

Predictive Maintenance Solutions

For achieving carbon neutrality in logistics



Achieve your environmental and business goals by remotely monitoring all power, moving parts, workpieces, and environmental components

- Monitor 3-phase induction motors and their peripherals
- Monitor equipment temperature conditions
- Monitor insulation degradation in motors
- Monitor voltage, current, and remaining life of switched-mode power supplies

ZERO EMISSIONS 2050

Achieving carbon neutrality by 2050: A goal we can't ignore

Given the recent and dramatic increase in weather disasters occurring throughout the world, reducing greenhouse gas emissions has become a topic of global concern. The Paris Climate Agreement addresses this issue by stipulating that participating countries achieve carbon neutrality by the latter half of this century. Domestically, carbon neutrality is being driven by regulations and sustainability NGOs.

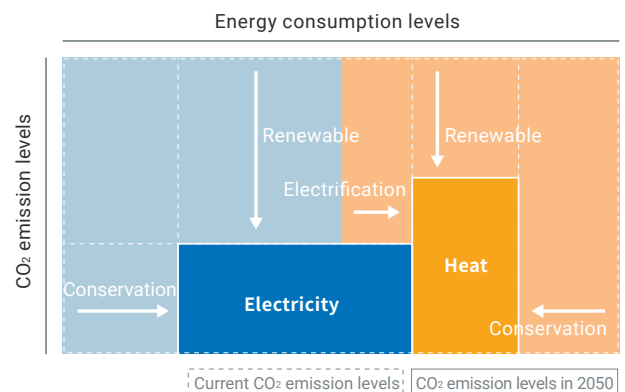
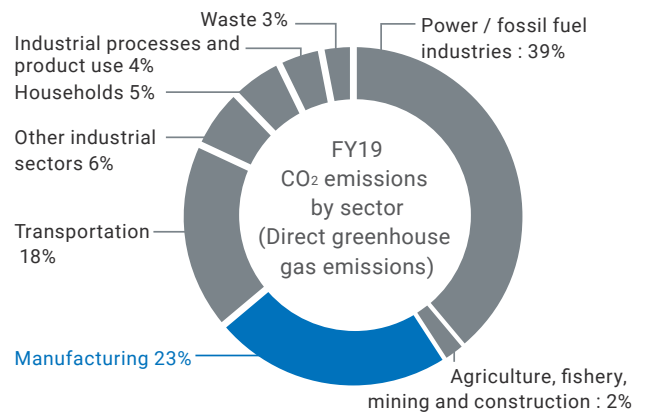
What is carbon neutrality, and what must be done to achieve it?

Carbon neutrality is the balancing of carbon dioxide and other greenhouse gas emissions with the removal of these gases (e.g., through forest management) to achieve a net-zero carbon footprint. The ambitious target of achieving carbon neutrality by 2050 requires action across all industries and departments. Many large companies are also requiring their suppliers to meet stringent sustainability measures.

Each company must balance the three main aspects of emission reduction – energy conservation, renewable energy, and electrification – to implement the right measures for its business. The logistics sector in particular bears a significant responsibility for moving towards a greener world.

- Power/fossil fuel sector: Expand the use of renewable energy
- Transportation sector: Use renewable energy, for instance with electric vehicles
- Manufacturing and building sectors: Implement rigorous energy conservation measures and use renewable energy

This brochure showcases some solutions that warehouse managers can use to conserve energy and reduce emissions while continuing to achieve business goals.



The responsibility of the logistics sector

According to investigation by Japan's National Institute for Environmental Studies, the logistics industry accounts for a large part of the world's energy-related CO2 emissions, and logistics facilities therefore have an urgent need to reduce their power consumption and waste.

Achieving environmental goals is an opportunity to achieve business goals as well

It's important to keep in mind that efforts towards carbon neutrality don't have to come at the expense of your profits. Recent technological innovations have given rise to solutions that can simultaneously resolve environmental and business issues by helping logistics facilities use energy more efficiently, reducing waste production, and increasing safety.

