Powering production: Vestas aircoil A/S on the cutting edge of digital twin technology

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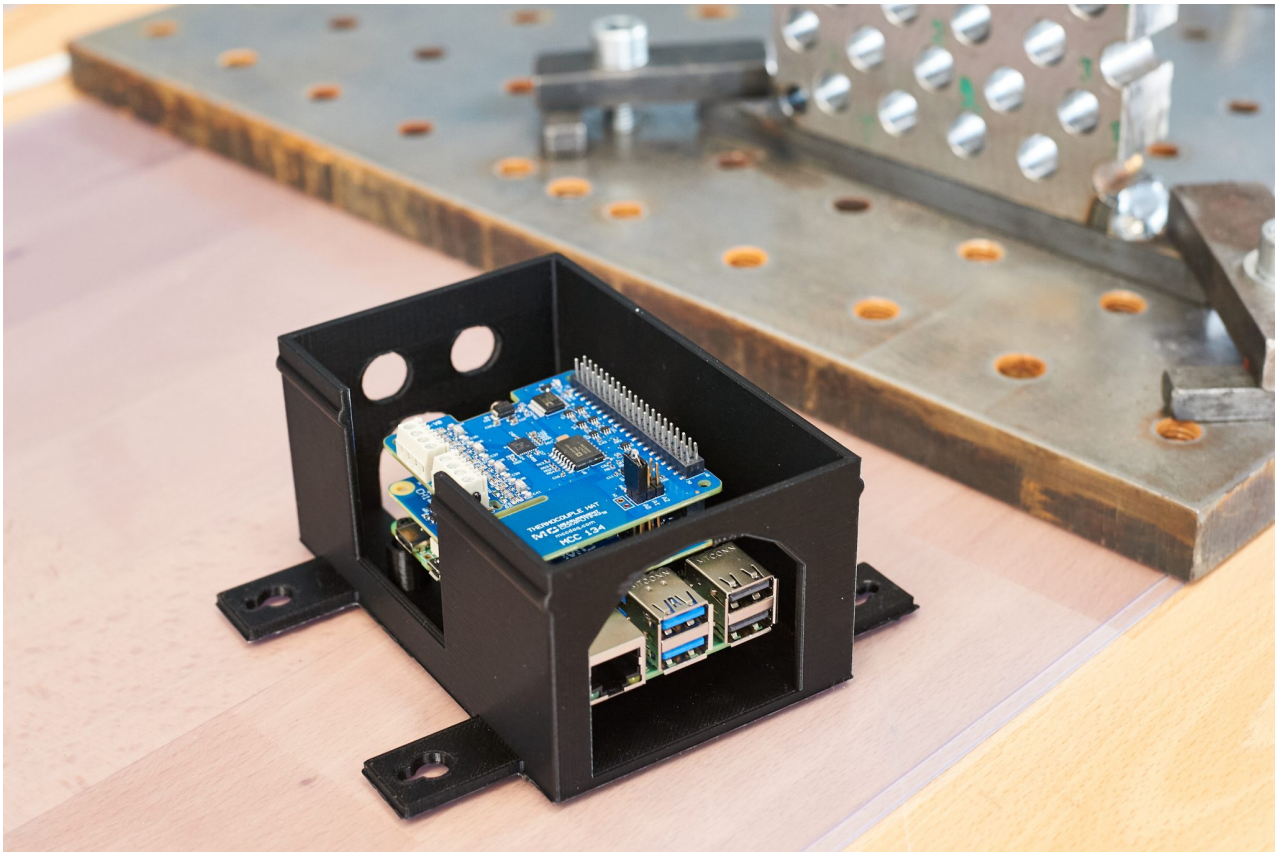

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In an exclusive Q&A interview, Vestas Aircoil A/S, a leader in heat exchanger and charge air cooler solutions, sheds light on its transformative journey with digital twin technology

From enhancing product development to revolutionizing real-time production monitoring and improving Overall Equipment Effectiveness (OEE), the company reveals how this innovative approach is driving efficiency, reducing downtime, and paving the way for the future of manufacturing.

Q. Could you elaborate on how Vestas Aircoil A/S currently leverages digital twin technology in your production processes?

