# CONSTRUCTION EQUIPMENT®

# Smart Machines:

## A Guide to Advanced Technology on Modern Construction Equipment

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Technology is quickly changing construction equipment. Grade control is almost standard on categories like dozers today. AI cameras just appeared like a year ago, and now everyone's offering one. Telematics isn't just machine location info. It's the ultimate ecosystem to collect data on everything from fuel burn to maintenance alerts, and it increasingly includes business functions (like project data tracking or equipment timecards as examples). The modern machine is smarter, but it's also maybe a little more complicated. So, we built this special digital edition of Construction Equipment to help you figure it out.

This eBook explores the trends and technologies changing equipment and fleet management in 2026. We examine grade control, AI cameras, telematics, equipment cost data, fuel-saving tools, and the industry's progress toward autonomous jobsites. We also measure the gap between all the talk about AI and its limited use in the field. It's true that technology can be intimidating, but once you realize how it works, it can make life a whole lot easier. This eBook is designed to help you do just that.

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# Top 10 Trends Shaping Construction Equipment in 2026

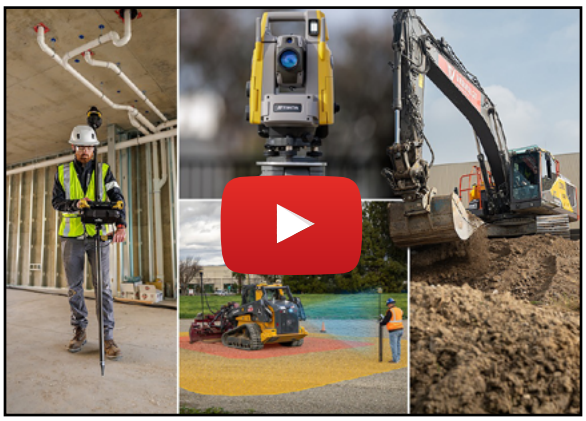
## AI cameras to multi-fuel engines, fleets face a wave of smarter, faster, and more flexible iron

KEITH GRIBBINS

Keith Gribbins

The construction equipment market continues to evolve. It's transforming, shifting focus, getting smarter, and economizing all at once. Walk any major machine tradeshow (I just did) and you can see it. Scan recent product launches, and you begin to see the patterns. More tech is baked in. More options are offered at different price points. At the same time, bigger forces are shaping demand like data center construction. No single trend defines this moment, but I could maybe pick 10. Here's a mix of technology, economics, and jobsite realities all colliding at once in 2026. Here are 10 trends defining the construction equipment market right now.

**1. Grade control is getting simpler and more common**



*Topcon*

Grade control no longer feels like a premium add-on. It's becoming standard equipment. High-end 3D systems still lead on large earthmoving jobs, but smaller and smaller units are embracing 3D automation tech. Example: Check out Komatsu's new 15-metric-ton PC158USLCi-12. It's the company's first tight tail swing excavator with Intelligent Machine Control (IMC) 3.0. There's also big growth in the 2D end. Factory-installed systems are cheaper, easier to use, and good enough for most applications. Check out Cat's Ease of Use system. All of Hyundai's Next Generation crawler excavators (HX230L through HX400L) feature advanced, standard 2D machine guidance and control for enhanced digging precision (see video above). We also see tech companies like Topcon releasing entry-level 3D machine control setups like 3D MC-Edge, bridging the gap.

**2. Compact equipment still rules the jobsite**

*Kubota*

Mini excavators and compact track loaders (CTLs) continue to dominate sales. These machines hit a sweet spot in size and versatility. They're powerful, portable, and adaptable. Contractors can trench, grade, lift, and load with each platform. Together, they are a powerful one-two dig-and-load combo. We're seeing CTLs get bigger. Kubota just launched its largest CTL yet (the SVL110-3); other brands like Cat, Manitou, Takeuchi, and beyond have launched large-frame CTLs over the last few years. Also, the mini excavator market continues to expand. With more than 20+ brands, we're still seeing OEMs like Kioti (a strong ag brand) enter the mini excavator market, aiming to take potential market share.

**3. AI cameras move from hype to safety tool**

*Leica*

AI cameras will soon become standard safety tech. These multicamera systems detect people, obstacles, and unsafe behavior in real time. Some even log incidents for training and compliance. This is not future tech. It's already on jobsites. Tenna, a construction technology company recently acquired by John Deere, just announced the TennaCam 2.0 HE 360 AI, a heavy equipment multicamera system offering 360-degree AI hazard detection, in-cab alerts, recording features, and more. Leica Geosystems' new XSight360 system uses edge-based AI and up to six onboard cameras to provide operators with full 360-degree visibility around heavy equipment, object and people detection, cloud data recordings, and more. XSight360 was developed jointly with Xwatch Safety Solutions.

**4. Data centers are driving the construction boom**

*ID 163055427 © Vladimir Timofeev | Dreamstime.com*

Data centers are everywhere. These projects require heavy site prep, utilities, and tight schedules. That means more boom lifts, scissor lifts, excavators, loaders, and compact equipment on the ground. According to Brian Bieller, president of BOMAG Americas Inc., during an AEM/Conexpo press event: "There is reason to be optimistic. The boom that data centers posted includes construction spending [increasing] by 59.1 percent in 2023, 55.5 percent in 2024, and expected 37.4 percent in 2025. It's still impactful because of the construction of new chip and fabrication plants and electric vehicle battery factories, which were incentivized by the CHIPS Act in 2022 and Inflation Reduction Act in 2023."

**5. Tax policy is accelerating fleet upgrades**

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The One Big Beautiful Bill Act could reshape buying cycles. The act permanently reinstates 100 percent bonus depreciation under Section 168(k) for qualifying property placed in service on or after January 19, 2025. The bill also expands Section 179 deductions, introduces Qualified Production Property incentives, preserves Pass-Through Entity Tax deductions, and does much more that equipment owners and fleet managers should know. I highly suggest you read this Carl Oliveri article right over here. New tax credits and 100 percent bonus depreciation make equipment purchases more attractive. Fleets can write off machines faster and improve cash flow.

**6. Sensor fusion improves machine accuracy**

*Topcon*

Machines are getting smarter by combining technologies. For instance, sensor fusion is changing how machines understand the jobsite. Instead of relying on one system, machines now combine multiple inputs. GNSS, LiDAR, cameras, and inertial sensors all work together. The machine blends that data into a single, real-time view of its position and surroundings. Machines can grade more precisely, avoid obstacles, and build accurate 3D maps, execute accurate 3D files, or both. Here's Mark Contino, vice president of North American retail distribution at Topcon Positioning Systems, talking at a Conexpo press conference:

"We started this first back in the '90s," said Contino. "We were the first manufacturer to provide multi-constellation Global Navigation Satellite Systems [GNSS]. We were the first to combine a fan beam laser with GNSS to create our Millimeter GPS solution. What you're going to see and what you've been seeing over the last several years in the industry, especially from technology companies like Topcon, is what we call sensor fusion. And that's bringing multiple types of technology together, whether it's LiDAR and GPS or different things that are coming together to provide better solutions for our customers. Our goal always is to be able to get more done with less."

**7. Telematics have become jobsite control centers**

*Ditch Witch*

Telematics platforms are evolving fast. They're no longer just tracking hours and location. They're managing workflows in real time. Systems now can connect multiple machines, capture data, provide security, facilitate maintenance, and inform operators and owners in one interface. Ditch Witch's Orange Intel telematics platform connects the entire workflow from pre-inspection and rod-by-rod drill planning to as-builts and post-inspection reporting. Cat just announced a partnership with Geotab (one of the biggest telematics company in the world) to pull on-highway trucks into its VisionLink telematics ecosystem. That means one dashboard for yellow iron, highway tractors, service trucks, vans, and everything in between.

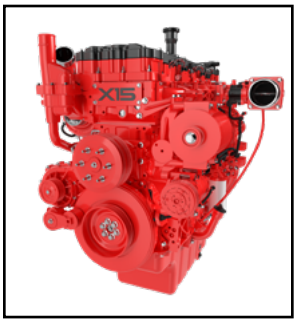
**8. OEMs are splitting machines into tiers**

You now see base models and premium models of

*Bobcat*

the same machine. Bobcat's "Classic" and "Pro" lineup is a clear example. The Bobcat Pro CTLs and skid steers will have more features and therefore be at a higher price point. Classic models will cost less and have fewer bells and whistles. John Deere employs a similar strategy with its tier system. At the same time, online-first brands like Ignite Attachments are pushing price transparency and direct sales. Value is driving decisions as much as performance. For fleet managers, make sure you're pricing out multiple money tiers when selecting new construction equipment.

