

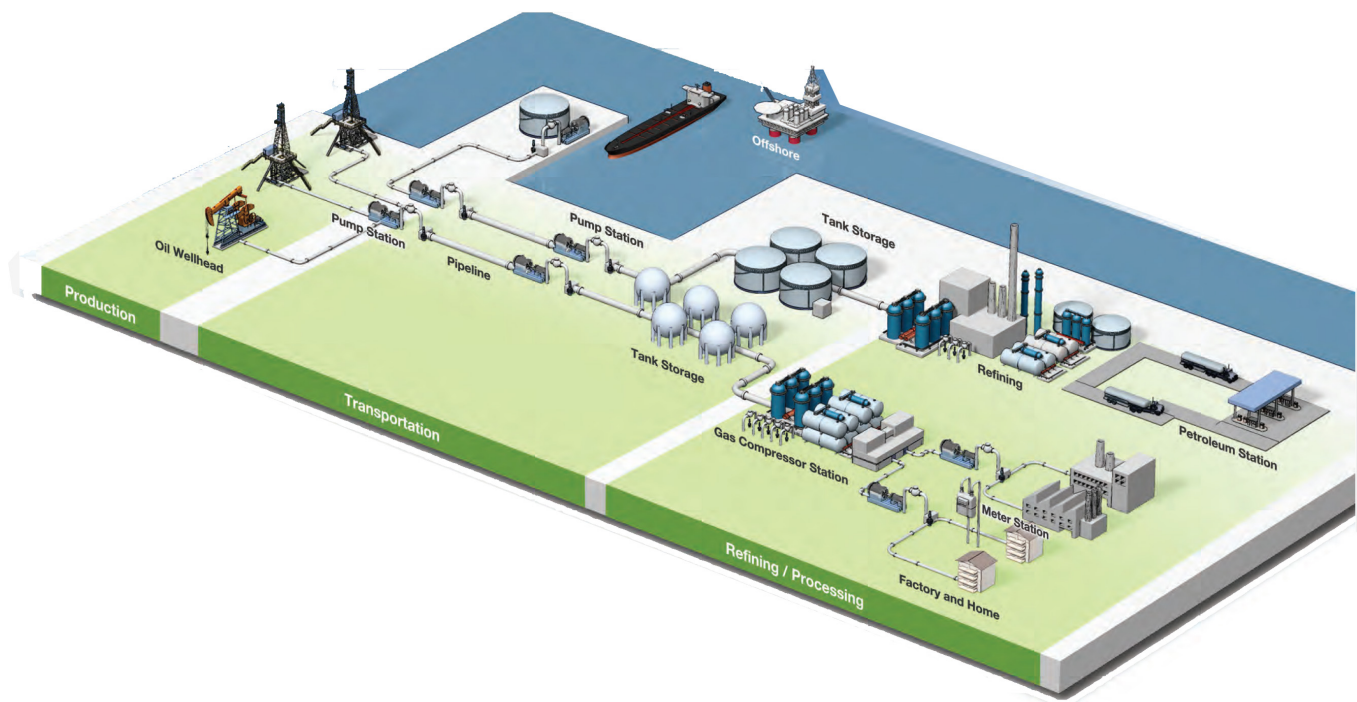
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## Advantech's Oil & Gas Solutions

### Certified Products & Solutions for Hazardous Applications



### Industrial Solutions for Oil & Gas Applications



The oil and gas industry is still at the heart of the world's energy supply. From exploration and development, drilling and production, to fuel transportation and processing, creating reliable, efficient and accurate monitoring and control systems is important for every stage of the oil & gas industry. These applications are still some of the most dangerous and demanding of any industrial application, and require rugged and reliable products to ensure safety and efficiency. Advantech leverages over 25 years experience in the automation industry to design different product offerings and solutions for reliable use in hazardous locations.

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## Information and Applications

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### **Certification Definition - Class I, Division 1 & 2**

Hazardous locations are areas where potential hazards (e.g., fires, explosions, etc.) may exist under normal or abnormal conditions because of the presence of flammable gases or vapors, flammable liquids, combustible dusts or ignitable fibers. According to the NEC (National Electrical Code), there are three types of hazardous locations categorized by Class I (gases, vapors, and liquids), Class II (dusts), and Class III (fibers and flyings). Division 1 means normally explosive and hazardous and Division 2 means not normally present in an explosive concentration but may accidentally exist.

