

Solutions for Total Facility Condition and Trend Monitoring

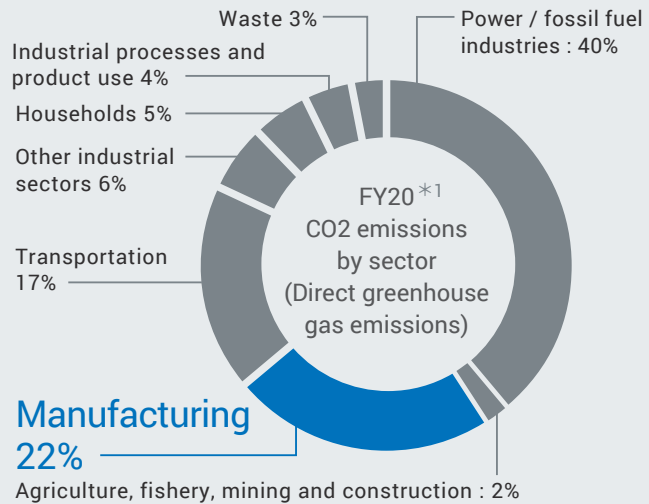


Problems in Manufacturing Sector

Why the Manufacturing Sector Should Work Toward Carbon Neutrality

According to investigation by Japan's National Institute for Environmental Studies, manufacturing accounts for 22 % of the world's energy-related CO2 emissions.*1 This is a sizable share, indicating carbon neutrality efforts in the manufacturing sector can greatly impact total CO2 emission levels. Factories in particular, with their massive power consumption and industrial waste, are a major source of CO2 emissions, and in urgent need of improvement."Without initiatives taken to achieve carbon neutrality, there is a risk of corporate value being lost and negative impact on business. Therefore, achieving carbon neutrality is our corporate mission.

*1. Created based on the data from the Greenhouse Gas Inventory Office of Japan, National Institute for Environmental Studies



- Power / fossil fuel sector: Expand use of renewable energy
- Transportation sector: Use renewable energy, e.g. by using electric vehicles
- Manufacturing and building sectors: Implement rigorous energy conservation measures, use renewable energy

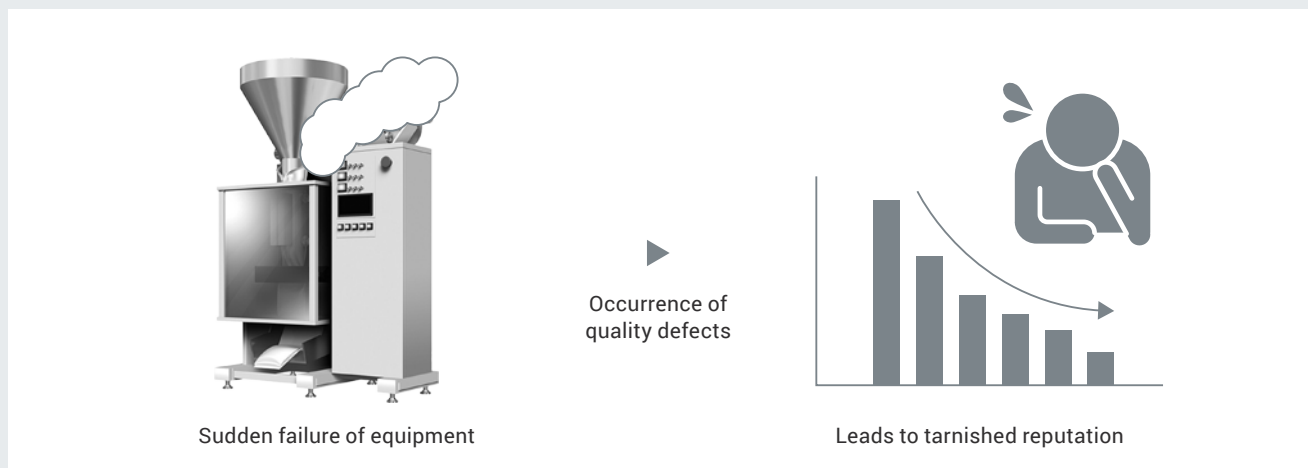
Conserving Energy Through Predictive Maintenance

Predictive maintenance allows you to effectively cut energy usage by reducing the frequency of failures and automating the equipment inspection process. 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 0.8 billion USD of defects and 18.1 billion USD of downtime.*2 This improves machine throughput, profitability and reduces the impact on the environment

*2. References:NIST Advanced Manufacturing Series 100-34, Economics of Manufacturing Machinery Maintenance, Douglas S. Thomas, Brian A. Weiss, June 2020
<https://www.nist.gov/el/applied-economics-office/manufacturing/topics-manufacturing/manufacturing-machinery-maintenance>
<https://nvlpubs.nist.gov/nistpubs/ams/NIST.AMS.100-34.pdf>

