 compliant for substation applications • Built-in IRIG-B time synchronization function • Two expandable I/O modules • Supports 1 x RS-232 port / 2 x RS-485 isolation ports • Supports 2 x 10/100 / 1000Base-T RJ-45 ports	• 8-channel differential analog input • 16-bit analog/digital converter, up to 250 kHz sample rates • Synchronous data acquisition, phase information without distortion • Input channel with programmable gain • Multiple trigger modes	• 8-channel analog input • Adjustable filtering bandwidth 0.1Hz ~ 25KHz •Input voltage range +/- 5V •Output voltage range +/- 10V • Sensor output 4mA

Choose Advantech as Your Best Partner

Founded more than thirty years ago, Advantech has become an intelligent service industry leader, and has offices around the world. Through close cooperation with a vertical field of systems integrators, Advantech provides a wider range of applications in each industry, and comprehensive smart city and Internet of Things (IoT) solutions in order to facilitate a convenient and smart life.

Advantech's mission is to continue to drive the earth to become more intelligent, to drive innovation of smart city, to build the model IoT industry, to assist industries to accelerate intelligence operations to become the most influential global businesses of smart city and Internet of Things (IoT).

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Smart city solutions

Advantech's five major smart city solutions make the system able to fully utilize Internet of Things (IoT) architecture for comprehensive sensing, reliable communications, and intelligent processing. These solutions provide a more intelligent experience to the public, business, and government, improving the overall quality and image of a city.

Digital Retail and Hospitality

- Ustore Manager
- iCloud Solution
- In-Store Management
- Central Control and Cloud Management
- Restaurant Management

Intelligent Hospital

- Integrated Operating Room
- Quality Nursing Care
- Intelligent Outpatient Services

Digital Logistics and Fleet Management

- Logistics & Warehousing Management System
- Fleet Management System

Why Advantech

Designing specific solutions according to industry characteristics

In order to offer the market new value-added services, and to meet the needs of as it moves from "product" to "services", Advantech provides innovative SRPs (Solution Ready Packages) for various professional industries. Advantech also provides application solutions for industry-specific hardware and more intelligent services to its customers, allowing customers to focus on their work, and make application integration easier.

Perfect cloud integration solutions

Advantech has been cultivating various industries for many years, understanding the purposes and needs of users, and providing appropriate hardware and software to match solutions. With particular emphasis on the product development of cloud-based architecture in recent years, WebAccess+, a new industrial cloud software, provides comprehensive evolution of intelligent remote detection management service that instantly detects and accurately grasps the system state.

Model Corporate Citizen

Advantech is committed to being a model corporate citizen by helping to preserve the environment and by giving back to society. Our environmental program focuses on reducing, reusing, and recycling materials used in our manufacturing operations. Advantech's environmental compliance effort includes the following:

- ISO 9001 Certification
- ISO 14001 Certification
- ISO 13485 Certification
- OHSAS 18001 Certification
- TL9000 Quality Management System
- RoHS Directive Compliance
- WEEE Directive Compliance
- Authorized Sony Green Partner

After Service

Product Warranty

When the basic product warranty expires, users can buy warranty extensions. We provide a full-service to customers to lower maintenance costs.

Professional Installation

All new settings are tested by Advantech's professional team and we offer optional installation and integration services. After installation, we set the management and operation via the internet immediately, providing real-time information.

Complete Training

With a total training solution which including multimedia player software with user demonstrations and hands-on experience system maintenance staff can learn to operate their system in no time.

Intelligent Building and Urban Space Management

- Intelligent Space Management
- Intelligent Building Energy Management System
- Urban Space Management
- Transportation Control System

Intelligent Agricultural and Environmental Protection

- Intelligent Environmental Protection
- Intelligent Agriculture
- Intelligent Water Affairs
- Intelligent Plant Equipment Monitoring
- Oil and Gas
- Power and Energy

WebAccess+ Alliance

ADVANTECH WebAccess/NMS

ADVANTECH WebAccess+IMM

ADVANTECH WebAccess+IVS

ADVANTECH WebAccess/SCADA

Industry-Leading Quality Assurance

Advantech is a global embedded computing researcher, developer, and manufacturer, providing various industries a variety of industrial PCs, touch screen, data acquisition modules, and other products. With stable quality assurance, Advantech products can not only be used in inside, but also outside in harsh environments. With the support of Advantech industrial computers, Advantech provides intelligent and stable project planning to industries.

Customer-oriented Support

Advantech 's complete technical and repair support provides a variety of customizable after-sales services, including extended warranty, advance replacement, upgrade, fast repair and so on. With hotline AE 24/7 technical support, we keep you investment at peak performance and within your budget.

WebAccess+ Alliance

One for All · All for One

WebAccess/SCADA

Smart HMI/SCADA Software

- 100% browser-based HMI/SCADA software
- Easy to connect and control a variety of IoT Devices
- Supports a variety of mobile devices and browsers

WebAccess+IVS

Intelligent Video Software

- Intelligent Video Platform
- Intelligent Video Analytics Modules
- Modulized SDK ready for software integration

WebAccess+IMM

Interative Multimedia Software

- Digital Signage Management Platform
- Intelligent Programming Platform
- Supports Industries and Application Scenarios

WebAccess/NMS

Network Management Software

- Network Equipment Management and Monitor
- Integration of Network Topology
- Location Identification for Wide Area Deployment

Advantech invites system integrator partners to join the WebAccess+ Alliance to jointly develop the Internet of Things (IoT) and create business opportunities

WebAccess+ Alliance Partner

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