

Implementing a smarter maintenance approach for smart buildings

Tips and solutions for updating maintenance strategies with digitalization in HVAC applications

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Increasing digitalization is not limited to connected consumer devices or smart factory floors. Digitalization is also becoming the norm in modern buildings. Smart buildings have integrated systems that can share information, using IoT sensors and building automation to assure efficiency, comfort, access, and monitoring.

These smart systems can control the heating, ventilation and air conditioning (HVAC), as well as lighting and security, and even user-centric functions like building signage. Users expect more control and seamless integration with other systems, as well as efficient maintenance services.

The benefits of smart buildings with smarter maintenance include reduced downtime, preventive

notifications for planning maintenance tasks, and remote maintenance options to reduce travel for more sustainable maintenance.

Typical traditional maintenance tasks for HVAC solutions in smart buildings include manual check and patrols of controlled ventilation systems for air inlet, cooling tower fans for air conditioning, and fume extraction systems. How can the managers of smart buildings take the first steps towards smart maintenance in their facilities with automation solutions?

Smart maintenance is a combination of actions to reduce manual checks, using automatic analysis of the key factors for preventive maintenance.

Preventive vs smart maintenance?

While preventive maintenance is performed according to a schedule that reflects historical events, predictive maintenance monitors asset condition in real time and prompts interventions before failures cause a disruption. Advances in sensors, analytics, and communication technologies are making predictive maintenance increasingly practical and affordable.

Preventive maintenance or also called scheduled maintenance consists in cyclic maintenance to reduce faults or malfunctioning. Preventive maintenance has the main objective of extending the life cycle of assets and limiting downtime, to prevent excessive qualitative and quantitative degradation of production.

Predictive maintenance is a type of preventive maintenance that is carried out following parameters that are measured and processed to identify the remaining operating time of the machine, before failure. For this purpose, different methodologies are used, such as vibration measurement, thermography and analysis of absorbed currents.

Maintenance Tip 1

Avoid misalignment of the v-belt in a heat exhaust fan

Issue:

An exhaust fan is needed to remove fumes, moisture, or heat from an area of a building, venting them outdoors for removal. The fan uses a motor to turn its blades, and pulleys are used with a belt to drive the fan motor. If the pulley wears out, this will result in increased friction on the belt and additional stress on the drivetrain, which accelerates wear and can reduce airflow. Pulley alignment, belt sizing for the pulley grooves, and belt tension are common causes of underperformance for fan systems. These issues cause more mechanical energy to be dissipated through friction and less energy to be converted into airflow. The motor still consumes relatively high amounts of power, but the fan receives less of that power.

Solution:

By installing a K6CM-CI condition monitoring device, pulley wear can be monitored with comprehensive current diagnosis. Thanks to the solution, degradation level measurement results can be

obtained. When the measurement value reaches the set warning or critical alarm threshold, OMRON's Remote Access Solution RT1 can send the data securely to a cloud-based system. This data can be accessed remotely to find out exactly what the issue is, and for example the pulley can be replaced before any disruption is caused to the operation of the fan. This ensures continuity of service and reduces the impact of emergencies. Even if connectivity to the cloud is not available at that time, data is stored and sent to cloud when the connection is up again.

The data can be collected by the controllers or directly by intelligent devices. Even in case of a hard power off of the plant, by connecting a small uninterrupted power supply (UPS) to the RT1 Series Remote Access Solution, it is possible to send data and trigger e-mails or a text message to the maintenance team to provide all the information needed for fixing the issue or taking actions. These solutions reduce travel cost and the effect of urgencies.



Maintenance Tip 2

Detect duct deterioration and avoid air duct overheating in coating and drying processes

Issue:

Coating and drying is one of the most dangerous processes in car manufacturing. In the drying oven, air heated to 400°C in the combustion chamber travels through the air duct for use in drying. These air ducts degrade over time, sometimes allowing air hotter than 100°C to leak, which can lead to burn injuries during patrol inspection. Hot air may also cause coating components accumulated on the interior of the duct to overheat. Such incidents can result not only in unexpected stoppage in production but also actual human injury or even death. As the air ducts wind through spaces above the ceiling, underground, and other places that are hard to physically access, checking their condition is difficult. In addition to preventing overheating incidents and ensuring occupational health, streamlining the workflow is also a major issue in coating line maintenance.

Solution:

By installing a thermal condition monitoring device (K6PM-TH) it is possible to constantly monitor abnormal heat generation due to drying duct deterioration. Temperatures surrounding the air ducts are remotely monitored by the K6PM, allowing users to detect hot air leaks even from office environments or another safe environment thanks to OMRON's Remote Access solution. The maintenance team can also get access to one or more IP-Cameras to monitor the conditions of the duct and get an actual look at what is happening. This limits the risk for the operator caused by hazardous conditions at the location.



Maintenance Tip 3

Avoid cooling tower fans breakdown due to degradation of bearings

Issue:

Cooling water is used in production facilities. If temperatures rise during the day, cooling fans are turned on to cool the fans, which in turn cool the water. If the bearings in the fan deteriorate, this can lead to failure over time.

Solution:

By installing a K6CM-CI comprehensive current diagnosis type condition monitor, the monitoring solution can detect how the current waveform deviates from the ideal sine wave in abnormal conditions. Thanks to the set warning or critical alarm thresholds,

the user can assess the right timing for maintenance based on the degree of deterioration instead of elapsed time. OMRON's secure Remote Access Solution automatically notifies the user when to perform maintenance. All the issues related to manual inspection and access constraint due to the fact that cooling towers are normally located on the roof of the buildings can be avoided. OMRON's Remote Access Solution also provides 4G cellular and WiFi-based units that enable remote access without LAN availability.



OMRON offers a complete range of products for monitor building equipment 24/7 with high-performing technologies.

- Advanced predictive maintenance with data collection and visualization from key assets of the plant to monitor parts, and process data to reduce the impact of failure.
- Notification on usable parts and spare parts needed for maintenance.
- Immediate connection to the plant for a quick troubleshooting and when possible, fixing the issue.
- Positive impact for society by CO2 reduction thanks to reduced travel for maintenance.

OMRON offers a complete range of products for smarter maintenance solutions.



Remote access

Access machine data everywhere via a secure connection WIFI/4G/LAN connection. Execute a quick connection to a machine to get relevant information and to monitor machine status. Access to IP camera can help understand the issue.



Compact automation

Get full equipment data visibility and remote access with a controller that can collect data produced by sensors and actuators.



Condition monitoring

Monitor key assets of the machine (motor current/vibration/temperature/insulation resistance), detect abnormal working conditions and share information and trends via EtherNet/IP.



Monitoring relay

The smarter way to protect your system and increase safety, thanks to redundancy with the inverter protection functions. Monitor for incorrect phase sequence and phase loss. No heat generation due to nearby inverters installation



Power supply

Visualize and control the condition of power supplies and load check centrally. Visualize the time to replace power supplies.



Inverters

Be proactive against potential failures and predict drive failures with ageing models for critical components (fan, IGBT, ...). Designed for 10 years of maintenance-free use.

For more details on OMRON's solutions for smart maintenance, please contact us or visit <http://industrial.omron.eu>.