Food waste loss reduction with safety and peace of mind

In recent years, there has been increased interest in SDGs, which has shifted the spotlight onto the problem of food waste. Some 2.5 billion tons of food is wasted worldwide *3, of which 16% *3 is said to be attributable to production and logistics, including the manufacturing industry. On the other hand, food safety and security are also being scrutinized, and there is a dilemma in that large amounts of food must be disposed of in order to prevent foods with a risk of quality defects from entering the market. Food waste has a huge negative impact both in economic and environmental terms. In particular, damage to companies' brand image due to food waste brings a major economic loss.

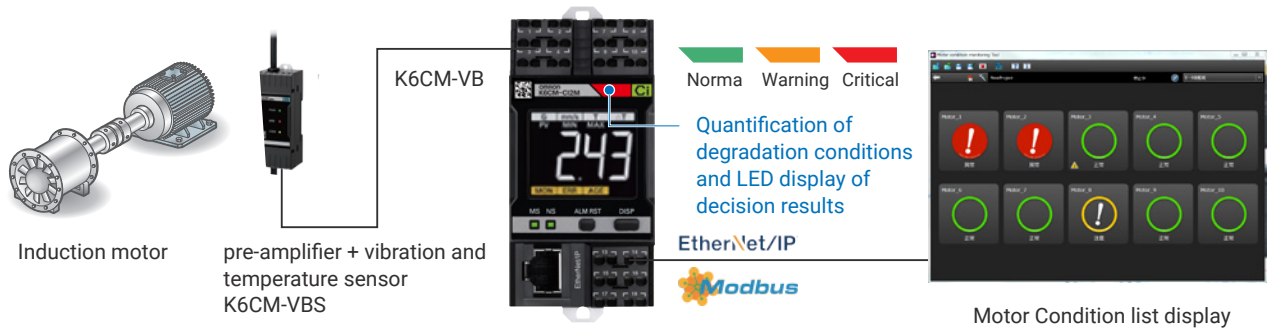


*3. 世界自然保護基金 (WWF) と英国の小売り大手テスコの報告書「Driven to Waste (2021年7月)」

Omron's Predictive Maintenance Solutions

Equipment condition analysis can be achieved by new maintenance personnel through predictive maintenance

OMRON's solutions convert information collected by sensors into easy-to-understand numerical values and parameters that show clear changes, even providing support for determining the necessity of maintenance through comparison with threshold values. This will enable decision-making that was previously only possible with equipment manufacturers or experts.



Improvement example

BEFORE

Unable to carry out maintenance, equipment suddenly stopped, resulting in quality defects.

■ Unexpected equipment stoppage

Foods accumulate inside the equipment, causing quality defects.

■ Diminished functionality of equipment

Abnormal operation leads to quality defects.

AFTER

By digitalizing maintenance, it is possible to reduce food waste in manufacturing processes and prevent quality defects.

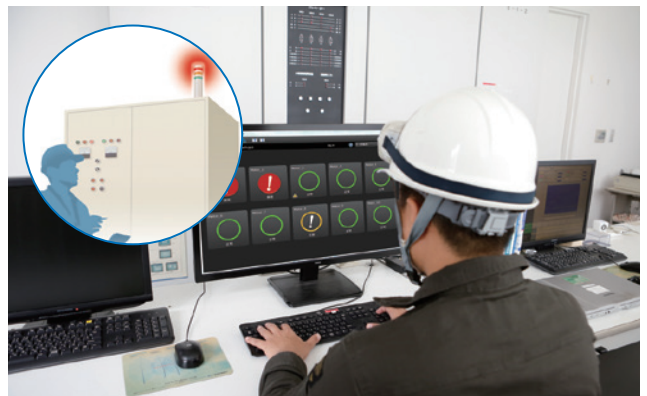
■ Long halt of equipment operation

By monitoring degradation conditions of important equipment, long halts can be prevented before they occur.

■ Detection of

“something different from usual”

By capturing microscopic changes in movement that are different from usual, quality defects can be prevented before they occur.