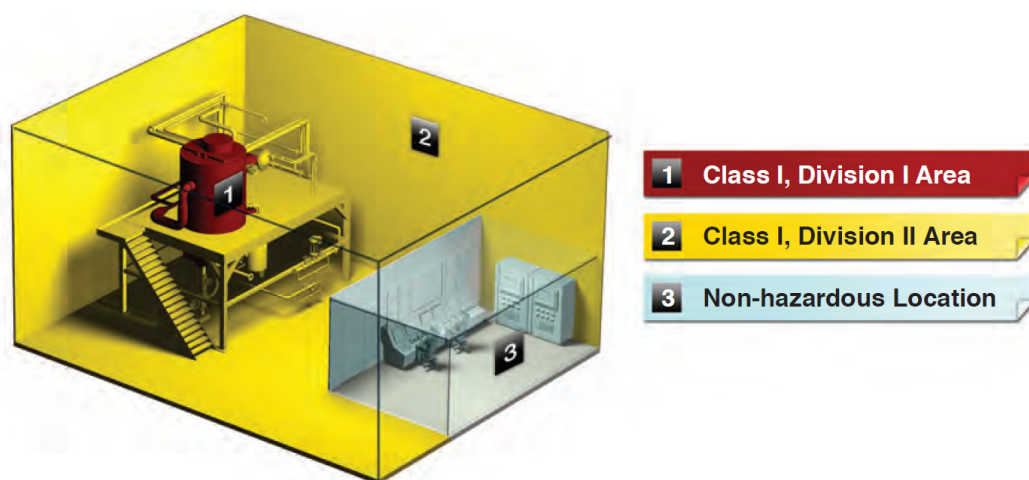
Class I is directly related to the oil and gas market applications, such as petroleum refineries, gasoline storage, dispensing areas and utility gas plants. According to the ignition temperature of the substance, its explosion pressure, and other flammable characteristics, the gases and vapors of Class I locations are broken into four groups by the Codes: A, B, C, and D. Temperature classes also exist to designate the permissible surface temperature of electrical equipment which allows them to operate normally in the surrounding atmosphere.

CLASSES	GROUPS	DIVISIONS	
		1	2
Class I : Gases, vapors, and liquids	A: Acetylene B: Hydrogen, gases or vapors of equivalent hazard C: Ethyl-ether vapors, ethylene, or cyclo-propane D: Gasoline, hexane, naphtha, benzene, butane, propane, alcohol, etc.	Normally explosive and hazardous	Not normally present in an explosive concentration (but may accidentally exist)

TEMPERATURE CLASSES	
? T6 85 ~ 100° C (185 ~ 212° F)	? T3 200 ~ 300° C (392 ~ 572° F)
? T5 100 ~ 135° C (212 ~ 275° F)	? T2 300 ~ 450° C (572 ~ 842° F)
? T4 135 ~ 200° C (275 ~ 392° F)	? T1 450° C + (842° F +)

## Hazardous and Non-hazardous Locations

Below is a conceptual diagram of Class I, Division 1 & 2 hazardous areas and non-hazardous areas.



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## Advantech's Certified Products & Solutions

HMI/SCADA Software Industrial Monitors Industrial Ethernet Switches Media Converters Serial Device Servers Modbus Gateways DIN-rail PCs PACs Data Acquisition Modules Advantech continues to provide vertical market-oriented product solutions to fulfill various application needs. Advantech's CID2 certified product offering includes; HMI, Industrial Communication, Embedded Automation Computers, and Data Acquisition modules. These solutions are well suited to fit the demanding requirements of various oil and gas applications. Furthermore, Advantech's standard product offerings can be used in non-hazardous locations, such as facility control and management for the oil and gas industry.

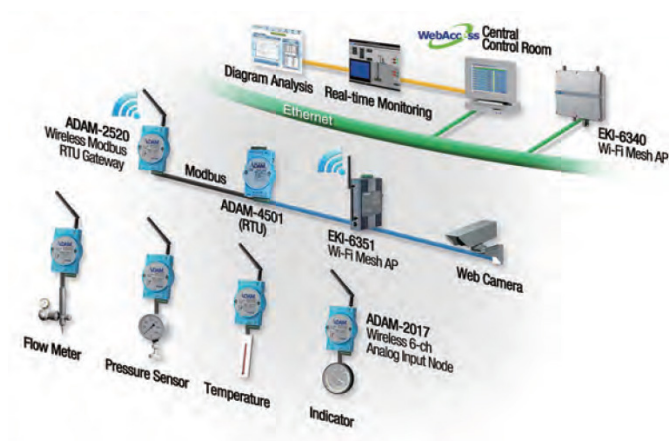




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## Oil Field Drilling Monitoring System