Vestas Aircoil is leveraging digital twin technology across both product development and real-time production monitoring. Initially, the focus was on developing and testing heat exchangers and charge air coolers more efficiently using virtual models supported by sensor data. Sensors were installed on a specially designed cooler to simulate thermal and structural performance.

Recently, Vestas reached a significant milestone in the Realtime Anomaly Detection (RAD) project in Brașov, Romania. This project involves a digital twin-like setup on a fin press machine, marking the shift toward operational-level digital twins. The aim is to detect and respond to anomalies in production in real-time, thus improving reliability and reducing downtime.

This evolution from simulation-based use to live production monitoring was driven by:

- A growing need for real-time decision-making in manufacturing
- A desire to reduce downtime and increase OEE

Q. How does the implementation of digital twin technology at Vestas Aircoil A/S contribute to improving Overall Equipment Effectiveness (OEE)? Could you provide an example of a tangible benefit achieved?

Digital twins contribute to OEE by enabling:

- Predictive maintenance: – Monitoring key metrics like temperature and vibration to prevent failures
- Reduced downtime: – Faster anomaly detection and response

Example: In the RAD project, real-time data from the fin press is being processed to identify irregular behavior, potentially preventing costly disruptions and optimizing machine utilization.

A prime example is the Realtime Anomaly Detection (RAD) project on the fin press machine Here, real-time data is continuously processed by the digital twin to identify irregular behavior. This proactive detection capability helps prevent costly disruptions, avoids producing faulty parts, and ultimately optimizes machine utilization, directly boosting the fin press's OEE. This demonstrates the power of operational-level digital twins in ensuring efficient and reliable production.

Q. What are the key data sources and technologies that feed into your digital twin models for production, and how do you ensure the accuracy and reliability of this data?

To create accurate and reliable digital twin models for production, Vestas Aircoil A/S taps into a variety of crucial data sources and employs a sophisticated suite of technologies.

Key data sources include:

- Thermocouples for temperature mapping – accelerometers for vibration monitoring
- Operational machine data from production lines (e.g., the fin press in Brașov).

Technologies used include:

- Raspberry Pi + MCC 172 DAQ systems for prototyping
- Hioki dataloggers for industrial-grade collection

- Edge computing for local filtering and real-time analysis

Data integrity and reliability are ensured through:

- Strategic sensor placement and calibration
- Cybersecurity standards such as FIPS and Zero Trust models

Q. Looking beyond current applications, what future advancements or expanded uses do you envision for digital twin technology within Vestas Aircoil A/S?

The future at Vestas includes:

- Scaling digital twins to entire production lines
- Integrating multiphysics models combining thermal and structural data
- Expanding real-time anomaly detection across machines
- Exploring Digital Twin-as-a-Service for broader industry application, supported by the INTO-CPS platform
- Enhancing on-site analytics and incorporating machine learning for deeper insight.

Q. What have been the primary challenges in integrating digital twin solutions with existing production systems and workflows at Vestas Aircoil A/S?

Challenges include:

- Bridging IT/OT systems for real-time data sharing
- Internal learning curves in project management and digital infrastructure.

The RAD project adds new complexity, including the need for operator adoption, integration with legacy systems, and secure cloud connectivity.

Q. For other companies considering implementing digital twin technology for production and OEE studies, what key advice or lessons learned would you offer based on your experience?

Vestas Aircoil A/S offers practical, adaptable, and secure recommendations to help in adopting this transformative technology:

Key advice includes:

- Start small with “good enough” tools (e.g., Raspberry Pi for prototyping)
- Prioritize flexibility and scalability
- Invest early in cybersecurity and data governance
- Maintain clear communication between engineering and production teams
- Use open-source and cloud-based platforms to avoid vendor lock-in (e.g., INTO-CPS).

Q. In the broader context of industrial digitalisation and government initiatives, how do you see Vestas Aircoil A/S's work with digital twins contributing to national or international manufacturing innovation?

Vestas Aircoil is advancing manufacturing innovation by:

- Making digital twin tech accessible to SMEs through the Grand Solution project CP-Sens funded by Innovation Denmark
- Supporting sustainability via lifecycle extension of components
- Promoting open innovation (licensing IP through INTO-CPS)
- Creating replicable models for other sectors (e.g., marine, offshore, wind energy)

Their work is a showcase of how a medium-sized company can lead the way in national and international digitalization initiatives.
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