WEG MOTION FLEET MANAGEMENT, INTELLIGENT MANAGEMENT FOR WATER ASSETS

WEG Motion Fleet Management provides efficient management of critical water infrastructure, enabling water assets and equipment to be monitored and controlled, bringing them to their optimal operating point.

Critical water infrastructure is essential to society, life, and human health and can be threatened by electrical, mechanical, and cybernetic problems, with severe consequences for water supply. This is why investment in cutting-edge technologies to preserve and respond to these problems is increasing. At the same time, these tools also serve to achieve economic savings and turn assets into more intelligent and sustainable infrastructures.

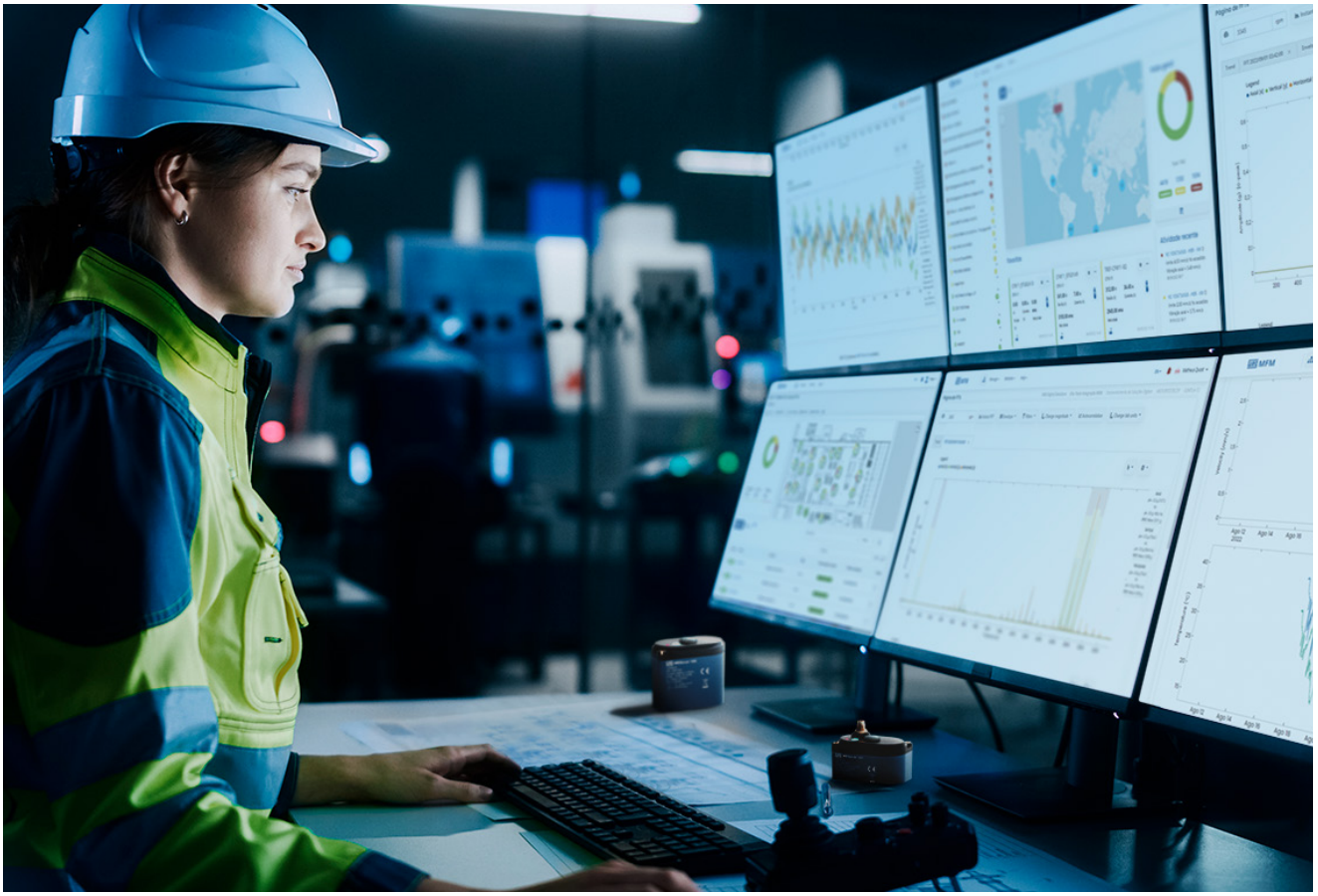
Asset and equipment management is undergoing a significant revolution thanks to industrial digital solutions based on cloud computing, wireless intelligent sensors, and maintenance 4.0 methodologies. Whereas previously large, critical assets were monitored manually and with purely electronic technology, the new solutions enable intelligent monitoring of the entire equipment fleet at an affordable cost, enhancing asset management and maintenance. The result is seen in the increased machine and plant availability and performance, reduced unexpected breakdowns, and reduced fleet operating cost, i.e., reduced TCO.

