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Better tools, same downtime. What has to change?

The maintenance industry has invested in more sensors, software and AI than ever before, and the tools keep improving. The downtime numbers haven't followed. The question is how to turn better information into effective maintenance.

Better tools, same downtime

Condition monitoring has come a long way. Electrical signature analysis, for example, reads the whole drivetrain through the generator. Blade monitors can detect damage long before it becomes catastrophic. On paper, the wind industry has never been better equipped to spot failures early.

Yet across the wider maintenance industry, unplanned downtime has barely moved. That isn't a verdict on the technology. A sensor can tell you something has changed. Someone with experience still has to decide what it means, whether it can wait and who climbs the tower. That part of the job hasn't been automated and, in many organizations, it hasn't been strengthened either.

At Weather Guard Lightning Tech, we talk to asset managers, site supervisors and engineers every week. We hear the same thing repeatedly: much of the technology works, but the maintenance program built around it often doesn't.

The tools arrived. The operations didn't change.

The figures help explain the problem. MaintainX's State of Industrial Maintenance 2026 surveyed more than 2,200 maintenance and operations leaders in the US and Canada. It found that 79% of teams reported unplanned downtime staying flat or rising in the previous year. In its previous survey, AI adoption stood at 44%; in 2026, it reached 58%. These are findings from maintenance across industries, not wind-specific downtime figures.

The contrast makes more sense when you look at how the work is organized. Half the teams surveyed spend less than 40% of their time on planned work. That suggests monitoring and AI are often being added to reactive operations rather than used to plan work ahead.

Where downtime rose, respondents identified three main causes: equipment failure, labor shortages and poor knowledge transfer. Two are people problems. Teams lack technicians, and experienced staff aren't always passing on what they know. An alert is only useful if someone recognizes what it means.

Researchers have identified a related problem. A June 2026 study in Sensors described a trade-off: suppressing false alarms can mean missing slow-developing faults. It takes someone who knows the machine to judge which alerts deserve action.

The human in the loop

Few people have been more direct about this than Dr. Howard Penrose, President of MotorDoc and chair of IEEE 1415. His view is consistent: monitoring and AI often underdeliver because the human has been taken out of the loop. Sensors, dashboards and a computerized maintenance management system (CMMS) don't improve maintenance on their own. Automating bad habits only makes them faster.

He put it more plainly on The Uptime Podcast: 'Nobody's actually using condition-based maintenance as condition-based maintenance.' Operators collect condition data, then continue with calendar-based work or wait until an alarm becomes a failure.

Acting on condition data still isn't the norm in maintenance. It means changing the schedule, and the system rarely rewards the person who does. If a technician defers a task because the data looks healthy and the component fails, that decision is questioned. If the task is completed on schedule and the component fails anyway, it often isn't. So teams keep the interval work and log the alarm.



Trust matters too. A team that has chased a dozen false alarms may stop treating the next one as urgent. Even when an analyst spots a real fault, the site may lack the crew, parts or budget to act before it becomes a failure. Changing that doesn't necessarily take new technology. It takes making an alert easier to act on than to ignore: a clear diagnosis rather than an anomaly score, an action proportionate to the problem, evidence for the budget meeting and someone accountable for the decision.

What the tools need to work

In practice, three conditions have to be in place for these tools to reduce downtime.

The first is knowledge of how the machine fails. Each failure mode appears in the data in a particular way, with a particular lead time. A system built on that knowledge can explain what it has found and how urgent it is. Without it, the system may flag a change but struggle to explain it. An unexplained alert is easy to set aside.

The second is people with the time and skill to act on the findings, whether on the operator's own team or at a service partner. In the MaintainX survey, limited staff or expertise tied with budget as the biggest barrier to getting a return on technology. Without that expertise, alerts pile up and technicians lose trust in them.

The third is a maintenance process that can respond to a warning: room in the schedule, parts and crews ready to move and a clear owner for the decision.

Turning findings into action

Some companies working in wind already bring all three together. What sets them apart is how they turn findings into action.

MotorDoc uses electrical signature analysis, treating the generator as a sensor for the whole drivetrain, a method reflected in IEEE standards. Its tools are intended for technicians onsite. Penrose says most technicians can collect data after a couple of hours of training, while its circulating-current tool indicates whether a bearing is in danger. He says many findings arrive early enough for a small intervention, such as clearing out old grease or tightening a bolt. A specific, inexpensive action is easier to schedule than a vague warning.

Malloy Wind, a division of Malloy Electric in Sioux Falls, South Dakota, takes a different approach without relying on software. It dismantles failed bearings, investigates why they failed and supplies upgraded designs. In one example reported by the company, a bearing brand on a particular platform kept failing while another did not. Malloy traced the difference to raceway hardening and corrosion protection in the bolt holes. The finding informed an upgraded part that could be fitted during the next replacement up tower.

EchoBolt, a UK company, addresses the interval problem directly. Rather than re-torquing every bolt on a schedule, crews measure tension ultrasonically, reportedly in about ten seconds per bolt, and work on those that need attention. Most bolts, Managing Director Pete Andrews told us, 'are static and absolutely fine and can be left alone.' Its BoltWave device is designed for the client's own technicians. Readings go to the cloud, where an office engineer can decide whether to intervene while the crew is still onsite.

Aerones, based in Riga, Latvia, uses robots to repair leading-edge erosion on turbines, supported by its coatings laboratory and rain-erosion testing. The company reports repairs on more than 500 turbines in 2025, including work for Vestas and TotalEnergies. It also says it guarantees both the material and the application, giving operators a defined basis for assessing repair risk.

AP Renewables, an engineering firm in Hamilton, Ontario, works on electrical faults. Its SCADAScope platform draws high-resolution data from turbine controllers and converters, which its engineers use to investigate root causes.

In a 2026 case described by the company, a turbine had broken down repeatedly over five days without a diagnosis. A warning had gone unread for 17 hours before an overcurrent trip. The company says converter data revealed the cause. That is the human in the loop doing what a dashboard alone couldn't.

In each example, the aim is to turn a reading into a diagnosis, make the next step clear and put experienced people behind the decision. That is what gets an alert acted on rather than simply logged.

Questions worth asking

For asset managers considering their next monitoring or AI investment, a few questions can help establish whether it will change outcomes:

- Which failure modes have you caught on turbines like mine? Ask for the component, the lead time and what was found when the turbine was opened.
- Who makes the diagnosis? Ask about the field experience of the people reviewing the data, not just the platform's features.
- What is your false-alarm rate, and how do you know? The answer should be supported by fleet data.
- What does my team have to do? If the system depends on expertise you don't have on staff, budget for it or choose a vendor that supplies it.

The 2026 survey data doesn't show that monitoring and AI have failed. It shows that buying them isn't enough. Downtime falls when tools are paired with people who understand how machines fail and a process that lets them act early. The companies worth backing are those already putting those pieces together.

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