**9. Multi-fuel engines offer flexibility**




*Cummins*

There is no single path to clean power. Multi-fuel engines are emerging as a practical solution. These engines can run diesel, HVO, natural gas, and even hydrogen blends. That gives fleets flexibility

based on fuel availability and cost. A great example of this is Cummins' X15 off-highway engine, which boasts a range of alternative fuel options, including HVO biofuels and hydrogen capabilities. Cummins also noted its Connected Solutions will be featured on the X15, offering remote monitoring, diagnostics, and over-the-air updates. The X15 is part of Cummins HELM (Higher Efficiency, Lower emissions, and Multiple fuels) platforms, which are a series of 7L to 15L engine platforms (B, X10, and X15) designed to be fuel-agnostic.

**10. Mini track loaders are on the rise**

*Caterpillar*

This category of equipment has many names — compact utility loaders, mini skid steers, compact tool carriers, or mini track loaders. Regardless of what you call them, these stand-on machines are compact, fast, and easy to operate. Operators can jump on and off quickly. That's huge for landscaping, utilities, and tight jobsites. Major OEMs continue to enter the space. Caterpillar just announced its TUL100 compact utility loader. Case just announced another electric model. Bad Boy Mowers launched its Recon unit. Toro, Ditch Witch, Vermeer, Bobcat, Ariens, Wacker Neuson, Kubota, and tons of other manufacturers are all ready to sell you these mini track loaders in 2026. Check'em out.

## About the Author

***Keith Gribbins*** *is the head of content at Construction Equipment, where he leads editorial strategy across print, digital, video, and social channels. An award-winning journalist with more than 20 years of experience, Keith has won 17 national and regional editorial awards and is known for his hands-on reporting style, regularly visiting manufacturers, operating equipment, and covering major industry events worldwide.*

# Inside John Deere SmartGrade: From EZ Grade to Full 3D

## Deere offers a progression of grade-control technology designed for everything from basic slope work to complex engineered surfaces.

RICHARD RIES

John Deere

John Deere SmartGrade is the umbrella term for all John Deere grade-assist solutions: EZ Grade, which makes it easy to maintain a grade; 2D SmartGrade Ready for use in grading simple slopes for drainage; and 3D SmartGrade, which adds elevation control for simple or complex 3D engineered projects.

SmartGrade was launched on 700K single dozer in 2016 and continues to evolve. The current iteration has a larger, more responsive monitor that can display 2D and 3D at the same time. SmartGrade delivers many benefits, but at the top of the list are much greater efficiency with far less rework, and a levelling of the field of performance among operators of widely differing skill and experience levels, according to Colton Kreber, product marketing manager, John Deere.

### SmartGrade expands across the John Deere dozer lineup

Dozers are a target category of machine for the use of SmartGrade. Deere has nine dozers, eight of which are P-Tier. There is also the 850 X-Tier E-Drive. All accept SmartGrade. **EZ Grade** comes

standard on all small- and mid-size dozers and uses sensors on the chassis and D-frame to provide pitch and roll information. John Deere **2D SmartGrade Ready** offers slope control and compatibility with laser and sonic systems. It also accepts total station robotic control to achieve millimeter accuracy.

**3D SmartGrade** has become very popular, says Mark Colvin, senior product manager, grade management. "It's rare to see a site now with a dozer that is not equipped with it, and if several dozers are on site at least one will have 3D." He says the utilization rate is high for 3D on dozers equipped with that feature.

## Operations Center tracks SmartGrade use

*John Deere*

John Deere Operations Center includes machine data but also tracks progress from GNSS data. It allows fleet managers to see how many dozers are on site, how many are equipped with SmartGrade and of those, how many are using SmartGrade in a given time frame. There is an RDA (remote display access) feature so that a technology specialist can see the dozer display in real time, as well as RDC (remote display control) allowing that specialist to take control of the monitor. Operations center communicates via a phone, tablet, or other wireless device.

## Customer feedback drives technology development

*John Deere*

Development of systems such as SmartGrade is customer driven. While many OEMs make this claim, Deere backs it up with a robust customer interaction program. Experts talk with customers and with dealers, as dealers hear about many topics from many customers. These experts are referred to as field teams, and they vary their research practices not only by consulting a variety of customers and dealers, but also by defining specific goals and objectives for these visits. They also vary the geographic locations. The country is a mix of soil types: loam, sand, rock, clay; what works in one cannot be automatically assumed to work in another so field teams spend time at each.

SmartGrade is one example of John Deere applying rigorous protocol to the development of a solution. Their optional **Advanced Vision System** is another. On dozer applications it provides a 360-degree view of the machine. On the touch-screen monitor the operator can select the 360-degree view or front, right, rear, or left view

and can have multiple views displayed at once. Kreber says that during development, testers said they wanted a larger monitor as they felt the front view wasn't as clear as they wanted.

"By digging deeper into the testers' concerns we realized the correct solution was not in providing a bigger monitor," says Kreber, "but in slightly reconfiguring the front camera array. We did that, and it solved their concerns."

Kreber says it's important to maintain the essence of the John Deere experience in developing machines.

"We want to provide the same feel and familiarity," he notes.

To the extent possible as dictated by machine type and function, displays are similar, sealed switch modules (SSMs) are consistent, iconography is the same, and controls have the same look, functionality, and feedback ("haptics"). Seating is similar and the relationship of the seating position and the positioning of controls is familiar and intuitive.

## Configuring machines for different customers

John Deere recognizes that there are subsets of customers and goes to great lengths to ensure machines with the proper configurations are available to each. Two packages that illustrate this are forestry and demolition with unique guarding and other features specific to those applications. Deere also offers varying trim levels, bundles, and performance packages, some of which are factory-ordered and some of which are dealer-installed.

*John Deere*

**John Deere Performance Tiering** is foundational to meeting the needs and expectations of groups of customers. **G-Tier** machines are simple and dependable yet still offer Deere quality and dealer support to fit smaller budgets. **P-Tier** brings in a plethora of production and performance features to elevate performance and efficiency for customers who work their machines hard, every day. **X-Tier** is the gateway to premium technology, fuel efficiency, and overall performance for those who need exceptional equipment to consistently achieve peak performance.

### About the Author

***Richard Ries*** *began his free lance journalism career in June, 1985, calling on his experience as a service manager at a Honda motorcycle dealership to place his first article. When the motorcycle market collapsed in the late 1980s, he moved to the booming bicycle market. Finding that market lacked the professionalism he sought, he moved to construction in 1995 and has remained there ever since.*

*His countless clients have included entities in Australia, England, France, Germany and Scotland. He has written for trade and consumer periodicals, equipment and component manufacturers, government agencies and non-governmental organizations. Clients have also commissioned him for photography and videography work, either stand-alone or as part of package of text and images.*

# John Deere Explains SmartDetect: How AI Cameras Can Make Construction Equipment Safer

## What separates an AI camera from a standard backup camera? John Deere answers that question and many more in this Q&A.

KEITH GRIBBINS

John Deere

Over the past few months, *Construction Equipment* has been exploring this fast-moving technology through a series of in-depth Q&As with industry leaders, including Tenna and Brigade Electronics. Each company approaches their AI-powered vision a little differently, but all are working toward the same goal: making jobsites safer and more productive. Now it's John Deere's turn. In this exclusive Q&A, we talk with Nathan Demski, senior product manager, and Colton Kreber, product marketing manager, both with John Deere Construction and Forestry, about the company's SmartDetect and SmartDetect Assist technologies. We discuss how AI cameras work, what they cost, how they integrate with telematics, where they deliver the biggest return on investment, and where AI-powered jobsite awareness is headed next.

***CE:* Nathan and Colton, thanks so much for taking the time to talk to *Construction Equipment* today. I am a big John Deere fan. The company has long specialized in building practical, operator-focused machines, and it's exciting to see that**

**same philosophy now being applied to AI-powered safety technology. For instance, we've been seeing an interesting amount of AI cameras showing up at tradeshows and on machines in the last 12 months. Maybe we can start off this conversation with some basics. What is an AI camera or AI camera system? How is it different from a normal camera?**

Kreber: An AI camera system combines advanced imaging hardware with on-board edge device processing and artificial intelligence in the form of computer vision machine learning (CVML) to interpret what it sees in real time. Unlike traditional cameras, which simply provide a visual feed, AI-enabled systems can recognize objects, identify potential hazards, and provide actionable alerts to operators — helping turn visibility into awareness and, ultimately, safer in the moment decision-making.

