# Predictive Maintenance Solutions

www.axiomtek.com

As one of the leading companies in the Industrial IoT industry, Axiomtek has been providing its customers with more efficient data gathering processes, actionable analytics, and easier ways to comply with regulatory standards and industry requirements.

## The Advantages of Predictive Maintenance

- Reduce downtime
- Optimize maintenance schedule
- Optimize spare parts inventory
- Reduce maintenance costs
- Extend equipment life
- Improve yield rate
- Improve plant safety
- Optimize asset availability

# What is Predictive Maintenance?

Predictive Maintenance (PdM) techniques are used to determine when in-service equipment need maintenance to prevent costly operational interruptions resulting from equipment failures.

## How It Works

While preventive maintenance is characterized by routine or scheduled checks of equipment, the PdM system relies on the collection and analysis of real-time data on the conditions of the equipment. The PdM system conducts non-interference monitoring in the background, collects operational data via the use of sensors, and transmits the collected information through cloud or designated servers for the appropriate team to monitor the equipment conditions. Control center staff can use the data to build failure models and program the PdM system to recognize these failure models as a part of the machine learning process. The PdM will develop the ability to make predictions for future maintenance.

## The Process of Predictive Maintenance

### ON-TIME MONITORING

Using real-time data monitoring to ensure the equipment working properly.

### ADVANCED MAINTENANCE ALERTS

Sending an alert to the administrator with predictions for future maintenance based on current data.

### CONNECTED EQUIPMENT

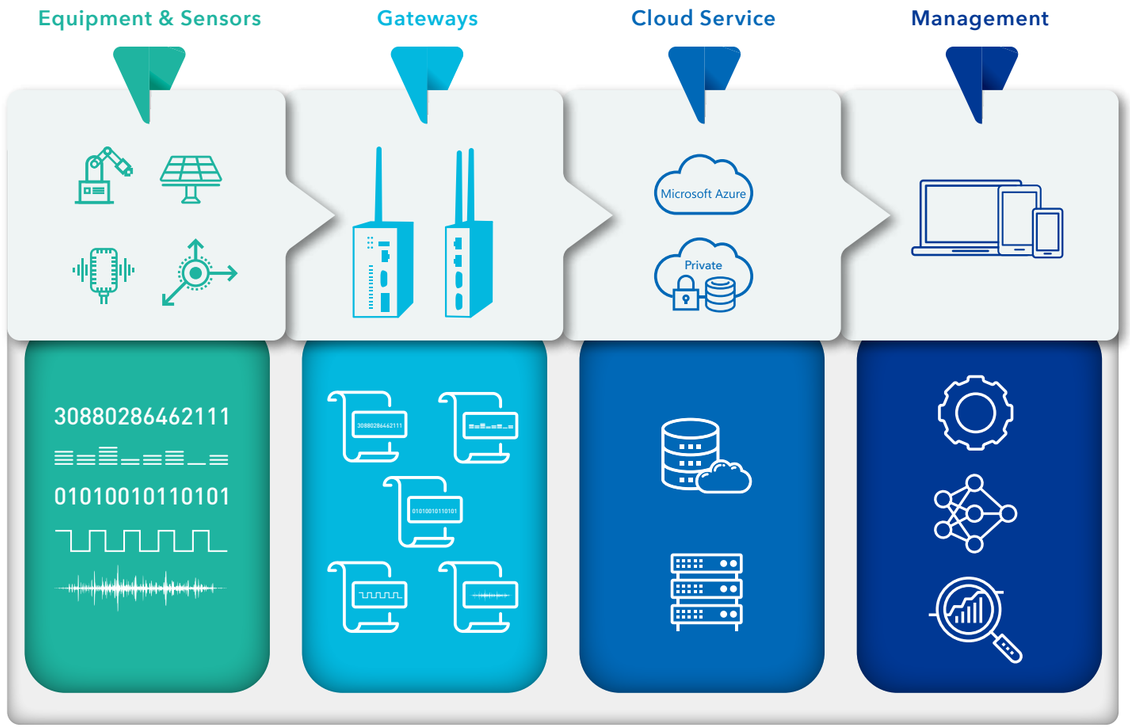
Installing sensors into the equipment to collect data in real time.

### PREDICTIVE ANALYTICS

Using machine learning to build failure prediction models.

### LINKED WITH DECISION SYSTEM

Connecting with systems such as MES, SAP, and ERP to manage resources and take necessary measures for maintenance.




## The Structure of Predictive Maintenance

The predictive maintenance solution consists of four blocks: equipment & sensors, gateways, cloud service, and management.