An oil field is a region with an abundance of oil wells extracting petroleum from below ground. Because the oil reservoirs typically extend over a large area, possibly several hundred kilometers across, full exploitation entails multiple wells scattered across the area. In addition, there may be exploratory wells probing the edges, pipelines to transport the oil elsewhere, and support facilities. Because an oil field may be remote from civilization, establishing a field is often an extremely complicated exercise in logistics.



### System Description

Oil well management is a complicated process, but Advantech's Internet of Things system for oil and gas production produces good effects. Onsite RTU module (ADAM-4501), supports Modbus RTU/TCP, completes onsite data acquisition, packaging and uploads. Through an industrial wireless network, built by EKI-6351 and EKI-6341 modules, remote WebAccess software compiles and

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analyzes the data of well mouths. WebAccess? B/Sstructure shows its outstanding performance when it comes to remotemanagement and maintenance.

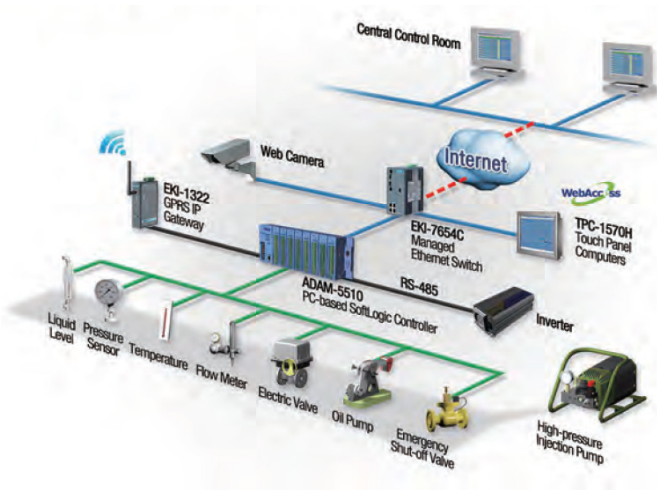
- Zigbee wireless data acquisition module of [ADAM-2000 Series](#) acquiresanalog data of temperature, flow, pressure, etc., at oil wells. WirelessZigbee method greatly saves wiring costs. It is easy-to-use, increasingsystem maintainability.
- ADAM-4501, supporting Modbus RTU/TCP communication, works as onsiteRTU. It is responsible for processing and uploading the acquired data, andpackaging and uploading the acquired data from dynamometer.
- Industrial [EKI-2525](#)Ethernet switch, suitable for rugged production site,connects onsite RTU, network camera, and wireless AP EKI-6351.
- Wireless AP at the pooling station is responsible for receiving data fromeach oil well. Industrial wireless AP EKI-6340 is IP67 protection rating,suitable for outdoor implementation.

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## **Pump Station Monitoring System**

The oil & gas industry includes the global processes of exploration, extraction,refining, transporting, and marketing petroleum products, such as oil, which istransported through large pipes that can stretch across continents. The oil iskept in motion by pump stations along the pipeline, and usually flows at speed ofabout 1 to 6 meters per second.

### **System Description**



The main function of an intelligent remote supervisory system is to monitor the operating status of local and remote intelligent equipment. WebAccess software manages and controls the water injection pumps & valves, the parameters of intelligent equipment such as the temperature and pressure of lubricating oil; valve opening angles; the details of valves, alerts and the open/close functions. WebAccess? powerful network functions are perfect for on-site and remote monitoring of intelligent equipment.