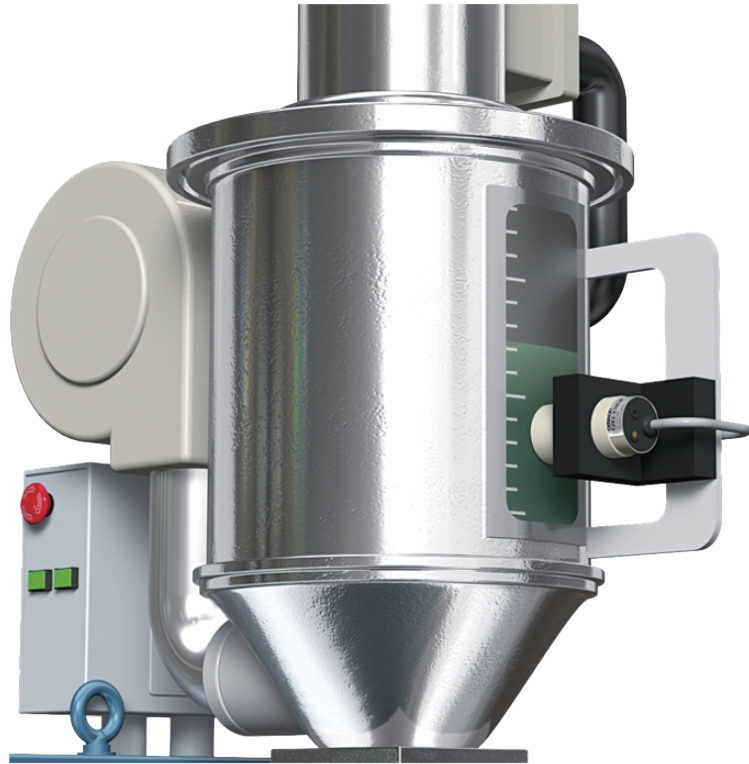


Total condition monitoring for mixing and stirring equipment

In recent years, food safety and security have been scrutinized, and consumer are more keenly aware of contamination than ever before. If contamination occurs even once, there will be significant damage to corporate image and a risk of legal action. To avoid such risk, it is important to monitor equipment condition and maintain normal conditions.

Monitoring Target

Mixers, mixer motor,
V-belt, control panel,
DC power supply,
internal mixer bearings



Monitoring of foreign matter inside mixers



Advanced Motor Condition
Monitoring Device
K7DD



Mixer motor insulation degradation monitoring



Insulation Resistance
Monitoring Device
K7GE-MG



Error Mode	Quality defects due to presence of foreign matter
Detection principle	Load changes occur when stirring blades come into contact with foreign matter. This will appear as variation in power, so this can be detected with advanced motor condition monitoring devices
Implementation effects	By realizing that foreign matter has entered a mixer, it is possible to prevent quality defects. Contributes not only to condition monitoring objective but also to quality improvement

Error Mode	Mixer motor insulation degradation monitoring
Detection principle	When there is heat or environmental impact, motor insulation resistance values change, so this can be detected with insulation resistance monitoring devices
Implementation effects	Trend monitoring in insulation, which are difficult to ascertain purely by human intuition, can be monitored by periodically measuring motor insulation resistance values. Contributes to reduced person-hours thanks to automation of periodic inspections using insulation tester

V-belt degradation monitoring

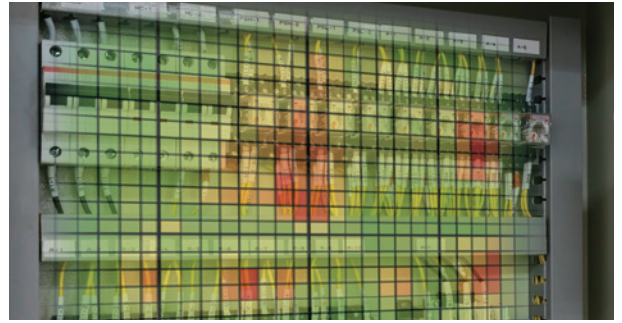


Motor Condition Monitoring Device
Comprehensive current diagnosis type
K6CM-CI



Error Mode	Inadequate stirring due to V-belt degradation
Detection principle	Irregular load changes occur due to V-belt warping with age, and the electric current waveform becomes distorted. The distortion can be detected by capturing with motor condition monitoring devices (comprehensive current diagnosis type)
Implementation effects	V-belt abnormalities that cannot be captured through oscillation can be monitored. Contributes to scheduled maintenance by enabling replacing before V-belt snaps

Control panel abnormal heat monitoring



Thermal Condition Monitoring Device
K6PM-TH



Error Mode	Fire due to abnormal heat generation of firing furnace panel transformer
Detection principle	Surface-wide temperature monitoring of abnormal heat generation of a device (transformer) inside the panel can be achieved using contact-free infrared sensors
Implementation effects	Frequency of inspections can be reduced by using a thermo viewer. Constant surface temperature monitoring contributes to reduced fire risk thanks to ability to take measures before abnormal heat generation occurs

Monitoring of replacement timing for sensors and control device DC power supplies