Over the last decade, WEG has developed various Industry 4.0 solutions for internal applications in its production lines and market offerings. This dual strategy has generated operational efficiency benefits and new advantages for customers in the water and industrial sectors.

As a leading equipment manufacturer with a wide range of solutions, it also enabled WEG to develop Motion Fleet Management and its product family of digital solutions, leveraging its expertise and launching a refined product to its customers worldwide. The project, which started in 2017, featured the following developments chronologically:

- ★ Installation of the WEG Shop Floor Management (WSFM) system at the production sites.
- ★ Adopting the WEG Manufacturing System (WMS) methodology to reduce incidents.
- ★ Use of Maintenance 4.0 and installation of WEG Motor Scan sensor on assets.
- ★ The Motion Fleet Management (MFM) system provides online monitoring and asset management.

As a leading equipment manufacturer, WEG has developed Motion Fleet Management and its product family of digital solutions



Online monitoring with a cloud solution

Digital hardware (sensors and gateways) and software solutions for real-time monitoring are now offered as ready-to-use solutions. Therefore, implementation time and cost are drastically reduced, and the benefits can be seen quickly. By adopting this technology, WEG's maintenance team reduces the number of unplanned outages, optimizes repair actions, and speeds up decision-making:

★ Asset management;
★ Supports maintenance scheduling and actions based on the operational condition of assets;
★ Assists plant operational team decisions;
★ Reduction of the total cost of the asset;
★ Valid for end users, workshops, or maintenance companies.

An integrated family of sensors and edge devices

A family of sensors and edge devices seamlessly integrated with the MFM allows customers to capture and handle information from any rotating equipment, such as electric motors, gearboxes, pumps, compressors, conveyor belts, etc., as well as automation equipment like VFD (variable frequency drives), Soft Starters and Smart Relays, transformers and large machines such as medium voltage motors and generators.

The MFM is one of the market's most complete asset management systems. It allows customers to have mechanical and electrical information from all assets in the industry on the same system, intuitive and comprehensive dashboards, and a powerful vibration analysis tool where experts can plot circular waveform or waterfall cascade graphics, apply various filters, or even ear the bearing noise. A customer configurable report system, including weekly fleet report, online alarm, and critical asset communication through WEG Digital Notify APP, are linked to functions from a CMMS (Computerized Maintenance Management System) that allows customers to receive and handle notifications from the MFM and a mobile phone.

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Motion Fleet Management allows customers to have mechanical and electrical information from all assets in the industry on the same system

The recently launched WEGscan 100, a vibration, temperature, and magnetic field sensor, was granted two patented technologies. WEGsense integrates hardware characteristics with the Artificial Intelligence Advance Algorithm to detect early bearing lubrication problems. At the same time, WEGsync allows the MFM to obtain synchronized vibration measurements from up to seven sensors, allowing for phase analysis and ODS (Operating Deflection Shape).