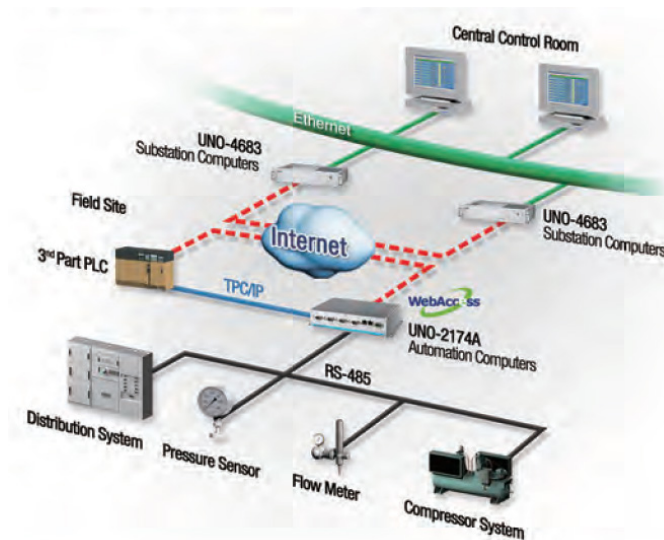
- High-performance [ADAM-5510](#) PAC controller controls all relevant parameters and control loops, which has 8 I/O slot expansion to expand I/O module easily. [ADAM-5510](#) controller acquires all monitoring data of water injection pump, and controls valves and inverter. According to experts' request, it gives real-time alarm and malfunction alert, corresponding analysis, and animated demo.
- Industrial [EKI-1322](#) alert module sends real-time alert message to designated phone number, effectively help administrator to handle alert and malfunction of equipment.
- Industrial IP65-compliant [TPC-1770H](#) touch panel works as onsite HMI, facilitating human-computer interaction for the onsite personnel to control and operate intelligent equipment.
- Industrial [EKI-7654C](#) Ethernet switch builds a communication network, connectin

g [ADAM-5510](#), webcam, and industrial touch panel [TPC-1770H](#).

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## Oil Pipeline Monitoring

Oil pipelines are made from steel or plastic tubes with inner diameter typically from 4 to 48 inches. Most pipelines are buried at a typical depth of about 3 to 6 feet. As crude oil contains varying amounts of wax, buildup may occur within a pipeline. Often these pipelines are inspected and cleaned using pipeline inspection gauges, used to detect anomalies in the pipe such as dents, metal loss caused by corrosion, cracking or other mechanical damage.



### System Description

To ensure transmission quality, there are a lot of stations along long-distance oil and gas pipelines. The control system of the pipeline needs to perform real-time monitoring and control of each station. To guarantee its safety and stability, a communication system has to be stable, reliable, safe and rugged. With long-term cooperation with many professional oil and gas pipeline companies, Advantech's gateway and industrial Ethernet switch products have been successfully applied to many such systems.

- [UNO-2174A/UNO-2178A](#) embedded computer with WebAccess software has features like multiple serial ports, Ethernet ports, wide operating temperature, etc

[UNO-2174A/UNO-2178A](#) serves as protocol converter gateway at stations to convert protocols, such as electronic control



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system, compressor system, etc.,for connecting PLC.

- Other than serving as a unified data protocol gateway at stations

#### [UNO-2174A/UNO-2178A](#)

embedded computer also serves as protocol converter gateway;for example, converting Modbus RTU/TCP to IEC-60870-5-104 for controlcenter. UNO series with flexible and high-performance protocol convertingfunction is very suitable for onsite system.

- Control center adopts high-performance communication server [UNO-4683](#)with an Intel Core i7 processor to process uploaded data, and to receive datawith IEC-60870-5-104 protocol.

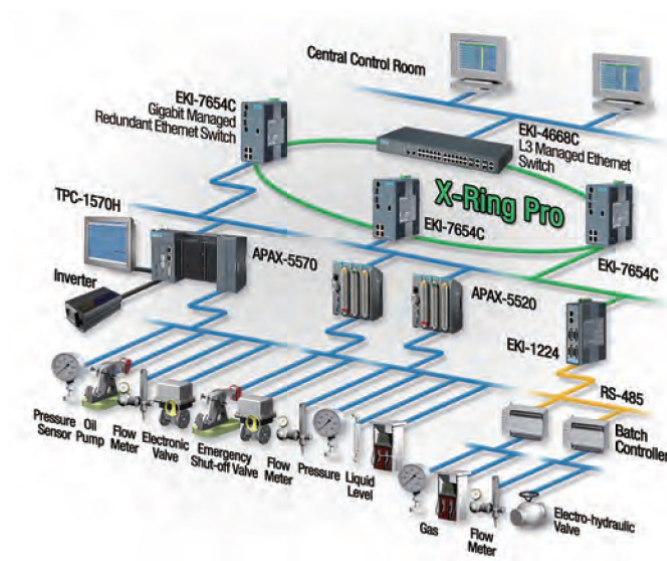
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## **Tank Storage Monitoring**

This application was setup to help monitor a fueling operation. Theinformation & machine diagnostic data will be collected and sent back tothe office and corporate headquarters. An accurate monitoring system notonly measures fuel levels, but also temperatures and estimated volumeinformation.