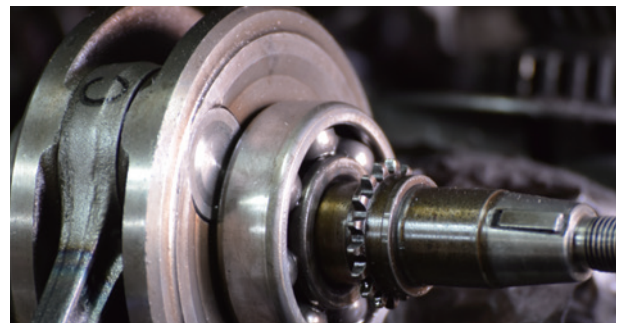


Switching Power Supply
S8VK-X



Error Mode	DC power supply failure due to age-related degradation
Detection principle	DC power supplies often reach the end of their life due to a decline in the capacity of internal condensers, and the speed of capacity decline changes significantly depending on the temperature of the usage environment. Timing for replacement can be detected by measuring internal condenser temperature and calculating capacity decline
Implementation effects	Output condition of power supply load can be ascertained, which makes it possible to reduce verification workload. Contributes to prevention of sudden equipment stoppage by enabling scheduled replacement with visualization of timing for replacement

Bearing in mixer degradation monitoring



Motor Condition Monitoring Device
Vibration and Temperature type
K6CM-VB



Error Mode	Equipment stoppage due to bearing failure (grease degradation or scratches)
Detection principle	When there is abnormal load applied on bearings, the orbital plane is separates, producing roughness, and smooth rotation is no longer possible, resulting in high-frequency oscillation. Since oscillation in the order of kHz can be measured, this can be detected with motor condition monitoring devices (oscillation and temperature monitoring devices)
Implementation effects	The skills of maintenance personnel with a stethoscope rod an the like can be digitalized to enable simple trend monitoring. Contributes to prevention of sudden motor failure by enabling scheduled maintenance with the visualization of bearing degradation condition

Total condition monitoring for packing equipment

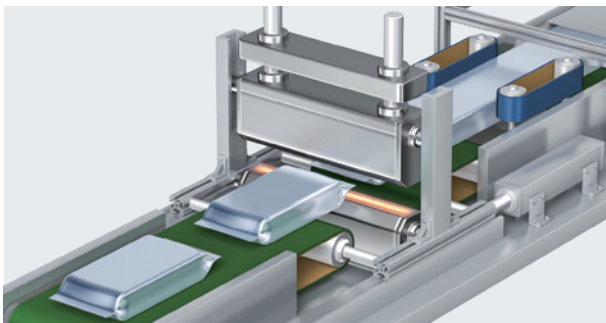
While the number of types of goods and individual packing are increasing due to diversification of needs, increased environmental awareness is bringing about a shift to packing using new materials as a solution to the marine plastic issue. As a result, production requirements are becoming stricter, and there is a risk of repeated occurrence of quality defects if the equipment management level remains unchanged. Therefore, it is becoming essential to monitor equipment condition in greater detail than before.

Monitoring Target

Heater,
transport motor,
transport
chain conveyor,
control panel,
DC power supply



Monitoring for signs of heater burn-out

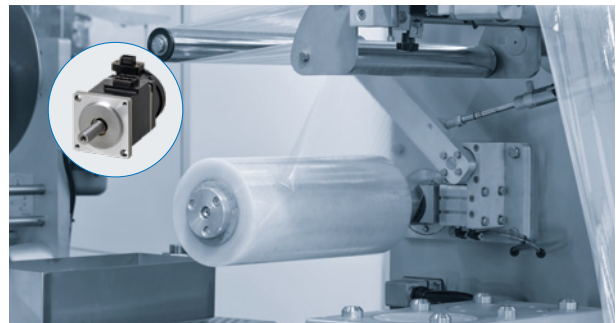


Heater Condition Monitoring Device K7TM



Error Mode	Packing defects due to heater burn-out
Detection principle	When a heater is used for many years, oxidization progresses and fragility ensues, leading to increased resistance values, so this can be detected with heater condition monitoring devices
Implementation effects	Downtime resulting from sudden heater burn-out can be reduced. Also contributes to prevention of retrogression occurring due to packing defects as a result of heater burn-out