**Can you give us an overview of your AI cameras for construction equipment. What products do you offer? How many cameras are in your system? What technologies or options do they offer?**

Kreber: John Deere's approach to AI camera systems is focused on enhancing operator awareness and jobsite safety through intelligent perception with our SmartDetect and SmartDetect Assist solutions. Our systems use strategically positioned cameras around the machine paired with construction industry trained CVML models to detect objects and humans to ulitmately provide the machines operator with timely alerts.

Demski: Beyond the capabilities of identifying a possible hazard with our SmartDetect solution Deere has recently launched the next evolution in this technology with SmartDetect Assist. We bring in additional sensor modalities to provide further layers of information to the model and if needed will automatically slow or stop the machine before contact is made with a known object. This isnt about replacing the operator but having the machine work in tandem with the operator through long days on a busy jobsite. Depending on machine configuration and application, these systems can support multiple viewing angles, dynamic detection zones, and seamless integration with state of the art in-cab displays. The result is a smarter awareness system that complements operator skill without adding complexity or nuisance.

**How much does an AI camera system typically cost for a piece of construction equipment? Are there other service fees involved (say, a telematics connection)?**

Kreber: Costs can vary based on the machine and configuration, but SmartDetect and SmartDetect Assist are designed to deliver strong overall value through improved safety, increased awareness, and reduced exposure to jobsite risk. Rather than focusing on the upfront investment alone, many customers evaluate these systems based on their ability to help prevent incidents, improve operational confidence, and support long-term fleet performance.

Demski: John Deere's jobsite safety solutions work in tandem with our existing onboard telematics soluiton, JDLink, as well as offboard data engine via John Deere Operations Center. More advanced solutions delivering high streams of data, such as video recordings, do come with with a separate service fee for the solution.

**What software and apps do your AI camera systems work with? What cool features can be accessed in the software? Recordings? Telematics connections? AI recommendations?**

*John Deere*

Kreber: SmartDetect and SmartDetect Assist are designed to work within the broader John Deere technology ecosystem, integrating with in-cab displays and connected machine platforms like John Deere Operations Center. Through these integrations, operators and fleet managers can access features such as real-time alerts, visual event data, and machine insights that help improve awareness and decision-making. They can also get weekly reports and heat maps through a SmartDetect Digital Subscription. As connectivity expands, these systems can also support broader data sharing across the fleet to help identify trends and opportunities for improvement.

**Can AI cameras connect to a telematics platform? How is that done? What information can be imported? What platforms can your cameras connect too?**

Demski: Yes, our machines and integrated machine technologies — such as SmartDetect — can connect to our telematics platform, John Deere Operations Center, as part of a fully connected equipment ecosystem. This connection is enabled through onboard telematics hardware and secure data transmission, allowing machine and event data to flow seamlessly from the jobsite to the cloud.

Through this integration, relevant information such as machine location, utilization, and SmartDetect event data — e.g., object detections and operator alerts — can be captured and shared in near real time. This creates a more complete picture of jobsite activity, helping fleet managers monitor performance, identify trends, and address potential safety risks. Importantly, the focus is not just on collecting data, but on delivering actionable insights. By organizing and visualizing this information within Operations Center, customers can better understand how machines are being used, support operator coaching and training efforts through informed safety briefings, and make more informed decisions to improve jobsite safety, efficiency, and overall productivity.

**How are these AI cameras installed on the machine? What is the process? How long does it take? How much does installation cost?**

Kreber: Installation is designed to be flexible and streamlined, supporting both factory-fit and field-install options depending on the machine generation and the level of technology the customer selects. For newer machines, systems like SmartDetect can often be integrated directly during the manufacturing process. For existing fleets, field-install kits allow dealers or trained technicians to retrofit machines with minimal disruption.

*John Deere*

Demski: The installation process typically involves mounting cameras in strategic locations, integrating them with the machine's electrical and display systems, and calibrating the software to ensure accurate detection and reliable performance. This work is performed using standardized procedures to ensure

consistency, quality, and ease of service across different machine models. Timelines can vary based on the specific configuration and machine type, but installations are designed to be completed efficiently — often within a short service window — so equipment can return to work quickly. Similarly, costs will depend on factors such as the number of cameras, system capabilities, and whether the installation is completed at the factory or in the field.

**How much connectivity is required — can these systems function effectively offline or in low-signal areas?**

Kreber: These systems are designed to operate reliably across a wide range of jobsite conditions, including areas with limited, intermittent, or no cellular connectivity. Core capabilities — such as object detection and in-cab operator alerts — run directly on the machine using onboard processing. This means operators continue to receive real-time visual and audible alerts even when the machine is completely offline, ensuring that safety functionality is always available when it matters most.

Demski: Robust connectivity enhances the system but is not required for its primary functions. When a connection is available, the machine can securely transmit event data, machine information, and usage insights to the customers John Deere Operations Center account. This allows fleet managers to review activity across machines, analyze trends, and support broader safety and productivity initiatives. Overall, the system is designed with a "work anywhere" approach: delivering consistent, real-time performance on the machine while using connectivity to extend visibility and insights beyond the jobsite when conditions allow.

**What categories of construction equipment are using AI camera systems? Excavators? Wheel loaders? Telehandlers? Dozers?**

Kreber: AI camera systems are already being applied across a growing range of construction equipment categories, with wheel loaders among the primary applications today. These machines are often operating in dynamic, high-traffic environments, making them a strong fit for technologies like SmartDetect that enhance visibility and operator awareness.

Demski: Other jobsite-critical equipment such as excavators, dozers, and additional material-handling machines are natural next steps for integration; as they present similar safety and visibility challenges. Each machine category introduces unique operating conditions, so solutions are thoughtfully developed and tailored to ensure they provide meaningful value in those specific applications. The broader goal is to scale AI-based detection capabilities across the fleet in a way that is both practical and impactful. By extending these systems to more machine types over time, customers can benefit from a more consistent approach to jobsite safety, improved operator awareness, and better overall visibility into fleet activity.

**Where are AI camera systems delivering the most value on jobsites today — safety, productivity, liability reduction, something else?**

Kreber: The greatest value today is at the intersection of safety and awareness. By helping operators better understand their surroundings, these systems can reduce the likelihood of incidents and improve confidence on the jobsite. At the same time, there are productivity benefits — fewer disruptions, smoother workflows, and more consistent operation — all of which contribute to overall jobsite performance.

*John Deere*

**How should fleet managers evaluate ROI on AI cameras beyond just incident reduction?**
Kreber: While incident reduction is an important measure of value, many fleet managers take a broader view when evaluating the ROI of AI camera systems like SmartDetect. Beyond safety outcomes, these solutions can drive meaningful improvements across daily operations and long-term performance. For example, increased operator confidence and awareness can lead to smoother, more controlled machine operation; especially in busy or complex jobsite environments. This often translates into better productivity and more consistent performance across operators. Additionally, early identification of potential hazards can help prevent work stoppages and reduce unplanned downtime, keeping projects on schedule.

Demski: AI camera systems can also improve overall jobsite coordination. By providing greater visibility into machine activity and interactions, fleet managers are better equipped to understand how work is progressing and where adjustments may be needed. This level of insight supports more proactive decision-making rather than reactive problem-solving. Another important factor is administrative efficiency. With captured event data and visual context, reviewing incidents or near-misses becomes more streamlined and objective, reducing the time and effort required for investigation and reporting. Taken together, these benefits of improved operator performance, reduced disruptions, enhanced jobsite visibility, and lower administrative burden direclty contribute to stronger overall fleet efficiency. Over time, this more holistic impact often represents a significant portion of the system's total return on investment.

**How accurate are current systems at distinguishing between real hazards and false positives?**
Kreber: AI camera systems have made significant progress in their ability to differentiate between meaningful hazards and non-critical objects. Advances in computer vision and machine learning allow these systems to better recognize people and relevant obstacles, helping ensure that alerts are timely and relevant rather than excessive or distracting. That said, this is an area of continuous improvement. Real-world jobsites present highly dynamic and unpredictable conditions, so ongoing development is focused on further refining detection accuracy while minimizing false positives. The goal is to deliver alerts that operators can trust. Alerts that are consistent, actionable, and supportive of safe decision-making without creating unnecessary noise or nuisance.