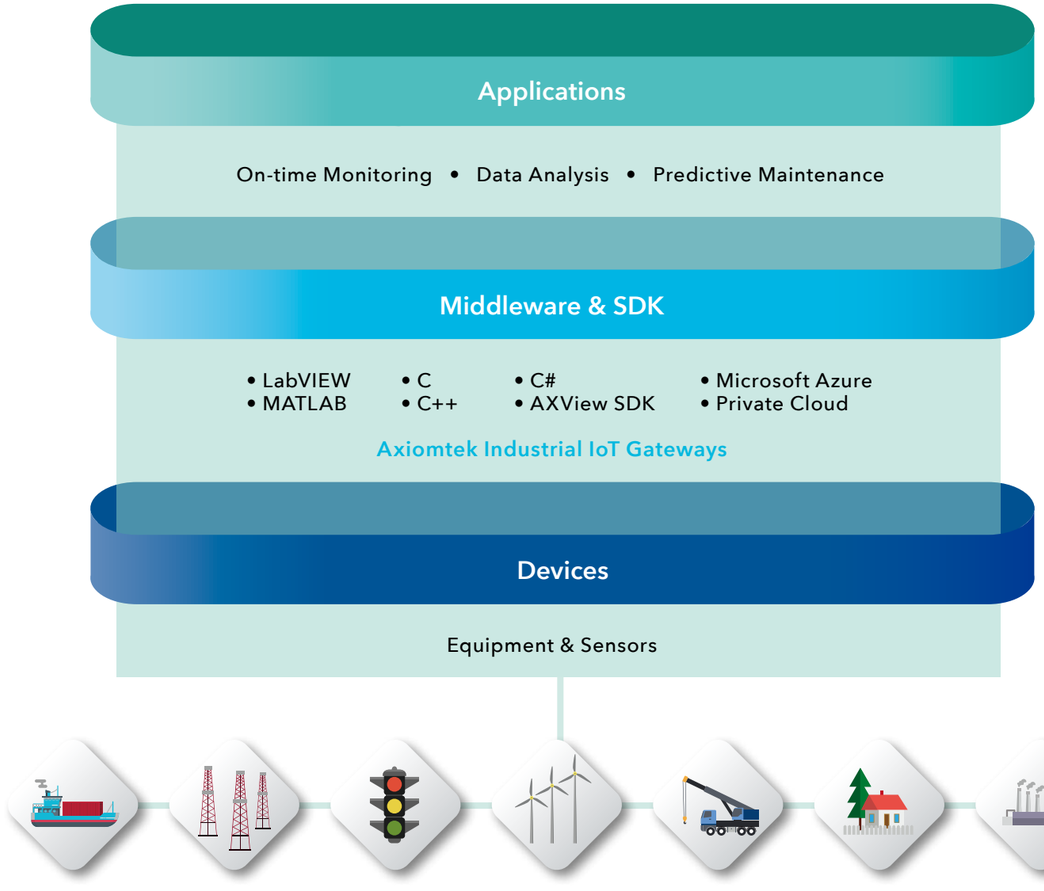
- **Equipment & sensors** generate massive amounts of data that could be analyzed in order to improve process efficiency and product quality. Data that comes from the equipment or sensors provides sufficient information for users to identify the condition of the equipment, and learn from the machine learning algorithms to improve product quality.
- **Gateways** are transporters. They transmit data from equipment or sensors and send it to a destination specified by the user for monitoring and analysis. In many cases, gateways can also serve as translators that calculate and convert raw data into something easier for users, applications, or other devices to understand.
- **Cloud service** is a shared software resource platform. The main functions of the cloud include data storage, computing, and analytics reporting. The cloud also delivers RESTful web service, calculates data, and builds failure models to train the PdM system.
- **Management** is a key function of PdM. Since equipment needs to be monitored at all times, PdM serves as an effective interface for users to track and handle overall conditions of equipment at any time from anywhere.

# What Axiomtek Offers

Axiomtek enables predictive maintenance technology that provides valuable insights to our customers so that they can drive better business decisions. Our middleware solutions help enhance our customers' ability to quickly respond to demand spikes and emergency situations by offering visual data over the Internet of Things (IoT) and important operational alerts.

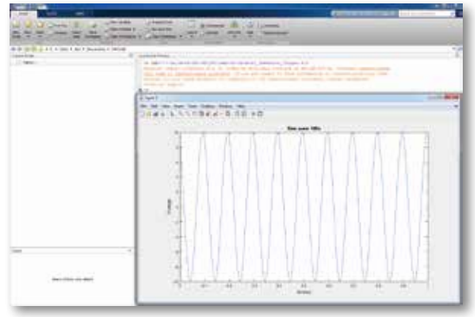
Axiomtek has developed a series of industrial IoT gateway products that come with a low power consumption Intel® processor and robust edge computing power. Our industrial IoT gateway devices feature rich I/O communication interfaces, wireless connectivity, and expandable designs. They are user-friendly, cost-effective, and reliable solutions for smart IIoT use.