In some distribution centers, the entire building may be air conditioned, leading to significant energy consumption. Some customers have successfully reduced this consumption by adopting inverter fan motors and by visualizing power consumption with demand monitoring equipment to optimize production equipment operation schedules (e.g., by optimizing break time distribution).

How Omron can help

Omron's product offerings for predictive maintenance are equipped to help the logistics industry achieve carbon neutrality by increasing energy efficiency through the monitoring of critical items like conveyors, motors, and packaging equipment. This is achieved by advanced algorithms tracking vital metrics like voltage, current, temperature, vibration, and insulation resistance to notify you if anything is operating outside of normal parameters.

Having real-time information on equipment status allows you to predict failures before they occur, leading to reduced equipment downtime, reduced maintenance schedules, and less waste created through excess maintenance and premature replacement of equipment.



Omron's commitment to the environment

Omron's "Carbon Zero" initiative sets the goal of reducing greenhouse gas emissions to zero by 2050. Using the Scope 1 and 2¹ greenhouse gas emission quantities of fiscal 2016 as a baseline, we back-cast from fiscal 2050 to set reduction targets for fiscal 2030 and fiscal 2020¹.

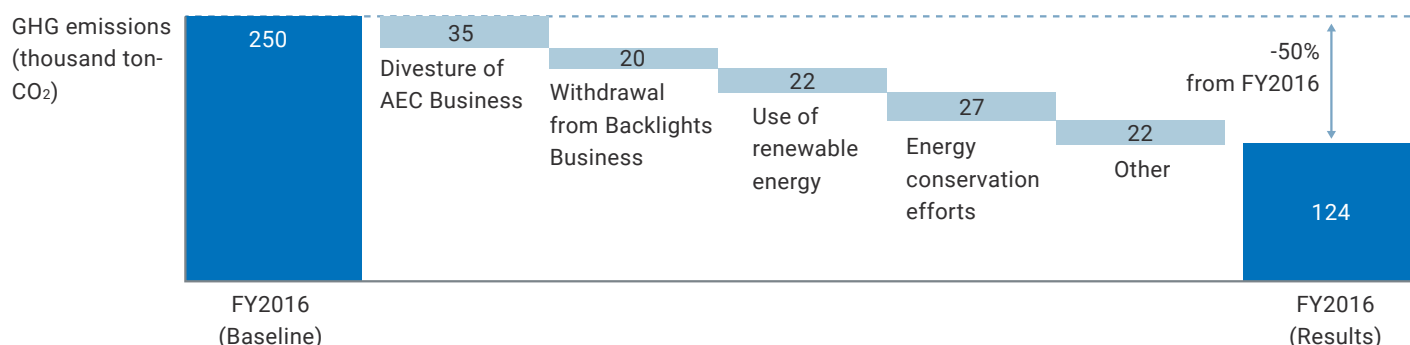
We are currently taking several measures to meet these goals. For example, in fiscal 2018, we began using electricity sourced from renewable energy for our Japanese locations. In fiscal 2019, we analyzed the energy conservation potential¹ of our locations in the Asia Pacific region, where we consume the third largest amount of energy, after Japan and China. In our Indonesian plants, we identified areas where annual energy consumptions could be cut by 23%, and we are taking action based on a medium-term plan aimed to address these issues.

In fiscal 2020, we implemented energy conservation measures in several of our locations and built new solar power generation systems. We also analyzed the energy conservation potential of our plants in Malaysia, which consume large amounts of energy. As a result of these efforts, in fiscal 2020, we were able to reduce greenhouse gas emissions by 124kt-CO₂, or by 50% compared to fiscal 2016.

Additionally, Omron has been listed for four consecutive years on the Dow Jones Sustainability World Index (DJSI World). Of the 3500 global companies that were evaluated, only 323 companies have been selected for the DJSI World Index, showing that Omron ranks in the top 10% of global companies when it comes to sustainability efforts. We are currently developing our next long-term vision, which will include targets for Scope 3¹ emissions as well.