**What's the right balance between assisting the operator and overwhelming them with warnings?**
Demski: We see technologies like SmartDetect and SmartDetect Assist continuing to evolve toward more predictive and proactive capabilities. While today's systems focus on detecting hazards and alerting operators in real time, the next step is to move earlier in the decision-making cycle. As AI models improve and more data is leveraged, these

systems will increasingly be able to anticipate risk based on patterns in machine movement, jobsite conditions, and operator behavior. This shift toward predictive safety means operators can be supported before a situation fully develops, helping prevent incidents rather than simply reacting to them.

At the same time, these advancements will continue to build on, and integrate with, existing machine intelligence. Rather than jumping directly to full autonomy, the near-term focus is on augmenting the operator, enhancing awareness, and improving decision-making in a way that feels natural and trustworthy in real-world environments. Ultimately, the goal is a more connected, intelligent jobsite where safety and productivity are continuously improving through a combination of human expertise and advanced technology.

*John Deere*

**Such great, info. Thank you. Is there anything else you'd like to mention? Please do!**
Demski: Striking the right balance is critical to ensuring AI camera systems are effective in real-world conditions. Our approach is to prioritize alerts that are both timely and relevant, focusing on situations that truly require operator attention rather than generating excessive notifications. This is achieved through a combination of intelligent detection, filtering, and thoughtful system design. By emphasizing meaningful hazards and presenting alerts in a clear, intuitive way, the system helps operators quickly understand what matters most in the moment. The goal is to enhance situational awareness without adding cognitive load or unnecessary distraction. Ultimately, the system is designed to act as a supportive tool, augmenting the operator's awareness and decision-making while maintaining a seamless and natural operating experience.

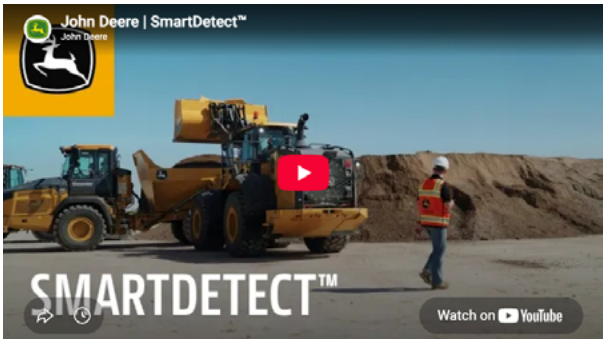
**How are manufacturers designing interfaces to make AI camera systems usable in the cab? Describe the cab experience. Are there extra monitors? Do your systems integrate into the machine monitor?**
Demski: The user interface is intentionally simple and intuitive. Camera views, detections, and alerts are presented in a clear, easy-to-interpret format, allowing operators to quickly understand what is happening around the machine without needing to shift focus away from their primary task. Visual cues are directly paired with audible alerts to ensure important information is noticed, while still avoiding unnecessary distraction. Design decisions prioritize usability in real working conditions, considering factors such as visibility in different lighting environments, intuitive adjustments, and minimal interaction requirements. The system is built so that operators can rely on it as a natural extension of the machine, enhancing awareness and decision-making without interrupting workflow or adding cognitive burden.

**How are fleets using AI camera footage for training, compliance, or defending against claims?**
Kreber: Fleet operators are increasingly finding value in AI camera data as more

than just a record of events. It is becoming a practical tool for training, documentation, and risk management. From a training perspective, recorded events and detections provide real-world examples that can be used to reinforce best practices. Instead of relying solely on theoretical instruction, managers can review specific situations with operators, helping them better understand both strong performance and opportunities for improvement. This makes coaching more targeted, consistent, and impactful.

Demski: In terms of compliance, camera data can support documentation efforts by providing a clear record of jobsite activity. This can help demonstrate that proper procedures are being followed and that safety-focused technologies are actively in use. Having this level of visibility can be valuable in meeting internal standards as well as external requirements. AI camera systems also play an important role in managing and defending against claims. When incidents or near-misses occur, having visual context and event data allows fleets to more accurately understand what happened. This can help reduce ambiguity, support faster investigations, and provide objective information when addressing disputes or liability questions.

Ultimately, the value lies not just in capturing footage, but in turning that information into actionable insights. By leveraging camera data effectively, fleets can strengthen training programs, improve accountability, and make more informed decisions that support both safety and operational performance.




**What's next? What's the next leap for AI cameras — full autonomy, predictive safety, or something else entirely?**

Kreber: SmartDetect and SmartDetect Assist represent an important step forward in how we approach jobsite awareness and safety. At John Deere, our focus is on delivering solutions that are practical, intuitive, and built for real-world conditions rather than controlled environments. These technologies are designed to integrate seamlessly into the way work already gets done, helping operators stay aware of their surroundings and make better decisions throughout the day. By combining advanced AI capabilities with a deep understanding of jobsite needs, we aim to provide tools that customers can trust and rely on. At John Deere, our focus is to help customers operate more safely, confidently, and efficiently every day, while continuing to build toward a more connected and intelligent jobsite experience.

**If you want to learn more about SmartDetect, visit this link.**

# Bridge the Missing Link in Machine Data

## Machine data should also flow to the operations side of the business.

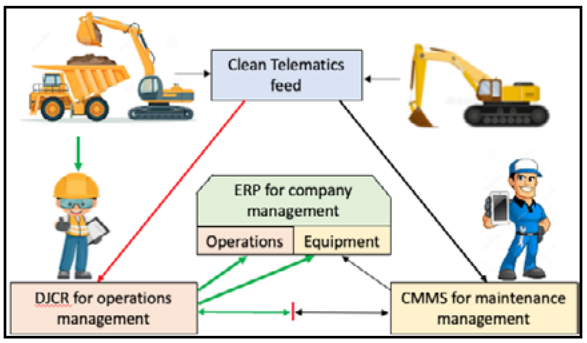
MIKE VORSTER

ID 166657477 © Bulat Silvia | Dreamstime.com

The telematics feed was developed to support computerized maintenance management (CMMS) systems. This is where it is having an impact, and this is where its strengths are promoted to the end user. This feed was never designed to provide data to the operations side of the business, however, so none of the systems can reliably tell us whether an excavator is digging a trench or loading trucks.

Every system produces data on machine location and time spent working or at idle. Location and time spent working are also used to reconcile the daily job cost report (DJCR). What if telematics were able to support the DJCR rather than question it?

The diagram at right illustrates this scenario.




*Data flows along the black line to maintenance staff, but perhaps it's time to open up a channel along the red line to operations management.*

### Job cost reporting and operations management

Now consider the righthand side of our diagram and the black arrows.

Start on the left with the job superintendent and the green arrows. Job superintendents are

responsible for completing a DJCR that records the resources used and the work done on the various operations performed by the crews on site. Available software applications support the process, which lies at the heart of the way in which companies measure performance, collect job cost information, and report progress.

In all cases, the superintendent must record who and/or how much. Who worked on the phase code and for how many hours, what machines worked and for how many hours, how much concrete was used, and how much pipe was laid. The quantity of resources used and the unit cost of the given resource drive the cost of the work; the quantity of the work done and the unit budget for the work drive the budget.

It is simple and straightforward when it comes to labor and materials. Timecards and delivery notes are checked and reconciled and flow directly into payroll and accounts payable.

It is more complicated when it comes to equipment. Who completes the "timecard" for the excavator? Who checks it, who reconciles it, and who makes sure that everything is in order? How do we know that the hourly rate used to represent the cost of the excavator for the time it spent loading trucks this afternoon is appropriate?

Regardless, the job superintendent must fill in the DJCR, must review it, certify it, and transmit the certified job cost and performance data along the thick green arrows into the company's ERP (accounting system). There, it plays a vital role in the material the CFO uses to prepare the financial statements used to manage the business.

## CMMS and maintenance management

Companies are progressively using GPS and geofence telematics systems to record the output from various sensors and obtain insights into the location and performance of the machine. The simplest of these devices will give information on the location of the machine; the most complex will provide fault codes, temperatures, and other mechanical information that helps to understand the mechanical aspects of the machine. All but the simplest will provide information on whether the machine is "working" or "at idle." Is an accelerometer shaking? Is an alternator generating more than a certain voltage? Is oil flowing in the lines that drive the slew motor?

The various sensors and telematics systems were designed to "put a mechanic in the cab" and help maintenance managers understand what is going on with the machine. The clean telematics feed flowing down the black arrow enables the maintenance manager to schedule preventive maintenance actions, measure fuel consumption, and perform a variety of other critical tasks.

Location and time spent "working" and "at idle" are also used to reconcile the hours worked reported by the job superintendent. There are many negative aspects to the reconciliation process, and there are serious complications associated with changes once the job superintendent has certified the DJCR and the data has flowed along the thick green arrows into the CFO's data base.