Packing film conveyor motor insulation degradation monitoring

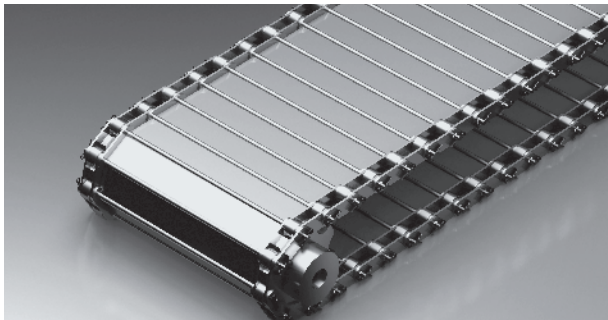


Insulation Resistance Monitoring Device K7GE-MG



Error Mode	Equipment stoppage due to motor insulation degradation
Detection principle	When there is heat or environmental impact, motor insulation resistance values change, so this can be detected with insulation resistance monitoring devices
Implementation effects	Trend monitoring in insulation, which are difficult to ascertain purely by human intuition, can be monitored by periodically measuring motor insulation resistance values. Contributes to reduced person-hours thanks to automation of periodic inspections using insulation tester

Transport chain conveyor abnormality monitoring

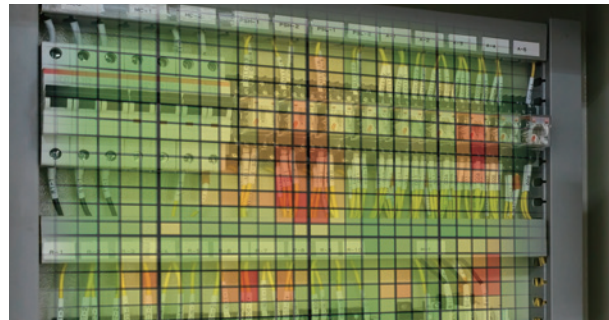


Advanced Motor Condition Monitoring Device K7DD



Error Mode	Grease running out or presence of foreign matter in transport chain conveyor gears
Detection principle	Load changes fluctuate with the presence of foreign matter and grease running out. Multiple load change patterns for each motor can be detected with a single advanced motor condition monitoring device
Implementation effects	Even failure modes can be specified, so maintenance workload can be reduced. Also contributes to preventing sudden equipment stoppages, since scheduled maintenance can be performed in line with the condition of chain conveyor degradation

Control panel abnormal heat monitoring



Thermal Condition Monitoring Device K6PM-TH



Error Mode	Failure due to abnormal heat of devices in a panel
Detection principle	Surface-wide temperature monitoring of abnormal heat generation of a device (transformer) inside the panel can be achieved using contact-free infrared sensors
Implementation effects	Frequency of inspections can be reduced by using a thermo viewer. Constant surface temperature monitoring contributes to reduced fire risk thanks to ability to take measures before abnormal heat generation occurs

Monitoring of replacement timing for sensors and control device DC power supplies

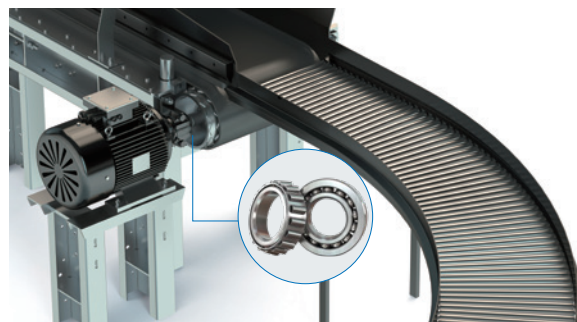


Switching Power Supply S8VK-X



Error Mode	DC power supply failure due to age-related degradation
Detection principle	DC power supplies often reach the end of their life due to a decline in the capacity of internal condensers, and the speed of capacity decline changes significantly depending on the temperature of the usage environment. Timing for replacement can be detected by measuring internal condenser temperature and calculating capacity decline
Implementation effects	Output condition of power supply load can be ascertained, which makes it possible to reduce verification workload. Contributes to prevention of sudden equipment stoppage by enabling scheduled replacement with visualization of timing for replacement

Transfer motor bearings abnormalities detection



Motor Condition Monitoring Device Vibration and Temperature type K6CM-VB



Error Mode	Equipment stoppage due to bearing failure (grease degradation or scratches)
Detection principle	When there is abnormal load applied on bearings, the orbital plane is separates, producing roughness, and smooth rotation is no longer possible, resulting in high-frequency oscillation. Since oscillation in the order of kHz can be measured, this can be detected with motor condition monitoring devices (oscillation and temperature monitoring devices)
Implementation effects	Scheduled maintenance is enabled by visualization of bearing degradation condition. Contributes to preventing sudden motor failure

Total condition monitoring for blow-molding equipment

A shift toward making container lighter and less bulky has in recent years been adopted as a measure to achieve carbon neutrality. Production condition management becomes stricter due to making container less bulky, so unless equipment monitoring is carried out in greater detail than before, there is a risk that yield rate will deteriorate considerably.