GHG Emissions in Fiscal 2020



1. Scope 1: Direct greenhouse gas (GHG) emissions. Direct GHG emissions occur from sources that are owned or controlled by the company (such as emissions from combustion in owned or controlled boilers, furnaces, vehicles, and the like).

Scope 2: Electricity-indirect GHG emissions. Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company.

Scope 3: Other indirect GHG emissions. Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but they occur from sources not owned or controlled by the company. (The Greenhouse Gas Protocol (<https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>))

*2. Greenhouse gas emissions calculated from sales forecasts, including the Automotive Electronic Components Business (AEC) that was sold off in October 2019. In considering targets to align with the SBT criteria in fiscal 2017, we set 2016, the year of the latest values, as the reference year. (SBT: Science Based Targets. Science-based, medium-to long-term targets for reducing greenhouse gases.)

*3. Omron's unique approach to identifying energy loss risks and opportunities for improving energy efficiency at production locations, formulating specific measures with estimates of impacts and costs.

Resolving issues in facility maintenance

Environmental burdens and business issues are inextricably linked. Prolonged downtime, for example, causes both a loss of productivity and an increase in power usage and waste. Therefore, preventing equipment failures is key to achieving both your environmental and business goals.

Issues like unexpected downtime are mainly caused by two types of failures: no-function failures and less-function failures. A no-function failure is one that causes the distribution center to stop operations. Such failures compromise the energy efficiency of normal operations.

A less-function failure, on the other hand, compromises the performance of the distribution center. Such failures waste energy by slowing down normal operations, compromising efficiency, and leading to more disposal.

Issues in Facility Maintenance



About the ISO14001 standard

Waste treatment and excessive energy conservation measures can have adverse effects on a company's business, making such efforts unsustainable. It is therefore critical to tie your business goals to your environmental goals so that both can be pursued simultaneously.

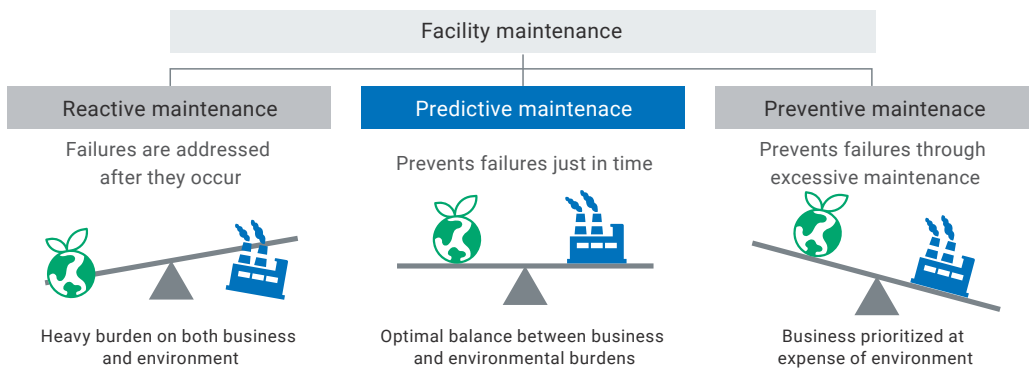
ISO14001, an international standard for environmental management systems, recommends organizations to balance environmental protection with social needs and flexibly adapt to changes in the environmental situation.