## Support rather than question job cost reporting

Sensor technology and the wireless communication needed to make the telematics systems work are

complex, and there is frequently some noise in the signals produced. Most systems, therefore, have mechanisms for cleaning the data, and huge strides are being made to improve reliability and confidence in both the hardware and the software. A clean telematics feed, as shown in the top of the diagram, is gaining acceptance, and more companies are investing in telematics technology to improve fleet management.

Wouldn't it be nice if we could cause selected parts of the clean telematics feed to flow along the red arrow and help the job superintendent to fill out the DJCR?

The red arrow is, in many ways, the missing link. Relevant pieces of the clean telematics feed must flow to the job superintendent. The machines must be able to tell the job superintendent two things: that they are on site, and that they did work for a given period of time according to their method of measurement. The superintendent should acknowledge, adjust, and certify the hours worked and assign the certified values to the appropriate phase codes.

We would be using telematics and all the associated technology to support rather than question the DJCR process. This would validate the data flowing along the thick green arrows and greatly improve the process.

Telematics is not just for the maintenance manager. Companies that have the red arrow in place have recognized that telematics improves job costing. They report an improvement in job costing and a substantial reduction in workload. This is especially true for machines that are charged to jobs on a daily basis where it is easy to forget that the third variable message board has not yet left the site.

The conflicts and disagreements that come from trying to reconcile hours worked data are also dramatically reduced. The job superintendent and the maintenance manager see the world through the same lens, and differences are settled in real time by the people directly involved.

It is going to be difficult. Telematics has always been seen as a way to "put a mechanic in the cab" and provide data to maintenance managers. The time has come to rid ourselves of the missing link and put the red arrow in place. We need to make telematics a mainstream construction technology and use it to "put a production engineer in the cab."

## About the Author

*Mike Vorster is the David H. Burrows Professor Emeritus of Construction Engineering at Virginia Tech and is the author of "Construction Equipment Economics," a handbook on the management of construction equipment fleets. Mike serves as a consultant in the area of fleet management and organizational development, and his column has been recognized for editorial excellence by the American Society of Business Publication Editors.*

*Read Mike's asset management articles.*

# John Deere Operations Center: Here's What Fleet Managers Can Actually Do with It

## John Deere's telematics ecosystem puts machine location, utilization, fuel use, maintenance, diagnostics, and jobsite data in one place. Here's how it works.

KEITH GRIBBINS

John Deere

Fleet managers manage a lot. They manage machines and attachments. They manage hours, location, fuel, and maintenance. They field service calls. They coordinate mechanics and service vehicles. They admin parts, fluids, and lubricants. They occasionally go all Magnum, P.I. and hunt down missing machines. It's a lot of moving pieces, and increasingly, all those pieces generate a new type of management — data management. Today's construction equipment continually stream data points about everything from location to fuel burn. That flood of information can easily become another thing to manage, or (just maybe) it can become a tool for managing everything else better.

That's the basic idea behind John Deere Operations Center. It's Deere's cloud-based fleet management platform for monitoring connected equipment, and it's helping fleet masters make better decisions with data.

How does it all work?

"Operations Center is designed to turn individual machine data points into a clear picture of how the entire fleet is performing," says Katie Voelliger, product marketing manager at John Deere. "Fleet managers can compare utilization, idle time, fuel consumption and maintenance needs across machines and jobsites, then use those insights to rebalance equipment, address operator-training opportunities or schedule service. Ultimately, that can mean less unnecessary idle time, better equipment utilization and more productive hours on the job."

## JDLink connects the machine to Operations Center

Let's start with JDLink. JDLink is the connectivity hardware and service that moves information between a John Deere machine (or other brand) and the owner's Operations Center account. So we're clear: JDLink and Operations Center are not the same thing. Think of JDLink as the connection. Operations Center is where you actually use the information.

*John Deere*

Deere says JDLink comes standard on most new models of construction equipment. Once connected, a machine can automatically send operating information into Operations Center. That data can include machine location, engine hours, engine load, utilization, idle time, travel time, working time, payload, cycle counts, fault codes, temperatures, pressures, battery voltage, regeneration activity, grade-control information, so many things!

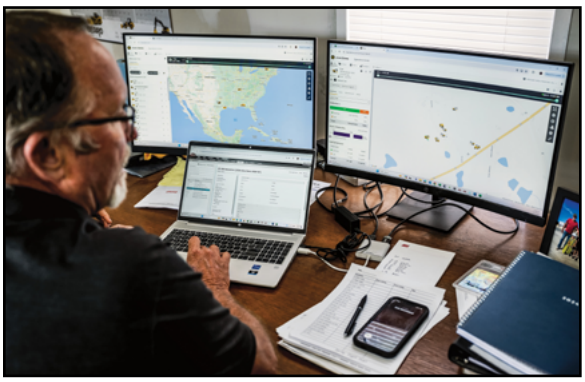
"We know most contractors operate mixed fleets, so Operations Center is designed to provide visibility beyond John Deere equipment," says Voelliger. "Supported non-Deere machines can be brought into the platform through compatible connectivity hardware or data-sharing connections, giving fleet managers one place to monitor core information such as location, hours and equipment status. The level of detail depends on the machine and connectivity source, while compatible JDLink-connected John Deere machines can provide deeper machine-specific information, including utilization, fuel data, and diagnostic trouble codes."

How much does this all cost? Sharing basic machine data does not require an additional subscription, says John Deere. But fleets can pay for tools such as John Deere Operations Center PRO Service, which adds lots of cool stuff: advanced diagnostics, repair information, live diagnostic readings, tests and calibrations, and controller reprogramming capabilities on compatible machines. Deere says customer licenses for Operations Center PRO Service start at $195 per machine annually.

## Alerts, Jobsite Manager, and Summary Cards

We suggest busy fleet managers start off by setting up some alerts in Operations Center. Create custom alerts around conditions such as idle time,

machine speed, fuel levels, or location. If a machine crosses a defined threshold, the system can flag it and let you know. That's just one example. Complementing the efficiency of alerts, Deere has also created tools in Operations Center to help users crunch numbers and see the data better. The **Jobsite Manager** tool organizes data around a project. Fleet managers can create jobsites — or allow Operations Center to automatically create them — and see the connected equipment working at each location. **Summary Cards** then roll that information into quick snapshots of job progress — fuel consumption, machine locations, and unit utilizations. Instead of checking 15 machines individually, a manager can step back and get that 30,000-foot view.



*John Deere*

## Machine Analyzer and Remote Display Access

This is one of our favorite widgets in Operations Center — the Machine Analyzer. Instead of simply seeing that a machine logged 10 engine hours, you can dig into how those hours were spent — working, idling, or traveling — and compare utilization and fuel consumption across machines and periods of time. The Machine Analyzer helps turn all those individual data points into patterns. What's even cooler? John Deere recently updated Machine Analyzer to monitor the use of grade-control technology and payload weighing.

"Investing in technology is only valuable if it is being used, and Machine Analyzer helps fleet managers understand whether that is happening," notes Voelliger. "On supported machines, managers can review the use of grade-control and payload-weighing technology alongside working, idle, and travel time. That visibility can help identify where technology is delivering value, where additional operator training may be needed and how adoption changes over time."

Here's another interesting service: Remote Display Access. With compatible equipment, an authorized person can remotely view and interact with the machine display. That creates the ability to help with troubleshooting or setup assistance without immediately sending someone to the jobsite. Everyone stays put.

## Equipment Mobile is in the palm of your hand

John Deere also offers its Equipment Mobile app, which is aimed at everyday equipment management on a phone or tablet. Users can find searchable operator's manuals, maintenance schedules, parts info, service history, and upcoming maintenance items. Deere has also added what it calls Maintenance Plan Auto Assignment. The feature lets customers add factory maintenance plans to machines and see the specific parts required for upcoming service.

Then, there's Shop.Deere.com, which adds parts diagrams, service videos, maintenance schedules, and parts purchasing.