### **System Description**

Oil terminal supervisory systems need technology that?s reliable, easy tomaintain, and scalable. They are not only responsible for safe production andtransportation, but also need to have easy comprehensive data access. Toacquire data separately from the tank farm and oil distribution zone the



system uses a unified control module to control all the points of the oil terminal and ensure data transmission quality and safety whilst being compatible with other systems such as ERP.

- This case uses Advantech APAX-5570 and APAX-5520 PAC controllers as the main control system, coupled with Advantech [TPC-1570H](#) touch panel at on-site working station, to control various valves of oil discharge zone and tank farm, and to acquire specific parameters of flow, temperature, pressure, level of tank farm, and so on, in each region.
- Oil distribution zone uses Advantech [EKI-1224](#) serial server to send serial data of flow computer to control center through Ethernet.
- The communication network of the whole oil terminal uses Advantech [EKI-7654C](#) to build industrial redundant network, and adopts EKI-4668C layer 3 switch to isolate office and on-site control networks.

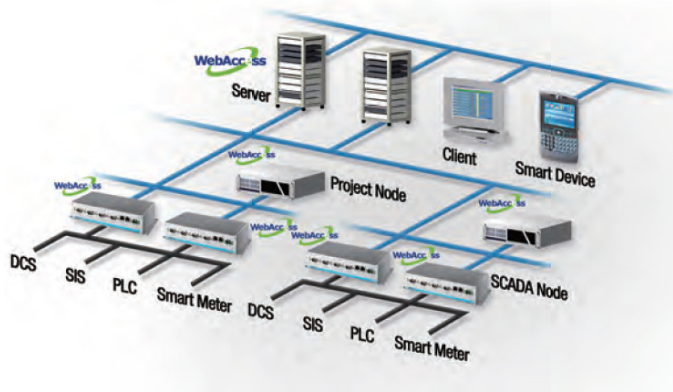
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## **Equipment Safety Status Monitoring**

Supervisory control and data acquisition system in refinery is mainly to acquire real-time meter data of each factory, meter alert, and alert design, and to feedback to management system immediately.

### **System Description**

Supervisory control and data acquisition systems in refineries are used to acquire the real-time meter data of each factory to immediately feedback to the



management system. The system uses the industry-leading internet configuration software, WebAccess, to build system network of data acquisition and process, utilizing the outstanding network features of WebAccess. It ensures effective and accurate large scale data acquisition (successfully being applied to 30,000 nodes), and fully supports a remote full-featured client.

- Advantech high-performance

#### [UNO-2174A/UNO-2178A](#)

embedded computer with WebAccess SCADA node in factory works as data communication server of DCS, SIS, PLC, and other systems to integrate and upload data.

- After

[UNO-2174A/UNO-2178A](#) unifies protocol, all data goes to factory management workstation (IPC) with WebAccess SCADA node.

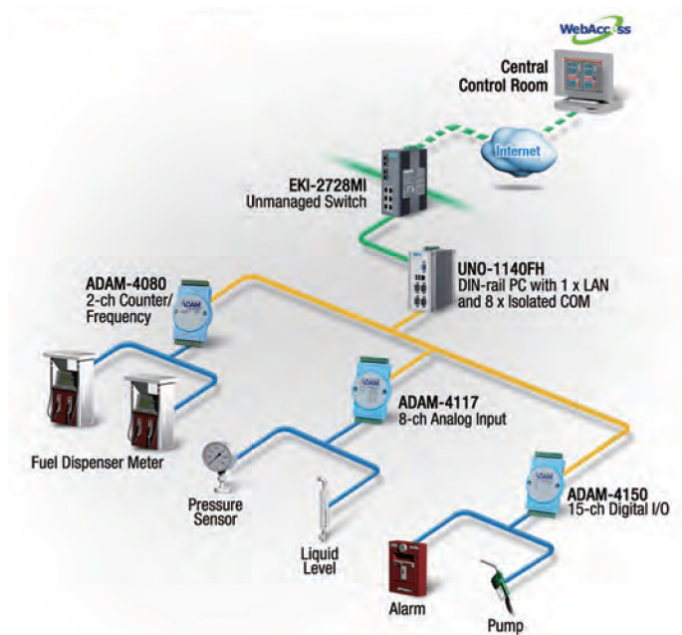
- At factory management workstation, WebAccess application compiles and sorts data, and upload to redundant and hot-standby server. After building connection, server will acquire data through SCADA node.
- If WebAccess remote client-end needs to check onsite data, it can directly check onsite SCADA node which ensures real-time data.