Preventing failures by switching to predictive maintenance

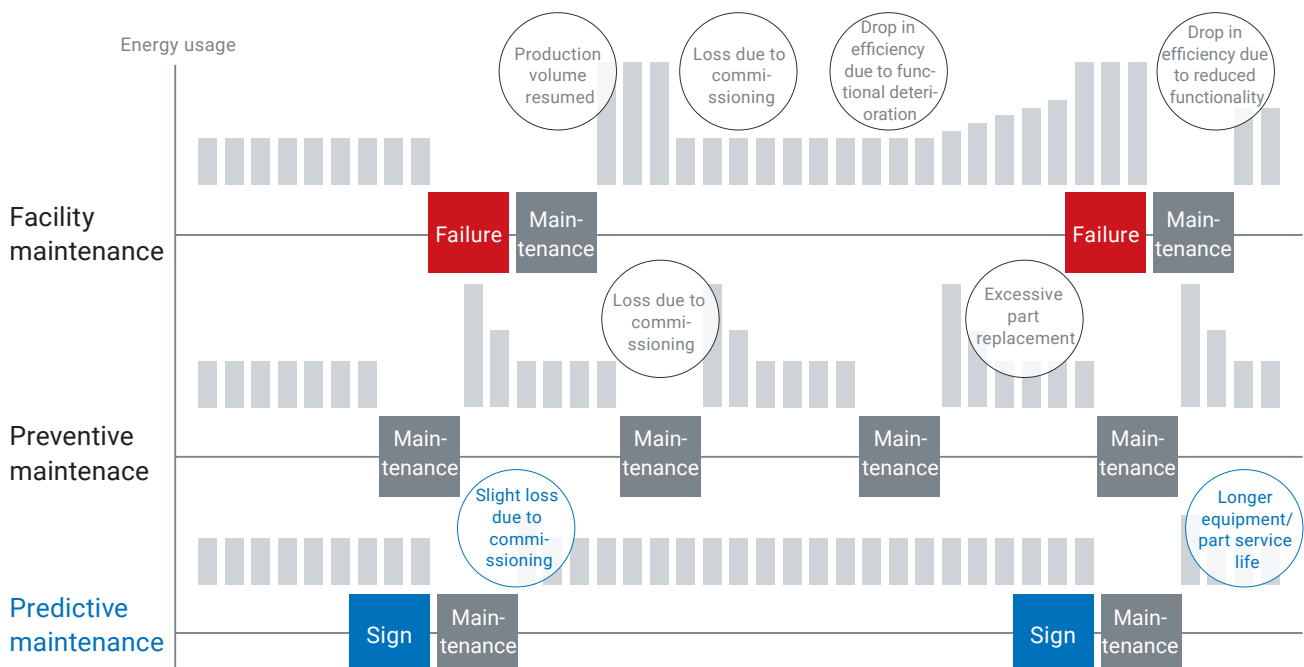
There are three main styles of maintenance: reactive, preventive, and predictive. The least effective of the three is **reactive maintenance**, in which failures are addressed after they occur. This is environmentally costly because it creates unplanned equipment downtime that results in inefficient power usage.

In the case of **preventive maintenance**, failures are avoided by means of regular manual inspections. This method requires frequent downtime during inspection and can lead to premature replacement of equipment, both of which can be taxing on the environment. This has led many organizations to consider a third option: technology-driven **predictive maintenance**.



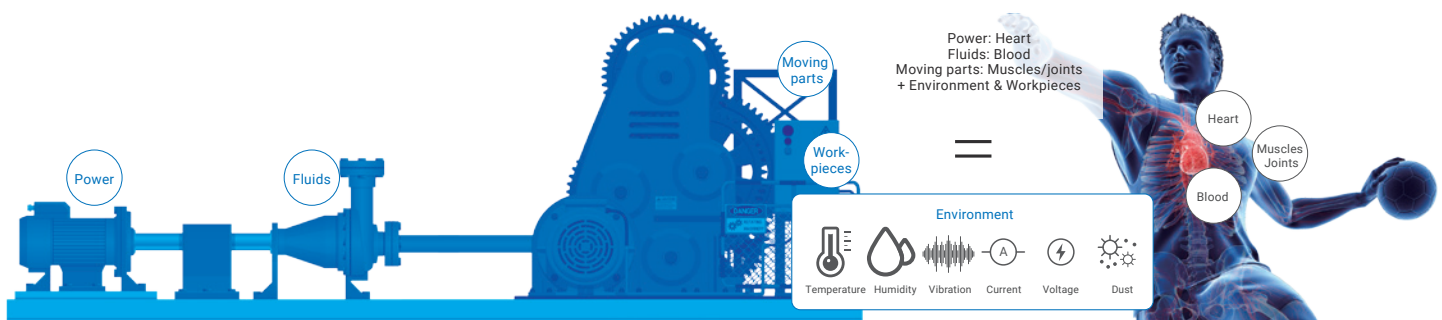
How predictive maintenance helps conserve energy

Predictive maintenance allows you to effectively cut energy use by reducing the frequency of failures and inspections. According to "Economics of Manufacturing Machinery Maintenance" (June 2020) by Douglas S. Thomas and Brian A. Weiss, adopting predictive maintenance would be effective in reducing 18.1 billion USD of downtime that occurs annually in facilities (*1). This is friendly to the environment, and the losses should be eliminated.