*John Deere*

## And then there's John Deere Protect

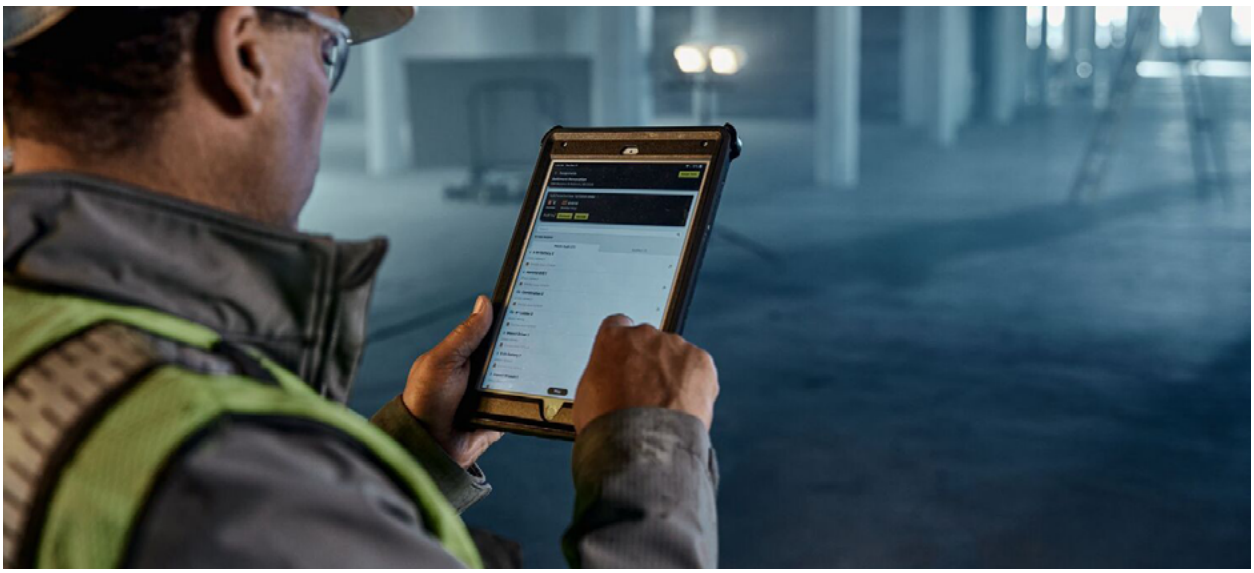
In the back of your mind always remember that analytics and maintenance can be outsourced. Check out John Deere Protect. Deere offers maintenance plans that connect scheduled service with inspections, fluid analysis, machine monitoring, remote diagnostics, parts, fluids, and dealer support. Depending on the plan, fleet owners can perform scheduled maintenance themselves or have certified John Deere technicians handle it.

"Operations Center provides the machine information that helps customers and dealers understand maintenance needs, while John Deere Protect helps turn those insights into a more proactive maintenance approach," explains Voelliger. "Customers can choose a **Parts & Fluids Maintenance Plan** if they prefer to perform scheduled maintenance themselves or a **Core Maintenance Plan** that places scheduled service in the hands of certified John Deere technicians using genuine John Deere parts and fluids. For contractors looking to hand off more of the maintenance burden, the Core plan and additional services available through participating dealers can provide a more dealer-managed approach, with exact options varying by machine and dealer."

# AI in Construction: Everyone's Talking About It, But Almost No One's Using It

## Only 8 percent of construction pros use AI today — here's what's holding everyone else back.

KEITH GRIBBINS



All photos provided by Dewalt.

AI is frickin' everywhere — except most construction pros still aren't using it for work. A new global survey from Dewalt lays that out pretty clearly. The company polled about 3,400 construction pros worldwide to see how AI is actually being used in the trades and where it's falling short. The result feels like a familiar story in construction — new tech always takes a while to integrate in this old school industry. Construction workers believe AI is cool and coming, but the industry is not currently using AI. Dewalt and friends seem to think the gap between those two things is training. From this press release:

"As jobsites become increasingly complex and technology-driven, the need for practical AI training has never been more important," said Bill Beck, president, tools and outdoors, Stanley Black & Decker [the parent company of Dewalt]. "Our research shows that trades professionals

are eager to develop and apply AI skills that will enhance their effectiveness and adaptability on the jobsite. Yet, too many still lack access to this essential training. At Dewalt, we believe that empowering our workforce with AI education is not just about keeping pace with technology — it's about equipping tradespeople with the tools and knowledge they need to solve real-world challenges, drive productivity, and lead the industry forward."

## How the survey was built

Dewalt surveyed skilled tradespeople and decision-makers across six countries in December 2025, covering residential, commercial, and industrial construction. That's a pretty impressive swath. The U.S. sample alone included 2,481 respondents, with 70 percent from the trades and 30 percent from leadership roles. The study also included a wide range of roles, from operators and electricians to engineers, safety managers, and procurement pros. I write about a decent amount of surveys. The research here looks better than most, so I'd say this is a grounded look at how AI is landing across real jobsites.

*Dewalt*

## Belief is high but daily use is not

The construction industry has already made up its mind on AI. Most construction pros expect it to become part of everyday work sooner rather than later. For U.S. survey results, about 90 percent believe AI will be indispensable within five years, and more than 80 percent expect it to be standard within three. It's a shift that's already underway. For fleet managers, that means AI tools are likely to show up inside software you already use, whether that's telematics platforms, estimating tools, cameras, or maintenance systems.

*Dewalt*

Here's the disconnect. While nearly everyone agrees AI is coming, very few are actually using it day to day. Only about 8 percent of construction pros say AI is part of their regular workflow right now, while a much larger group is still experimenting, researching, or testing tools. The survey results say 86 percent of construction professionals expressed feeling somewhat or very prepared to work with AI, but there's nowhere to do that. Currently, tradespeople rely heavily on self-directed resources such as YouTube (40 percent) and online platforms like Coursera (39 percent) for AI education.

This puts the industry in a familiar spot when it comes to technology. We see the value, but we have not fully committed. Let's just wait and see. I would encourage fleet managers to get ahead. Early adopters are still figuring things out, which means there is time to build internal knowledge before this becomes standard practice. I highly suggest you watch our recent panel on how fleet masters can start adopting AI technology and workflows.

## Where AI is actually showing up on jobsites

Right now AI is helping construction workers handle the parts of the job that involve data, planning, and decision-making. The strongest use cases right now are pretty practical. For early adopters, jobsite workflows come first. According to the survey:

- 46 percent report exploring AI in site operations and monitoring
- 46 percent report leveraging it in the planning and design phase of projects
- 41 percent are using AI to help with estimation, procurement, and supply chain processes

This data definitely aligns with where I see fleet managers struggling — paperwork, coordination, asset monitoring, and communication. Early adopters could reap the benefits, which go well beyond those just mentioned and also include increased productivity, utilization, security, safety, and cost savings. Start to add in things like predictive maintenance and machine control systems, and AI can become a powerful partner in a variety of ways.

## What Dewalt is doing with ABC

Dewalt is not just publishing the data. The company is trying to address the training gap directly. It has partnered with Associated Builders and Contractors to roll out hands-on AI training initiatives, including pilot programs and a monthly webinar series focused on real jobsite applications. The goal is to give both new and experienced workers a practical starting point for using AI. Here's what that effort includes:

- A hands-on AI pilot program through ABC's Central Florida chapter
- A monthly "AI Toolbox Takeaways" webinar series
- A $75,000 grant to the Trimmer Construction Education Fund

"Education is vital to bringing fundamental AI skillsets to our future workforce," said Matthew Abeles, ABC vice president of construction technology and innovation, in this press release. "Dewalt's commitment to providing AI resources to craft professionals through its donation to the Trimmer Construction Education Fund will be invaluable to improving safety and productivity on jobsites. ABC thanks Dewalt for its generosity and dedication to lifelong learning in the construction workforce."

## What this means for fleet managers and operators

AI is not here to replace your crew. In fact, your jobs are probably more secure than mine. But soon, AI will be required as a support mechanism. There's no getting around it. The biggest impact will come from how quickly teams learn to use it in everyday workflows. That includes planning jobs, managing equipment, tracking performance, and making faster decisions. The companies that invest in training now will be the ones that move faster later. The rest will be playing catch-up when AI becomes standard across the industry.

# Where to Find the Best Equipment Cost Data

## Understand the strengths and weaknesses of cost-tracking systems.

CRAIG GRAMLICH

ID 6472277 © Paulus Rusyanto | Dreamstime.com

When it comes to knowing costs, equipment data can be scattered across an organization, with each source telling a different story. The critical question is: Which dataset is the real source of truth for equipment costs?

Accurate and timely data is essential for decision-making, but perspectives vary. Maintenance trusts the work order system, Operations depends on job tracking, and Accounting considers financial records as definitive. Each perspective is valid, but determining the real source of truth requires understanding how costs, charges, and data flow through the organization.