Axiomtek provides a well-defined middleware and software development kit (SDK) for developers to easily connect equipment and sensors to gather data. We also offer software that controls system monitoring and alerts. Our cloud-ready solutions are IoT-enabled and are designed to help reduce our customer's development time and effort.

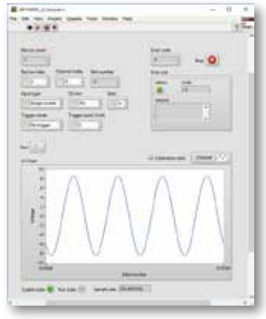



## Our Middleware Solutions

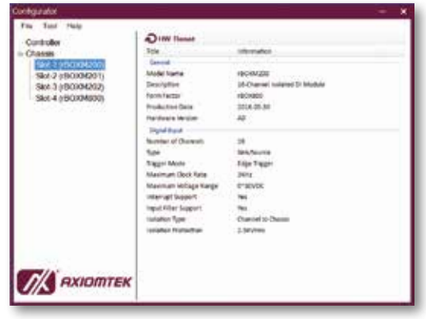
Visual Studio .NET Wrapper



MATLAB Driver Adaptors



LabVIEW Project Library (VIs)




Windows Configurator

## What AXView SDK Can Do


Local Monitoring

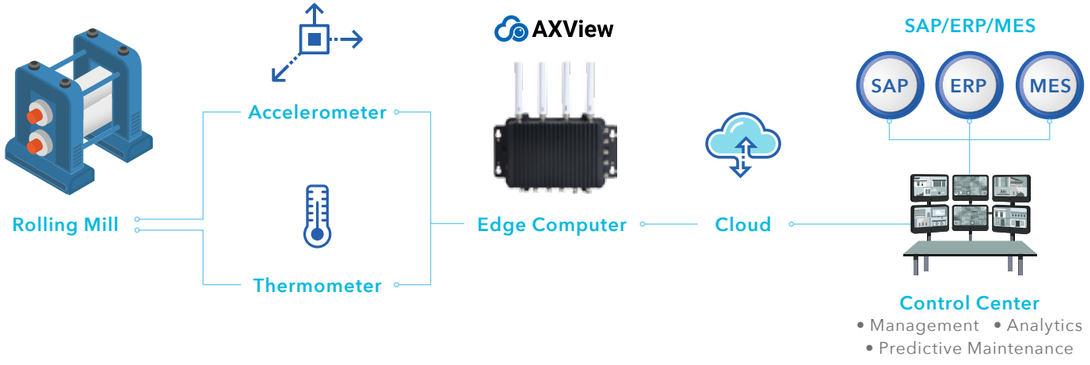
Integration for Solar Energy

Application

# Steel Plant Operations

In the metalworking industry, "rolling" is a necessary process for metal forming. A rolling mill plays a pivotal role in the process of influencing metal production quality. The factors that can affect the operations of a rolling mill include vibration, balancing, bearing smoothness, lubricating oil temperature, and the pressure of the oil hydraulic press. Predictive maintenance is key to maximizing uptime and increased efficiency.

During a rolling mill application, the PdM system collects and monitors data from the sensors mounted onto a rolling mill, which can include accelerometers, thermometers, and pressure gauges. By reading and analyzing data from the sensors, users can ensure that the mill's operation is optimized and potential failures are prevented. The machine learning algorithm can offer a way to improve efficiency and product quality.




## eBOX800-841-FL

Rugged IP67-rated Fanless Embedded System

- Intel® Atom® E3845 onboard
- M12-type lockable connectors
- -30°C to +60°C
- 9-36 VDC wide range power input
- Supports Axiomtek software & service development tool

## M801

High-resolution Accelerometer Analog Input Module

- 24-bit resolution
- Input source ±30V(DC), ±10V(AC)
- Supports IEPE (4mA min.) and IEEE 1451.1 TEDS Class 1
- -40°C to +70°C
- Supports LabVIEW, MATLAB, .NET Wrapper