Omron's predictive maintenance: User-friendly, site-contained solutions

Omron's site-contained predictive maintenance solutions allow a wide range of processes to be conducted using onsite condition monitoring devices, with the option to start as small as at the department level. These processes include collecting data from relevant devices, visualizing and analyzing this data, and making assessments and judgments based on this analysis. Omron predictive maintenance technologies monitor the conditions of power, fluids, moving parts, workpieces, and the environment.



Why distribution centers need advanced anomaly detection

Power is defined as something that converts energy (e.g., electrical energy) into heat or force for material handling machinery. Some examples include motors and heaters (and also the control panels that control them).

When power fails, operations within the distribution center can come to a stop, or — at the very least — operations are slowed substantially. Therefore, power is as important as the heart is to the human body and should never be allowed to stop. Understanding the mechanism of its failure through constant monitoring of its deterioration status is extremely critical.

Solutions for preventing no-function power failures

Our solutions prevent no-function failures by digitizing information on the deterioration status of power components. This allows for the detection of motor bearing and insulation failures, both of which consume high levels of energy, and of abnormal temperatures that are a direct cause of wasted energy.

- Solution for monitoring the conditions of 3-phase induction motors and their peripherals
- Solution for monitoring the temperature conditions of devices and equipment
- Solution for monitoring the trend of insulation degradation in motors
- Solution for monitoring the voltage, current, and remaining life of switched-mode power supplies

Monitoring all moving parts and environmental components to maintain excellent health

Moving parts use energy to move and process objects. In the human body analogy, these components would each correspond to the blood, muscles (joints), and living environment. Checking on them is therefore akin to a physical, through which the state of a person's body and lifestyle are examined to determine the causes of problems and find solutions.

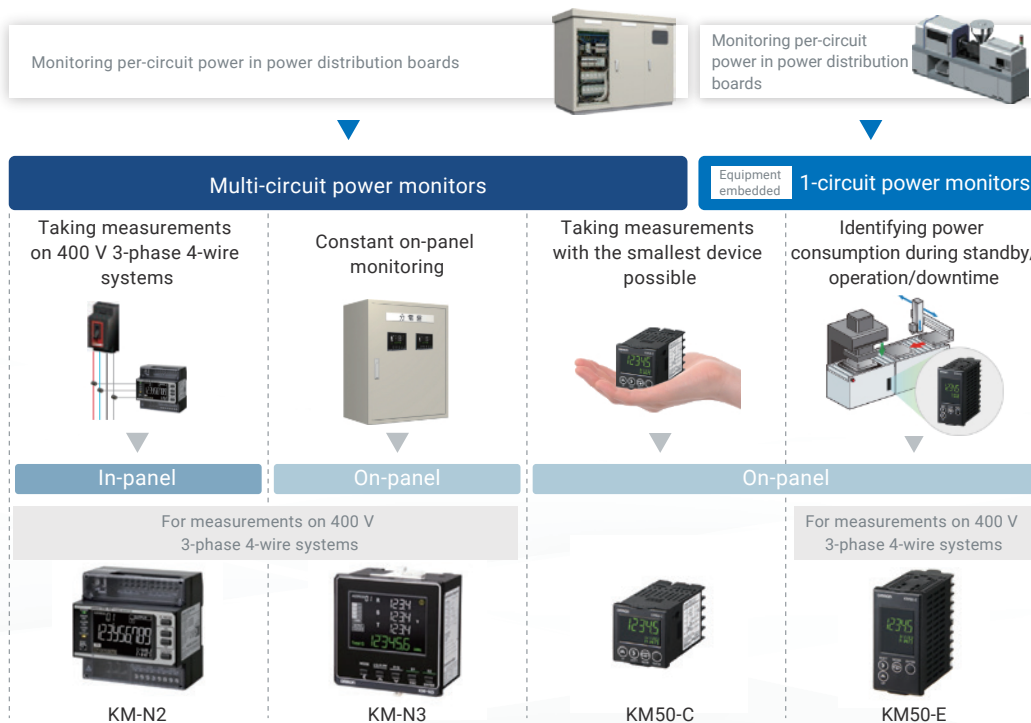
By monitoring critical metrics of your equipment – like electric currents, insulation resistance, temperature, and vibration – along with workpieces and environmental components, you can detect changes in conditions and deduce their causal relationships.