### What equipment data is available in a CMMS?

A CMMS manages and tracks maintenance activities, automating many tasks to ensure equipment is properly maintained. Here's what a CMMS excels at:

- Work orders: Work orders detail tasks, equipment, parts needed, and personnel to complete the tasks. They include preventive maintenance, condition-based tasks, and one-offs for down-events, damage, or capitalization-related costs.
- Asset lists: Lists contain detailed information about each piece of equipment, including make,

model, serial number, purchase date, and warranty information. This data aligns with matching equipment to operational needs and classifying equipment for internal rate charge-out systems.
- Inventory management: Keeping track of spare parts and supplies ensures that necessary items are available when needed, reducing downtime.
- Maintenance history: Logging all maintenance activities performed on a piece of equipment provides a history that can be used for repair analysis.

Although a CMMS provides vital data for maintaining and managing equipment, it has certain limitations.

- Cost tracking: Most systems operate outside the organization's enterprise software, lacking integration to true-up to actual costs or reconcile and report on the total cost of ownership (TCO). A CMMS may track certifications and registration renewals, but it does not account for depreciation, insurance, lease, or rental payments, thus omitting ownership costs.

  The system captures only maintenance-related costs such as parts and labor. Without integration to accounting software, labor rates remain generic and user-defined, are not fully burdened, or do not reflect overtime premiums. Parts and consumables such as bulk lubes, tires, or any non-inventoried items are challenging to track, apply to work orders, and allocate costs. Field activities like managing wear parts, grease, fuel, and consumables are also overlooked because they are handled by operations and not formally tracked.

  A CMMS also does not capture or allocate indirect or overhead costs such as the shop facility and the salaries of non-repair staff. Any attempts to include these indirect costs are often makeshift solutions resulting in variances and increased administrative burden.
- Usage tracking: A CMMS is great for tracking meter readings necessary for scheduling maintenance but not for tracking billable hours tied to how equipment was used in the field, which is crucial for accurate utilization metrics and cost recovery.

Since CMMS systems are designed around work orders, they are reliable for maintenance and repair history but incomplete for total cost reporting. Experience has shown that cost accuracy for CMMS systems hovers around the 85% mark for operating costs and less than 10% for ownership costs.

## What equipment data is in project tracking systems?

Project-tracking systems are essential for frontline field operations, helping to track labor, equipment, materials, subcontractors, and other costs incurred to generate revenue. Key strengths include:

- Schedule management: Manages project timelines with detailed schedules and deadlines, ensuring tasks and team members advance revenue-generating work.
- Resource allocation: Allocates resources effectively, including labor, equipment, and subcontractors. Configured properly, some can even track equipment availability and usage to minimize downtime and optimize utilization.
- Cost tracking: Integrates various expense categories, providing original estimates, projected budgets, and the tracking of actual expenditures against them.
- Real-time updates: Provides real-time project status updates, allowing project managers to quickly identify change, address issues, and keep projects on track.

These systems also have limitations.

- Integrations: These tracking systems rarely sync and integrate seamlessly with accounting and other software, leading to unreconciled, or preliminary, financial data.
- Equipment-specific items: Project software lacks detail on maintenance history, depreciation, and operating costs, obscuring the true cost of equipment usage. They either lack equipment costs entirely or use some form of user-defined value or internal rate to charge projects for equipment use. These rates are based on estimated ownership and operating costs. Any deviations to actual costs incurred or usage from the assumptions used to create these estimated rates result in variances that impact bottom-line financials which only become apparent as costs are reconciled after a project is completed—leading to skewed margins and profitability.

  Any operating cost not covered by the internal rate, such as wear parts, grease, fuel, consumables, steam cleaning, and operators, are often coded directly to the project rather than tagged or tracked to specific pieces of equipment due to system or administrative limitations.

  Data inputs for non-project-related metrics, such as time and costs spent greasing, fueling, or even entry of equipment meter readings and usage are lower priority than field production metrics like lineal meters or banked cubes. This incomplete data capture for equipment-specific information leads to an inability to see and respond to preventive maintenance and underutilization.
- Indirect cost allocation: Systems do not track or allocate indirect costs, such as overhead, to specific projects, and rely on percentages or estimates.

Project tracking software is invaluable for managing project schedules, resources, and estimated costs. It has limitations, however, in capturing complete and accurate equipment usage and the variances between charges and actual costs. This creates a "margin mirage" that ultimately impacts bottom-line profitability.

## What equipment data is in accounting systems?

Accounting software and enterprise resource planning systems (ERP) produce the financial statements for the organization and generally handle all money-related functions, linking payroll, accounts payable, purchasing, etc. The strengths of these systems include:

- Cost reporting: The interconnected nature of the ERP systems across payroll, A/P, purchasing, and other monetary systems ensures both accuracy and timeliness in financial reporting, making it the most accurate source for equipment cost data. The accounting system tracks or calculates all ownership costs, including purchase, depreciation, insurance, license, and registration. It captures all operating costs from maintenance to field operations. The system also includes all indirect costs, from workshop and yard expenses to head office and corporate general and administration (G&A).
- Internal rates and variances: The accounting system contains and administers the internal rate tables and charges for equipment use, making it easy to compare actual costs versus internal rate recovery and identify variances.
- Profit & loss: Accounting software produces P&L reports. It can produce P&L reports by fleet, class, or unit, simplifying the analysis of over/under recovery.

Cost data is certainly the primary benefit of accounting systems, but there are some limitations that include:

- Asset lists: The system tracks assets meeting the capitalization threshold but often ignores those that do not. Depending on the capitalization threshold, items like buckets, generators, or light towers might not be listed.
- Cost coding: This requires an appropriate level of detail in the cost code setup with consistent usage.
- Data entry detail: Accurate data requires integration with input sources such as time entry, telematics, or manual data collection, which can be administratively burdensome. Manual entry often results in a significant loss of detail and accuracy due to human nature and error.
- Statistical data: Non-monetary data should be viewed skeptically within ERP systems. Unless internal rates or units-of-production require the collection of billable hours or meter readings on equipment, it often results in incomplete data.

Accounting and ERP systems are the most accurate source of equipment costs and data, making them the primary source of truth for the critical step of knowing your costs.

This table details the key features, strengths, and limitations of the different systems.

Identifying the source of truth for equipment costs requires understanding the various systems in the organization. Work order and CMMS systems excel at tracking maintenance, and project-tracking software manages project resources and costs. Neither, however, offers a complete and accurate picture for equipment. Only accounting and ERP systems provide the most accurate financial data, but they can miss detailed equipment information or lack the configuration to report it properly.

By understanding the strengths and weaknesses of each system and following the flow of money through your organization, managers can effectively combine data to accurately report on equipment lifecycle costs, leading to well-informed decisions.

**Systems and Equipment Costs**

| Item | CMMS / Work Order System | Project Management System | Accounting System |
|---|---|---|---|
| **OWNERSHIP COSTS** | | | |
| Certifications | ✔ | ! | ✔ |
| Licence & Registration | ! | ! | ✔ |
| Depreciation | ✖ | ! | ✔ |
| Lease or Rental Payments | ✖ | ! | ✔ |
| **OPERATING COSTS** | | | |
| Preventive Maintenance | ✔ | ! | ✔ |
| Condition Based Maintenance | ✔ | ! | ✔ |
| Repair Parts & Labour | ✔ | ! | ✔ |
| Lubricants | ! | ! | ✔ |
| Fuel | ! | ! | ✔ |
| Wear Parts | ! | ! | ✔ |
| Tires/Tracks | ! | ! | ✔ |
| Operator | ✖ | ✔ | ✔ |
| **INDIRECTS & OVERHEAD COSTS** | | | |
| Workshop / Facility | ✖ | ! | ✔ |
| Utilities & Insurance | ✖ | ! | ✔ |
| Salaried Staff | ✖ | ✖ | ✔ |
| **TRACKING** | | | |
| Meter Readings | ✔ | ✖ | ! |
| Asset Lists/Registers | ✔ | ! | ! |
| Usage / Utilization | ! | ! | ✔ |

**KEY**
**Useable ✔**
**Use with Caution !**
**Do Not Use ✖**

## About the Author

***Craig Gramlich*** *has extensive experience in equipment management across transportation, heavy lifting, civil projects, mining, and construction sectors. Driven by a passion for cost and data analysis, he excels in enhancing equipment accounting, rate modeling, and developing programs for rate escalation and transfer pricing.*

*Through Lonewolf Consulting, Craig effectively unites Equipment, Operations, and Accounting departments, leveraging his extensive field experience to help companies streamline operations and find cost savings, significantly boosting ROI.*

*He holds a Bachelor of Commerce from the University of Alberta and a Certified Equipment Manager (CEM) certification, along with a variety of professional development courses, showcasing his commitment to ongoing professional growth.*

# Burn Less Diesel: Fuel-Saving Tips and Tech Every Construction Fleet Should Know About

## Fuel costs aren't getting cheaper. Learn how better operating habits and the latest technologies can reduce fuel consumption.

