FUTURE PERFECT: PREDICTIVE MAINTENANCE AND AI

Kontron's latest, most powerful rackmount server KISS 4U V3 SKX helps realize growing potential of AI-enabled Predictive Maintenance for Energy and Industrial Automation sectors.

// Predictive maintenance increasingly based on AI

Time is money. Today's Energy and Industrial Automation sectors demand maximum availability, as well as safety, from plant and machinery. While these alone are significant and growing challenges, so too is dealing with the unexpected failure of assets. A damaged steam turbine, for example, can cause substantial disruption, safety hazards and financial loss, not only to the power plant but also the power grid and the thousands of customers relying on a continuous supply of electricity.

In such capital-intensive and competitive industries as these, the optimization of asset maintenance to keep plant and machinery operating efficiently at minimum cost is therefore mission critical. However, the right balance between making the very most of existing assets, while still ensuring their maximum reliability, is not at all easy.

CHANGING MARKET REQUIREMENTS

Faced with such challenges energy exploration, power generation and manufacturing industries are increasingly moving away from purely preventative maintenance regimes to the implementation of IoT-enabled predictive maintenance strategies. While the former approach has relied on past performance data to develop pre-set maintenance and outage service schedules for different types of equipment, predictive maintenance brings into play variations in equipment behavior that might impact such rigid maintenance schedules.

Now, using predictive monitoring analytics, anomalies can often be identified before actual problems or unforeseen events occur. On the factory floor, for example, the connectivity of the IoT is allowing companies to advance from scheduled maintenance to the real-time monitoring of variables such as heat, vibration, light, sound and moisture across a broad range of production machinery. Technicians can use data from sensors to create so-called 'digital twins' of machines, allowing them to identify faults before they appear.

In the case of mechanical engineering, connecting machine sensors to software analytics platforms now allows machine equipment manufacturers to implement remote real-time monitoring of all equipment they have supplied. This means they can reduce or eliminate customer site visits by service personnel through powerful remote diagnostics, warnings and alerts, as well as provide condition-based and usage analysis. The insight gained from IoT-derived machine data can even offer them further business opportunities such as consultancy to customers on how to improve their production processes.

The use of predictive analytics software enables potential causes to be addressed and appropriate solutions put in place. When an outage does happen or is inevitable, the maintenance team can use machine data to assess the fault in advance and ensure the necessary parts are ordered and available ahead of time – considerably reducing any necessary downtime.

AI-ENABLED PREDICTIVE MAINTENANCE

Furthermore, energy and industrial companies are increasingly looking to AI and Machine Learning (a derivative of AI) to complement and take their predictive strategies to a whole new level. By providing an increased understanding of deviations from normal machine behavior, AI-powered predictive maintenance is in some cases already detecting possible failures many months in advance.

Action planning algorithms can be extended or replaced by Machine Learning to identify parameter drift or emerging component failures by using trend analyses and enabling complex pattern recognition - without any prior knowledge of actual or potential problems. With Deep Learning as an advanced technology of Machine Learning, machines actually learn and improve from their own experience with the help of so called neural networks which can identify, interpret and act on patterns in big data sets.

Today, the current major focus of AI applications in power plant maintenance is on needs-based service intervals with the maintenance time determined on the basis of equipment anomalies from day to day wear and tear. Any number of machines and process parameters can be monitored and maintenance requirements dictated in accordance with the status of individual components. For power plant turbines this can cover a range of potential issues such as imbalances, misalignments, stripping, cracks, loosenings blade fracture and foundation changes. This is helping maintenance activities to be more targeted on actual component wear and tear, eliminating the need to undergo full maintenance, therefore saving time and money.

Predictive Maintenance benefits

▶ **INCREASED ASSET AVAILABILITY AND RELIABILITY**
Knowing the condition of machines at any point in time, technicians ensure even the smallest discrepancy or gradual changes in machine behavior are reliably detected.

▶ **REDUCED OPERATING COSTS**
The earliest possible signalling of possible damage maximizes the reaction time for determining the most economical solution to the problem before it occurs.

▶ **SHORTENING OF PLANNED DOWNTIMES**
With the detailed knowledge of the machine condition, the revision or repair time can be reduced to a minimum and inventory carrying costs kept to a minimum.

▶ **IMPROVED HEALTH SAFETY AND ENVIRONMENT (HS&E) COMPLIANCE**
A deeper, real-time knowledge and awareness of machine condition allows pre-emptive measures to be taken concerning any potential safety or environmental issues.

▶ **INCREASED BUSINESS PERFORMANCE**
Improved output and productivity, reduced operating costs and increased profitability can be achieved with the help of appropriate predictive maintenance systems.

HIGH REQUIREMENTS FOR PREDICTIVE MAINTENANCE SYSTEMS

Predictive maintenance systems comprise increasingly powerful and complex monitoring and analytical software which collects data and records the historical baseline performance of individual assets. Edge-based sensors are deployed to enable a comparison of baseline data to real-time performance which is monitored continuously and triggers alerts if actual machine performance falls short of, or exceeds the pre-set baseline data range. Alerts are typically focused on pre-determined parameters such as temperature or vibration discrepancies.

The consistent implementation of such predictive maintenance strategies requires an immediately accessible, in-depth and real-time awareness of machine condition. In the case of power plants, for instance, this can be for a wide and diverse range of machinery, from steam turbosets, gas turbines, pump storage sets, compressor and turbo feed pumps, not to mention wind and tidal turbines.