Condition sensing for preventing less-function failures

Information on all changes in the conditions of warehouse equipment – including moving parts, environmental components, and workpieces – is digitized to always keep the warehouse in excellent health and thus prevent less-function failures. This helps to optimize energy use as well.

Power monitoring solutions

To achieve carbon neutrality, power usage needs to be visualized so that equipment that consumes a large amount of electricity can be identified and improvements can be made accordingly. Our KM Series products make this visualization possible thanks to their ability to monitor electric power usage of a wide range of equipment.



Business planning with an eye toward energy management

We are now creating new maintenance innovation solutions that empower our customers to proactively manage energy in their supply chains. To this end, we are collaborating with a wide range of companies through open innovation.

Use case: Reducing loss through maintenance innovation

Omron released its first ever condition monitoring device in 2017 and has continued to expand its product lineup ever since. So far, our solutions have been chosen by our customers primarily to achieve business goals. Going forward, we expect these technologies to be increasingly implemented to meet environmental goals as well.

Preventing conveyor failure with the K6CM Motor Condition Monitor

Conveyors use motors, gears, belts, and chains when running. These components are susceptible to foreign debris and wear that can cause unexpected failure at any moment. Protecting against this type of failure is critical to an efficiently functioning distribution center.



Implementation

With past inspection methods using insulation resistance meters, motor measurements often vary depending on when they are taken. Installation of a device that can monitor critical metrics (K6CM), including motor current, vibration, temperature, and insulation resistance allows for data to be immediately and automatically accumulated. This data helps clarify the effects of temperature and humidity with regards to data accuracy and demonstrate that maintenance schedules can be improved to optimize conveyor motor operation.

As a specific example, the K6CM is capable of monitoring for foreign debris that gets caught in the conveyor chain. Through vibration feedback provided by K6CM, abnormal operation and foreign debris can be identified by an internal algorithm. This allows maintenance to react quickly and remove the foreign debris before it causes a major issue with conveyor operation. This information is communicated back to a local monitoring PC via Ethernet IP communication.

Impact

Predictive maintenance products like the K6CM reduce the effort required for frequent manual inspections and enable systematic maintenance by identifying trends in the conveyor motor health. Customers can take action before a significant failure causes the conveyor to become inoperable.



To monitor the condition of 3-phase induction motors and peripheral equipment

For load abnormality

K6CM-CI



For insulation degradation

K6CM-IS



For bearing wear

K6CM-VB



Motor Condition
Monitoring tool



To monitor the trend of insulation degradation in motors

K7GE



K7GE-MG Logging
Tool

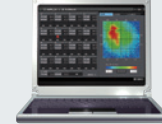


To monitor the temperature status of devices and equipment

K6PM-TH



Thermal Condition
Monitoring tool



Products for monitoring fluid components, moving parts, and environments

E8FC/E8PC

ZN-PD-S

STC-R

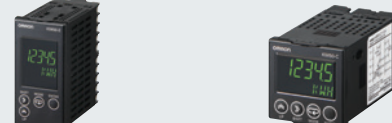
E9NC-T



Products for monitoring power usage and identifying problems

KM50-E

KM50-C



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