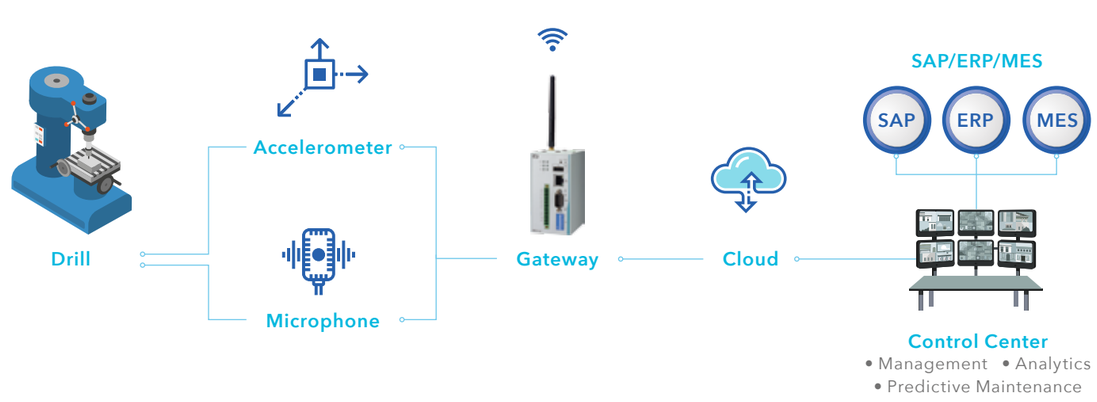


Application

# CNC Machine Operations

Computer numerical control (CNC) is an automation of machine tools using computers to control machine commands. CNC Machine is used for precision machining processes such as cutting, sanding, and drilling. Tools that can be controlled by the CNC process include mills, lathes, and grinders.

Predictive maintenance of CNC machines involves the collection of data via the use of sensors to review a variety of machine elements such as balance of platforms, damage to bearing, wear levels of drills, etc. By reading data sent by the sensors, users can access the operational conditions of the CNC machine. The back-end platform of the PdM system evaluates which part of the machine needs to be maintained or repaired, then provides maintenance recommendations for advanced maintenance required or replacement of the affected parts.




## IRU152

RISC-based DIN-rail Fanless Embedded System

- i.MX 6UltraLite processor 528 MHz
- Four analog input channels (16-bit, 250 KS/s)
- Isolated COM and DIO (2-IN/2-OUT)
- -40°C to +70°C
- Embedded Linux OS (Yocto)

## IRU151

RISC-based DIN-rail Fanless Embedded System

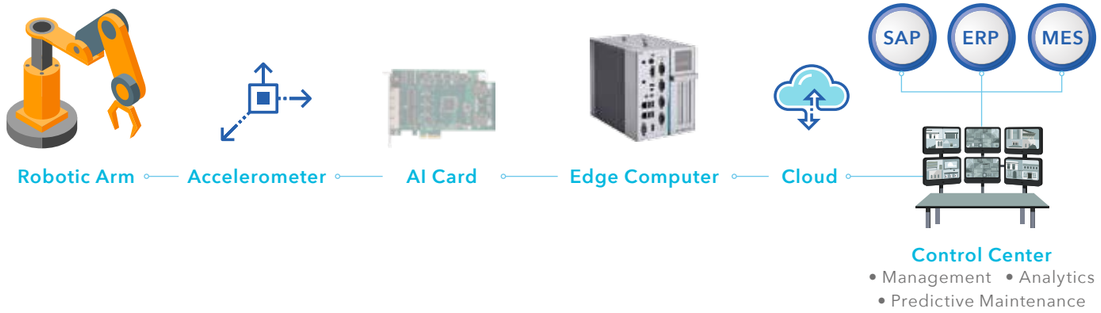
- i.MX 6UltraLite processor 528 MHz
- Four analog input channels (16-bit, 100 KS/s)
- Isolated COM and DIO (2-IN/2-OUT)
- -40°C to +70°C
- Embedded Linux OS (Yocto)

Application

# Robotic Arm Management

A robotic arm is a mechanical arm designed to simulate the functions of a human arm. It can be programmed to accurately perform different combinations of motions carried out by a robotic arm's joints and bearings such as rotating, shifting, and gripping.

A variety of robotic arm motions must be monitored, calibrated, and adjusted for the accuracy of movements. The PdM system can help prevent costly loss of productivity from unexpected machine breakdowns through the use of sensors attached to the arm. They can detect vibrations, jitters, and other deviations from the normal machine's standards and allow for advanced maintenance and uninterrupted operations.




### IPC962-511-FL

2-slot Fanless Barebone System

- 7th/6th gen Intel® Core™ or Celeron® processor
- Intel® H110 chipset
- 24VDC (uMin=19V/uMax=30V)
- -10°C to +60°C
- Supports Axiomtek software & service development tool
- Supports LabVIEW, MATLAB, .NET Wrapper


### AX92340

Analog Input Card

- PCI Express
- Input range: ±1.25V, ±2.5V, ±5V, ±10V
- 16-CH single ended or 8-CH differential analog input
- Throughput: 250 ksps
- 16-bit resolution
- Edge trigger: rising, falling
- Supports LabVIEW, MATLAB, .NET Wrapper

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