In all cases, analysis of machine data in close proximity to the network edge is therefore becoming increasingly important, rather than sending all data into a centralized cloud. Reduced latency ensures faster response times and decision making and ultimately will deliver more accurate and effective maintenance and operational strategies.

The server hardware systems must not only be sufficiently powerful and scalable to run increasingly complex AI-enabled software but be able to store, process and analyse large volumes of IoT machine data. They must also have powerful GPUs, be quickly and easily configurable, and highly robust for withstanding often challenging and harsh operating environments.

APPLICATION-ORIENTED SOLUTIONS FOR AI SUPPORTED PREDICTIVE MAINTENANCE

The latest generation of industrial rackmount server hardware from Kontron together with leading predictive maintenance software solutions enables power generation operators, mechanical engineering and manufacturing companies to maximize their assets; for operational visibility into the past, transparency into the present and more clarity about the future.

The company's new, most powerful KISS 4U V3 SKX high performance 4U Rackmount Server is designed for the demanding environments often encountered in power generation and industrial manufacturing production environments. It features Dual Intel® Xeon® processors and complements the company's extensive range of industrial KISS rackmount 4U, 2U and 1U servers.

It provides the processing power and connectivity required for today's most advanced predictive maintenance solutions in energy and industry while being able to withstand shock, vibration and extreme temperatures up to 45° Celsius. Hot-swap chassis and fan filters reduce the MTTR (Mean Time To Repair) many times over, as they can be replaced during operation without tools. In addition, the system can be quickly and stress-free opened for upgrades. Our KISS computers also offer the possibility of connecting heavy full-length CPU cards or GPU cards to the housing by means of a third fixing option, thus preventing transport damage or damage in harsh industrial environments. And our special shock and vibration suspension for drive cages allows rotating mass storage devices to operate reliably in continuous operation even under high shock and vibration loads.

PROVEN INDUSTRY STANDARD TECHNOLOGY
FOR LONG-TERM AVAILABILITY

Kontron's KISS server solutions are widely deployed in the energy and industrial sectors. They are purpose-designed on proven industry standard technology while ensuring long-term availability therefore guaranteeing the future-proofed flexibility required for reducing operational costs and personnel deployment. The company's global technical support services, strong partnerships with industry leading processor and component manufacturers, and its willingness to work alongside customers is also a major advantage.

▶ *"The close partnership with Kontron means our support personnel have gained a deep knowledge of the KISS server solution which gives us the advantage of being able to deliver a more responsive and lower cost maintenance service than previously, as well as ensuring maximum uptime and therefore user productivity. With Kontron embedded at the heart of our mission critical systems infrastructure we have the processing power, reliability, connectivity and worldwide support we need for cost-effectively managing our global field-based data acquisition systems. These are critical to our day to day operations and for securing future business growth."*

Major global products and services provider to the energy industry

KONTRON KISS SERVER RANGE

Kontron's rackmount systems are designed and tested for challenging environments, and are therefore the perfect fit in extreme temperatures and mechanically stressed conditions. Industrial grade and with high processing capability they are designed for use in industrial applications requiring high computing power and data availability.

The new industrial servers are ideally suited for complex computing tasks such as 'Artificial Intelligence' (AI) and machine learning which require the processing and analyzing of huge amounts of data. Efficient thermal concepts, maintenance-free and customizable designs, high performance computing and GPU units enable 24/7 operation and long-term deployment. A high degree of customization is facilitated through features like removable drives, various expansion cards and the availability of various heights 1U, 2U as well as 4U. Short versions offer maximum of processing power and flexibility for limited spaces.

AT A GLANCE

▶ Industrial grade for challenging environments: robust, reliable and sustainable

▶ Maximum performance up to 8th Gen Intel® Core™ i3/5/7 or Dual Intel® Xeon® processors

▶ Supports up to 3 double width high-end GPU cards for breakthrough 'multi precision performance' (NVIDIA® TESLA® V100); alternatively 1GB/ 10GB Ethernet cards (e.g. for connection of IP cameras for surveillance systems)

▶ Powerful power supplies from 800W up to 1200W (sufficient for the operation of 3 high-end graphics cards)

▶ Extended storage possibilities with up to eight 2.5" storage trays

▶ NVMe interface for connecting SSDs via PCIe

▶ Supports Intel® Rapid Technology enterprise Option RAID 0/1/10/5

▶ Remote Management by AST2500 BMC module

▶ Low noise level

▶ Modular and flexible concept for easy customization

▶ Long-term availability (5+ years)

▶ Tool-free replacement of fans, filter mats, or hard disk drives in the removable tray

▶ Microsoft Azure certified, TSN functionality optionally

About Kontron – Member of the S&T Group

Kontron is a global leader in IoT/Embedded Computing Technology (ECT). As a part of technology group S&T, Kontron, together with its sister company S&T Technologies, offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall.

For more information, please visit: **www.kontron.com**

About the Intel® Internet of Things Solutions Alliance

From modular components to market-ready systems, Intel and the 400+ global member companies of the Intel® Internet of Things Solutions Alliance provide scalable, interoperable solutions that accelerate deployment of intelligent devices and end-to-end analytics. Close collaboration with Intel and each other enables Alliance members to innovate with the latest IoT technologies, helping developers deliver first-in-market solutions.

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