

# Empowering your on-site maintenance team

Artificial intelligence (AI) is top of mind in virtually every industry and with the investment community at large. In many industries, AI is still little more than a buzz word as generalised applications are being retrofitted to work across varied widget production processes. However, with a specific knowledge base predicate and an engaged maintenance team ready for the industry-specific application, AI can be transformative in the manufacturing setting.

■ *by CemAI Inc, USA*

In the cement industry, the lone AI company providing a cement-centric maintenance solution is CemAI. CemAI is located in Norfolk, VA, and an affiliate of Titan Cement Group with an existing user base in North America, Africa and Europe. The CemAI system is currently installed at several Titan Cement Group locations. Titan will have CemAI installed at all cement manufacturing locations by the end of 2023.

“Industry 4.0 connects the human talent with technology,” says Scott Ziegler, CEO for CemAI Inc. “CemAI’s algorithms instantly supercharge that connection. Our artificial intelligence tools change the dynamics of plant maintenance from merely reactive or preventive actions to predictive and prescriptive solutions.”

An innovative predictive and prescriptive maintenance resource, CemAI provides early detection of operational anomalies using AI-based software coupled with the deep knowledge of cement industry experts. On-site maintenance and cement production teams can now call upon a specific tool, using AI analytics and the CemAI expert remote support included with the service, to maximise reliability.

“If your plant is heading through digitalisation then you need industry-specific AI experience,” says George Pantazopoulos, senior VP of Titan America Cement Operations and Corporate Engineering and one of many on-demand “experts” in CemAI’s arsenal of cement AI expertise.

## Onboarding process

The CemAI software becomes a living, breathing assistant to cement plant

operators from the outset of service. Onboarding with CemAI is seamless and interactive with the on-site team. A strength is the scalability of the service. The CemAI system can be immediately utilised with whatever

sensors and signals the plant currently employs. The module audits the current data flow and works with experts and the local teams to point out areas where additional sensors might be placed.

The system opens remote capabilities that the client can exploit as plant personnel desire. CemAI users determine whether the server for the application is onsite or cloud based. In either instance, data security and firewall protection are paramount.

In CemAI’s experience, maintenance teams access the system using a web-based interface. The user interface is friendly and intuitive. It keeps front and centre the actionable items that maintenance personnel and CemAI remote monitoring centre experts prioritise to minimise unplanned stoppages and reduce downtime while tracking cost savings and value creation with the resolution of alerts. Both plant personnel and CemAI remote monitoring experts have the same information available at all times.

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Trainers and remote expert teams support the onboarding process. Installation of the software and training of frontline staff proceeds with CemAI’s hands-on assistance. Following the implementation of the software, the CemAI 24/7 remote monitoring team remains accessible, supporting operations and the team on the ground.

CemAI service is available 24/7 to walk the client through digitalisation, equipment alerts and process diagnostics. The step-by-step troubleshooting instructions available from the service centres is enhanced by extensive libraries of prescriptive actions. For example, technical assistance in vibration and oil analysis results from the extensive experience available at the centres. Transparent KPI tracking and regular performance evaluation reporting keeps senior management current with developments.

“The savings in avoided shutdowns, equipment loss and inconsistent product

quality has been truly impressive in our experience,” says Cesar Constantino, VP of marketing and sales, CemAI, Inc.

The process from kick-off through wrap-up meeting can take about three months. The plant digital model is built using control computer mimic diagrams, equipment and sensor lists, and historical data during the second month upon data collected initially from plant sensors and signals. The model, which is built capturing process hierarchies, equipment dependencies, and signal interactions, serves as the template through which all subsequent real-time data reporting plays. After further planning is completed, the software is installed by the end of the second month.

System algorithms and machine learning (ML) start to reveal and develop correlations and interactions within actual operations that constantly inform and grow the modelling. The third month of onboarding consists of in-depth commissioning checks and a comprehensive wrap-up session. The entire process is seamless and unobtrusive to everyday operations and personnel.

After implementation, the on-site teams apply their knowledge to the ever-expanding flow of operational data now available. CemAI is an end-to-end solution. From primary crushing through pyroprocessing to finishing mills and cement loading, data from sensors potentially on every piece of equipment is analysed and correlated.

CemAI’s value as a maintenance tool for generating Overall Equipment Efficiency is primary but alone or combined with optimising software, process insights and gains also result from CemAI’s solution. Consistent monitoring of Blaine can lead to deviation recognition and its associations are a patent example of how the systems analysis of all parameters simultaneously in real-time saves costly production irregularities and preserves quality.

**Expert monitoring and consultation**

Not only does data collection and analysis build a deeper knowledge of the user’s plant operations but the availability within the CemAI system of the 24/7 remote monitoring centres delivers proactive insights. No one knows its plant equipment better than the line teams/

maintenance teams in place with every CemAI client. The value add of the remote experts is the AI system experience from multiple operations around the globe.

Frequently, now that a deviation from expected data can be perceived, the cause of the change is not immediately apparent and pinpointed. On call experts can aid the trouble-shooting process saving local maintenance time and costly investigative efforts. The resultant team work and problem-solving opportunity is among the most rewarding aspects of the system to local and remote maintenance experts.

**System improvements in practice**

At the Titan America plant in Medley, Florida, Pennsuco (PNS), which has over three years of experience with CemAI solution, the local maintenance team continues to tweak and improve its understanding of plant data.

Working at a level of Industry 4.0, PNS has amassed a large volume of operational data, applied AI and ML to develop correlations and inter-relationships revealed by the programme’s analytics, and effected changes based on the new understanding obtained. The determination of data sensors, locations, and the significance of any new data, and any new correlations discovered, requires the local engineers, expert assessments and their innovative thinking. PNS has learned that the power of AI is best harnessed when knowledgeable, local teams lead the design function.

“There is no substitution for human engineering control over the ML/AI optimising processes,” says Stojanche Milevski, CE director of maintenance engineering at PNS.

For example, at PNS, over 100 new high-resolution wireless sensors (measuring vibration and temperature) were placed on selected equipment by the

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**Carolina Corzo Ayala, process engineer at Titan America’s Pennsuco plant**

in-house engineers, increasing visibility on equipment previously outside the digital model. CemAI can accommodate the use of new sensors that transmit data wirelessly to readily incorporate the signals without having to run new cabling and setting up new points in the control room.

Upon incorporating these new sensors, PNS saw benefits in the short-term. Vibrational characteristics and “mission critical” status of equipment were the principal selection criteria. Local engineers appreciated that vibrational readings from rotating equipment, like fans with speed above 10Hz, were most reliable.

“AI-driven innovation arms the engineers with precise data and shows new interactions and correlations that they can use to effect real-time adjustments and control,” says Carolina Corzo Ayala, process engineer at PNS. “The technology gets ‘smarter’ with each run...and so do we.”

“The combination of expert teams and the power of AI/ML impact has proved invaluable to saving energy, increasing production and maximising efficiency,” says Zaklina Stamboliska, vice president of cement manufacturing, Titan Florida/PNS.

**Conclusion**

The predictive and prescriptive maintenance capacities of CemAI’s solution not only reduces stress on the maintenance teams but saves money and promotes energy efficiency. Instead of constantly being behind the eight ball, maintenance is proactive and minimising unplanned shutdowns and reheating delays. The value of quality maintenance function has always been high in cement manufacturing. With the addition of AI and ML tools, like CemAI, the equation has changed with maintenance adding even more valuable contributions to energy efficiency, equipment life and consistent product quality. ■

Process insights and gains also result from CemAI’s solution



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