Monitoring Target

Transport chains,
transport motors,
blow-molding
compressors,
control panels,
DC power supplies



Transport chain degradation monitoring

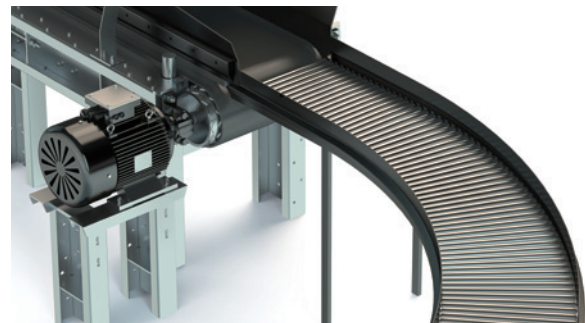


Advanced Motor Condition Monitoring Device
K7DD



Error Mode	Transport chain conveyor wear and foreign matter biting
Detection principle	Load changes fluctuate with the presence of foreign matter and grease running out. Multiple load change patterns for each motor can be detected with a single advanced motor condition monitoring device
Implementation effects	Even failure modes can be specified, so maintenance workload can be reduced. Also contributes to preventing sudden equipment stoppages, since scheduled maintenance can be performed in line with the condition of chain conveyor degradation

Transport conveyor motor insulation degradation monitoring



Insulation Resistance Monitoring Device
K7GE-MG



Error Mode	Excessive heat treatment of work due to conveyor stoppage
Detection principle	When there is heat or environmental impact, motor insulation resistance values change, so this can be detected with insulation resistance monitoring devices
Implementation effects	Trend monitoring in insulation, which are difficult to ascertain purely by human intuition, can be monitored by periodically measuring motor insulation resistance values. Also contributes to preventing sudden equipment stoppage thanks to ability to make scheduled replacements

Blow-molding compressor degradation monitoring

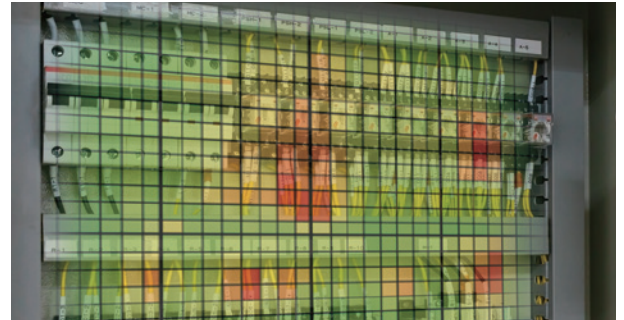


Motor Condition Monitoring Device
Vibration/Temperature type
K6CM-VB



Error Mode	Defective coating due to bearing failure (grease degradation or scratches)
Detection principle	Load changes fluctuate with the presence of foreign matter and grease running out. Multiple load change patterns for each motor can be detected with a single advanced motor condition monitoring device
Implementation effects	The skills of maintenance personnel with a stethoscope rod on the like can be digitalized to enable simple trend monitoring. Contributes to prevention of sudden motor failure by enabling scheduled maintenance with the visualization of bearing degradation condition

Control panel abnormal heat monitoring



Thermal Condition Monitoring Device
K6PM-TH



Error Mode	Failure due to abnormal heat of devices in a panel
Detection principle	Surface-wide temperature monitoring of abnormal heat generation of a device (transformer) inside the panel can be achieved using contact-free infrared sensors
Implementation effects	Frequency of inspections can be reduced by using a thermo viewer. Constant surface temperature monitoring contributes to reduced fire risk thanks to ability to take measures before abnormal heat generation occurs

Monitoring of replacement timing for sensors and control device DC power supplies

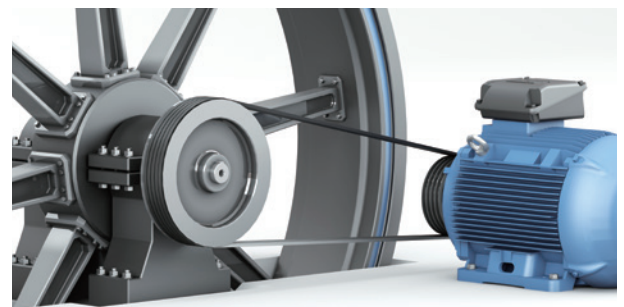


Switching Power Supply
S8VK-X



Error Mode	DC power supply failure due to age-related degradation
Detection principle	DC power supplies often reach the end of their life due to a decline in the capacity of internal condensers, and the speed of capacity decline changes significantly depending on the temperature of the usage environment. Timing for replacement can be detected by measuring internal condenser temperature and calculating capacity decline
Implementation effects	Output condition of power supply load can be ascertained, which makes it possible to reduce verification workload. Contributes to prevention of sudden equipment stoppage by enabling scheduled replacement with visualization of timing for replacement