Fault diagnosis with artificial intelligence

Another critical development of WEG Motion Fleet Management was to incorporate the knowledge gained by the company over 60 years of manufacturing electrical and mechanical equipment into a module that provides the system user with a comprehensive fleet report that includes the results of Artificial Intelligence data analysis, significant for users who do not have dedicated equipment for asset condition analysis.

Specialized modules are available for electric motors, low and medium-voltage variable frequency drives, soft starters, and gearboxes/gear motors. The technical modules apply artificial intelligence and machine learning to diagnose the current operational status of equipment and provide intelligent, easy-to-understand results to the system user. The Motor Specialist module, for example, uses magnetic field measurements to infer motor power consumption and three-axis vibration data to indicate early analysis of bearing failures and vibrations due to motor imbalance or misalignment, external vibrations, or other unknown faults.

WEG Motor Specialist has a sub-module for diagnosing mechanical faults and another for evaluating engine energy consumption

Specialist module

The Specialist module applies algorithms designed by WEG for advanced data analysis using Machine Learning and Artificial Intelligence. These algorithms are applied to the data collected by WEG Scans and thus generate helpful information essential for efficient fleet management. Such is the case of WEG Motor Specialist, which has a sub-module for diagnosing mechanical faults and another for evaluating engine energy consumption. Both functionalities have been developed by WEG's team of experts and validated in the company's laboratories.

These advanced analysis algorithms observe and learn the operating patterns and deviations of the monitored equipment, generating, for example, fault indicators for unbalance, misalignment, rolling (advanced fault), or external vibration. This information benefits operation and maintenance personnel as it aids decision-making, speeds up the repair process, and minimizes unscheduled downtime.

Exchange module

WEG Motion Fleet Management enables data to be exchanged between MFM and

third-party systems or platforms, storing data in the customer's database, integrating with third-party systems and applications, and customer-specific subscription plans.

Through regular and automatic Web Service REST-like data requests, data from WEG Motion Fleet Management is sent to the customer's system or third parties and can, therefore, be integrated into the customer's maintenance management software, SCADA or DCS, or any other production monitoring system they may have.

WEG Motion Fleet Management currently has hundreds of monitored assets, providing accurate maintenance information based on the asset's operational status, which is essential for predictive maintenance.

The MFM monitors' main assets are motors, variable frequency drives, soft starters, gearboxes, motors, compressors, pumps, and fans.

Some applications in water treatment plants

One of the applications of MFM in the water sector can be in pumping systems. By including a WEGscan sensor in the motor or drive that feeds the membrane filtration, ultrafiltration, or reverse osmosis system, for example, we can find out the production optimization margins, allowing us to extend its operating life and reduce electricity consumption and optimize the economic performance of the manager.

On the other hand, it is standard for water plants to have oversized motors, pumps, or process equipment. This implies a higher cost in CAPEX and OPEX simply because the rotating equipment is not at its real design point in operation. WEG's specialized sensors show how much it consumes and where it is on the duty and performance curves. If, in any of these cases, we observe that the rotating equipment, pump, blower, agitator, or compressor is continuously working at low load, with the MFM system, we can draw valuable conclusions for future plant designs where the equipment will be optimized from the beginning of the operation. In this way, we will save on investment costs, operation and power consumption, and maintenance costs.

The MFM solution can help to integrate into these systems in a much easier and more competitive way. This tool is intended to support not only the maintenance, vibration analysis, bearing problems, misalignment, or consumption that we have already mentioned but also to serve as a source of information to optimize plant operation in the process operation/maintenance balance and also to provide feedback for future engineering designs and project conception.

In general, WEG Motion Fleet Management provides much more efficient management of critical water infrastructure, enabling water assets and equipment to be monitored and controlled, bringing them to their optimal operating point, and avoiding unscheduled shutdowns, resulting in savings, improved manufacturing, and supply outages to end users.

At WEG, we work daily to develop more efficient and sustainable infrastructures, considering the water supply's value for the population and the daily work of plant operation and maintenance teams.