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## **Fueling Station Management**

This project implemented a gasoline pump control system for the dispensing, metering, and monitoring of gasoline tanks at a gas station. This fully automated system automated the process of dispensing gasoline and is supported by real-time connectivity between the gas station and its corporate headquarters.



### **System Description**

The control & management platform is an UNO-1140FH that is integrated with [ADAM-4000 Series](#) as a turn-key solution.

An [ADAM-4080](#) counter/frequency Input module with two 32-bit counter input channels and a built-in programmable timer for frequency measurement helps to manage the details of the fuel dispenser meters data and [ADAM-4117](#) analog input modules gather tank liquid levels, and pressure information. ADAM-4150 digital input/output module is in charge of alarms trigger and pumps on/off. Then the control & management platform can transmit all information via [EKI-2728MI](#) Ethernet switch to the corporate headquarters.

### **Benefits**

In this application Advantech's complete turn-key system & software provided a good cost-effective solution. All the products installed provide excellent safety & reliability. The [ADAM-4100 Series](#) modules are compact, versatile sensor-to-computer interface units designed for reliable operation in harsh environments. Their built-in microprocessors, encased in rugged industrial-grade ABS+PC plastic, independently provide intelligent



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signal conditioning, analog I/O, digital I/O, LED data display, and an address mode with a user-friendly design for convenient address reading.

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## **Advantech WebAccess**

### **Browser-based HMI/SCADA Software**

#### **Powerful Architecture for Multiple SCADA Servers and Client Applications**

Advantech WebAccess is a browser-based software package for human-machine interfaces (HMI), and supervisory control and data acquisition (SCADA). All the features found in conventional HMI and SCADA software packages are available in an ordinary browser including Animated Graphics Displays, Real-time Data Control, Trends, Alarms and Logs. Advantech WebAccess is based on standard Internet architecture; its basic components include SCADA Node, Project Node, Client and Thin Client. Advantech WebAccess is also featured key functions below for multiple SCADA servers and clients.



#### **Remote Diagnostics and Maintenance to Enhance Management Efficiency**

The unique feature, which distinguishes Advantech WebAccess from the competition, is that all engineering projects, configurations, graphics building (DRAW), historical data analysis,

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automatic report generation and software management (download, start and restart remote nodes) is performed using a standard web browser. If there is any troubleshooting needed, no matter where the operator is located, he can use a web browser to operate the system. This can significantly increase the efficiency of maintenance operation and reduce the maintenance cost.

### **Redundant SCADA & COM Ports to Assure Reliable Communications**

Advantech WebAccess is built-in to redundant SCADA and COM ports functionality, assuring continuous, reliable communications to automation equipment.

### **Integrated Audio, Video and Graphic Animations**

To increase the operating efficiency, Advantech WebAccess supports live full-motion video, audio, Adobe Flash and Windows Media and allows them to view in the same display, such as information of trends, alarms, push buttons and live data.

### **Free Dynamic DNS Services to Reduce Infrastructure Construction Costs**

To decrease the inconvenience of varied IP address and increase convenient network access, Advantech WebAccess also provides free dynamic Domain Name System (DNS) services. The function not only reduces infrastructure construction cost, but also provides easy domain network access.

### **Supports Apple® iPhone® and Smart Phones Using Android?**

In addition, Advantech WebAccess supports Apple iPhones and smartphones using Android through the WebAccess Thin Client and also supports GPS to send alarm messages as well. Users can use their smart devices to access the Advantech WebAccess to get information from field at anytime, anywhere.

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*all pictures are provided by Advantech*

### **products for solution:**

[ADAM-4100 Series](#)

[ADAM-4000 Series](#)

[ADAM-4080](#)

[ADAM-4117](#)

[EKI-1224](#)

[EKI-1322](#)

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[EKI-2728MI](#)

[EKI-7654C](#)

[TPC-1570H](#)

[TPC-1770H](#)

[UNO-4683](#)

[UNO-2178A](#)

[UNO-2174A](#)

[ADAM-5510](#)