Blow-molding compressor V-belt degradation monitoring



Motor Condition Monitoring Device
Comprehensive current diagnosis type
K6CM-CI



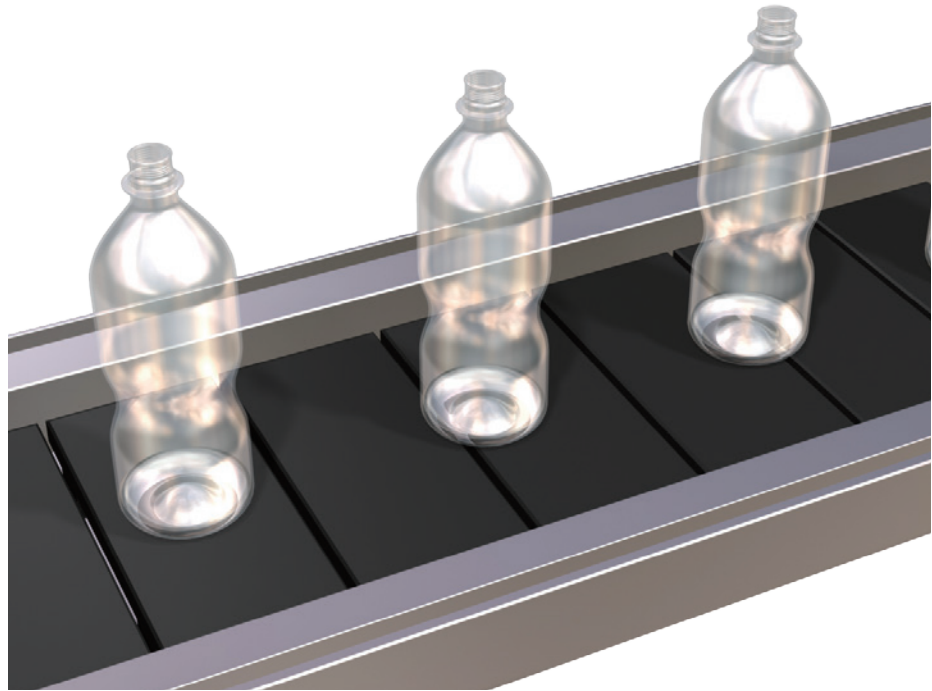
Error Mode	Equipment stoppage due to V-belt disconnection
Detection principle	Irregular load changes occur due to V-belt warping with age, and the electric current waveform becomes distorted. The distortion can be detected by capturing with motor condition monitoring devices (comprehensive current diagnosis type)
Implementation effects	V-belt abnormalities that cannot be captured through oscillation can be monitored. Contributes to scheduled maintenance by enabling replacing before V-belt snaps

Total condition monitoring for transport equipment

Transporters are used in all kinds of industries and are essential equipment for ensuring smooth production. When failure occurs in transporters, this has a huge impact on the entire production line and leads to immeasurable opportunity loss due to sudden equipment stoppage and long halts. Therefore, condition monitoring of equipment has been in particular demand in recent years.

Monitoring Target

Transport chain conveyors,
transport conveyor
motors,
control panels,
DC power supplies



Transport chain conveyor abnormality monitoring

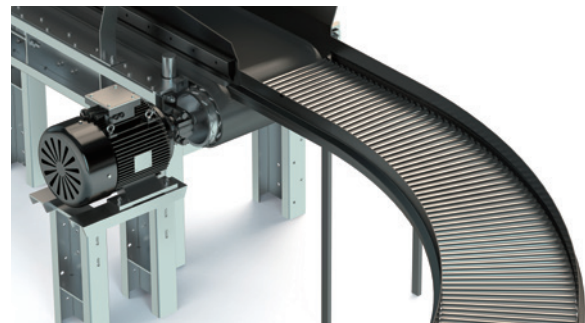


Advanced Motor Condition Monitoring Device K7DD



Error Mode	Grease running out or presence of foreign matter in transport chain conveyor gears
Detection principle	Grease running out and wear load changes vary, and multiple load change patterns can be detected with a single advanced motor condition monitoring device
Implementation effects	Even failure modes can be specified, so maintenance workload can be reduced. Also contributes to preventing sudden equipment stoppages, since scheduled maintenance can be performed in line with the condition of chain conveyor degradation

Transport conveyor motor insulation degradation monitoring



Insulation Resistance Monitoring Device K7GE-MG



Error Mode	Equipment stoppage due to pump motor insulation degradation
Detection principle	When there is heat or environmental impact, motor insulation resistance values change, so this can be detected with insulation resistance monitoring devices
Implementation effects	Trend monitoring in insulation, which are difficult to ascertain purely by human intuition, can be monitored by periodically measuring motor insulation resistance values. Also contributes to preventing sudden equipment stoppage thanks to ability to make scheduled replacements

Vertical transport conveyor motor abnormal heat generation monitoring

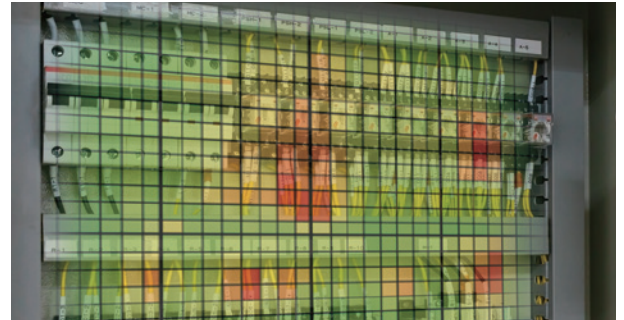


Thermal Condition Monitoring Device
K6PM-TH



Error Mode	Failure due to abnormal motor heat generation
Detection principle	Continued carriage on a transport motor of more or heavier products than envisage causes abnormal heat generation in the motor due to overload. Since this abnormal heat generation can be captured using contactless infrared sensors, this can be detected with temperature condition monitoring devices
Implementation effects	Frequency of inspections can be reduced by using a thermo viewer. Constant surface temperature monitoring contributes to reduced fire risk thanks to ability to take measures before abnormal heat generation occurs

Control panel abnormal heat monitoring



Thermal Condition Monitoring Device
K6PM-TH



Error Mode	Failure due to abnormal heat of devices in a panel
Detection principle	Surface-wide temperature monitoring of abnormal heat generation of a device (transformer) inside the panel can be achieved using contact-free infrared sensors
Implementation effects	Frequency of inspections can be reduced by using a thermo viewer. Constant surface temperature monitoring contributes to reduced fire risk thanks to ability to take measures before abnormal heat generation occurs

Monitoring of replacement timing for sensors and control device DC power supplies

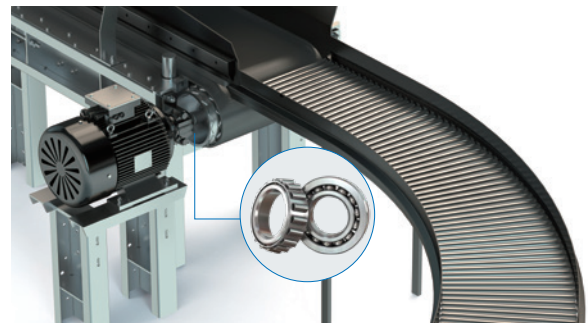


Switching Power Supply
S8VK-X



Error Mode	DC power supply failure due to age-related degradation
Detection principle	DC power supplies often reach the end of their life due to a decline in the capacity of internal condensers, and the speed of capacity decline changes significantly depending on the temperature of the usage environment. Timing for replacement can be detected by measuring internal condenser temperature and calculating capacity decline
Implementation effects	Output condition of power supply load can be ascertained, which makes it possible to reduce verification workload. Contributes to prevention of sudden equipment stoppage by enabling scheduled replacement with visualization of timing for replacement

Transfer motor bearings abnormalities detection



Motor Condition Monitoring Device
Vibration and Temperature type
K6CM-VB



Error Mode	Equipment stoppage due to bearing failure (grease degradation or scratches)
Detection principle	When there is abnormal load applied on bearings, the orbital plane is separates, producing roughness, and smooth rotation is no longer possible, resulting in high-frequency oscillation. Since oscillation in the order of kHz can be measured, this can be detected with motor condition monitoring devices (oscillation and temperature monitoring devices)
Implementation effects	The skills of maintenance personnel with a stethoscope rod an the like can be digitalized to enable simple trend monitoring. Contributes to prevention of sudden motor failure by enabling scheduled maintenance with the visualization of bearing degradation condition

Product Lineup for Omron's Predictive Maintenance Solutions



Advanced Motor Condition Monitoring Device
K7DD

Cat. No.N235-E1



Motor Condition Monitoring Device
K6CM Series

Cat. No.N220-E1



Insulation Resistance Monitoring Device
K7GE

Cat. No.N226-E1



Thermal Condition Monitoring Device
K6PM

Cat. No.H232-E1



Heater Condition Monitoring Device
K7TM

Cat. No.N229-E1



Switching Power Supply
S8VK-X

Cat. No.T211-E1

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