S.S. KIM, LEE TICE, TOM VALBAK, KEITH GRIBBINS

Photo credit: ID 25079625 © 350jb | Dreamstime.com

Fuel has always been one of the biggest expenses on a construction project. That hasn't changed. Even though today's construction equipment burns less diesel than ever, rising fuel costs continue to pressure equipment owners and fleet managers. The good news? Contractors have more tools than ever to run more fuel-efficient diesel operations. Today we got smart engines, intelligent hydraulics, eco modes, and advanced telematics connecting it all. Of course, some of the biggest savings come from thoughtful changes — shutting machines off instead of letting them idle, matching equipment to the job, and letting onboard technology help do the work. To do our part in this effort, we gathered expert advice from industry leaders and then took a look at the technologies helping contractors squeeze more productivity out of every gallon of diesel. Let's start off with...

### The true cost of excessive idling

**This section was written by S.S. Kim, product manager of mid-size excavators, at Volvo Construction Equipment.**

It's common to see a diesel engine left running while an operator waits on a truck, checks a grade, or takes a quick break. While many assume the only downside to idling is a few gallons of wasted fuel, the actual impact on a machine's lifetime operating cost is much more severe.

*Volvo Construction Equipment*

**Accelerated maintenance and component wear**: Idling actively beats up the engine. At low idle speeds, an engine doesn't reach its optimal operating temperature. This causes incomplete fuel combustion, leading to soot buildup on valves, cylinder walls, and piston rings. For modern diesel engines, this soot quickly plugs the diesel particulate filter (DPF), leading to more frequent forced regenerations, increased downtime and premature exhaust system failures.

**Artificially inflating engine hours**: Perhaps the most hidden cost of excessive idling is how it degrades resale value and warranty coverage. Hour meters track engine runtime, not distance traveled or tons moved. A machine that idles 40 percent of its life racks up thousands of non-productive hours. These hours speed up the intervals for mandatory services, exhaust warranty coverage prematurely and drastically lower the machine's residual value when it comes time to trade it in.

**Where the savings begin**: Transitioning away from a culture of constant idling requires visibility. By utilizing telematics data to track exact idle percentages across a fleet, managers can identify baseline habits and train operators on when to shut down. Minimizing unnecessary runtime is one of the simplest ways to preserve the life of the equipment while cutting back on operating costs.

## Fuel-saving practices that make a difference on today's jobsites

**This section was written by Lee Tice, senior product manager, JCB North America.**

Fuel efficiency is no longer just about engine technology. Across today's construction industry, contractors are finding that equipment utilization, operator habits, and jobsite planning often have the greatest impact on fuel consumption. One of the simplest opportunities is reducing unnecessary idle time. Even short periods of idling throughout the day can add up to significant fuel costs across an entire fleet. Telematics systems and onboard monitoring tools help identify excessive idle time, allowing fleet managers to coach operators and improve machine utilization.

*JCB*

Matching equipment to the application is equally important. Oversized machines may consume more fuel than necessary for lighter-duty work, while properly sized equipment can often complete the same task with lower operating costs. Selecting

the right attachment and ensuring it matches the machine's hydraulic capabilities also helps maintain efficient performance.

Routine maintenance remains another key factor. Clean air filters, properly maintained cutting edges, and sharp attachment components reduce engine load and help machines operate more efficiently. Small maintenance issues that go unaddressed can gradually increase fuel consumption over time.

Finally, thoughtful jobsite planning can produce measurable savings. Organizing material placement, minimizing unnecessary travel, and reducing repeat passes all shorten machine runtime while maintaining productivity. Combined with trained operators and effective workflow coordination, these practical strategies help contractors reduce fuel use, control operating costs, and keep projects moving efficiently.

## Run the numbers before you sign another fuel delivery invoice

Fuel delivery is one of those costs that's easy to set up and never think about again. But how much is that convenience costing you? Say your site burns 300 gallons a day. Even at a modest 30-cent-a-gallon premium, you're looking at over $8,000 in delivery charges in 90 working days, and that's before any feeds for after-hours drops or half loads. Let's compare with a 920-gallon fuel trailer. Labor to fuel up daily, couple weekly runs to refill, and that same 90 days runs closer to $3,000. That's a few thousand a quarter and grows the more fuel you burn. Delivery isn't always the wrong move, but hardly anybody actually prices the other option before signing. — Written by Lee Withers, regional sales manager, Thunder Creek Equipment

## Telematics can lead the charge in your fuel-saving mission

**This section was written by Tom Valbak, CEO, Xtellio.**

*Xtellio*

If you are considering adding a telematics solution to improve fuel efficiency, start by asking a few practical questions.

**What information can your equipment provide?** Engine hours, ignition status, fault codes, location, and fuel levels can help managers identify excessive idling, underused assets, inefficient deployment, and emerging maintenance needs. However, that information creates value only when it reaches the people and systems responsible for fleet decisions.

**Will a telematics solution work across your entire fleet?** Most contractors operate a combination of brands, equipment ages, small tools, and non-powered assets. A flexible system can close those visibility gaps without forcing you to replace otherwise productive equipment.

**What is the utilization?** Use the actual operating hours rather than relying only on calendar-based service intervals. Servicing machines according to real utilization can reduce unnecessary maintenance while helping prevent missed service on heavily used equipment.

**Do you have an operational baseline?** Before setting improvement goals, measure runtime, idle time, fuel use, and equipment movement, then focus on exceptions rather than overwhelming teams with every available data point.

**Is your platform closed or open?** Data should integrate with the fleet, maintenance, or business systems you already use. The goal is not just to collect more data; it's to make faster, better-informed decisions that reduce fuel use, downtime, and total operating cost.

## Cool fuel saving technologies

Good operating habits remain the fastest way to cut fuel costs, but equipment manufacturers continue to make those savings easier to achieve. Today's machines automatically manage engine speed, hydraulic flow, idle time, and drivetrain performance while telematics platforms help managers identify waste across an entire fleet. Let's take a look at some good examples.

## Liebherr Power Efficiency

Liebherr approaches fuel efficiency as a complete machine system rather than a single engine feature. Its Liebherr Power Efficiency (LPE) technology continuously coordinates the engine, hydrostatic transmission, and hydraulics to match power output to the task at hand. By automatically adjusting engine speed and hydraulic pump displacement, LPE can reduce fuel consumption by up to 20 percent compared to previous-generation machines. The Liebherr L546 wheel loader showcases that philosophy throughout its design. Engineers mounted the drive components at the rear of the machine, where they serve as a natural counterweight. That balanced weight distribution improves stability, increases efficiency, and helps reduce fuel use without adding unnecessary ballast. The focus on efficiency extends beyond operation. A single rear hood provides ground-level access to the entire engine compartment, allowing technicians to reach service points quickly and safely. Faster maintenance means less downtime and lower ownership costs. The L546 pairs its efficient powertrain with a hydrostatic travel drive and durable components designed for long service life. For more info, visit Liebherr's website.

*Liebherr*

## Bobcat V-Drive hydrostatic transmission

Modern construction equipment is increasingly equipped with technologies designed to reduce fuel consumption without sacrificing performance. One example is the V-Drive hydrostatic transmission available on the Bobcat TL923 telehandler. Unlike traditional transmissions that require manual gear shifts, the V-Drive system automatically optimizes machine performance to improve efficiency and deliver a smoother operating experience. Several integrated features contribute to fuel savings. Stop-and-start technology automatically shuts down the engine during idle periods and restarts it when needed, reducing unnecessary fuel burn. A maximum speed limiter allows owners to set travel speed parameters, helping control fuel use while

improving jobsite safety. Eco-Ride lowers engine rpm once travel speed is stabilized, minimizing fuel consumption during transport. Cruise control maintains a consistent travel speed, reducing throttle input and supporting greater efficiency over long distances. Beyond fuel savings, the V-Drive system also reduces operator noise, lowers emissions, decreases engine hours to help preserve resale value, and enhances overall operator comfort. For more info, visit Bobcat's website.

*Bobcat*

## Volvo CE smart technologies

Managing fuel consumption requires machine design that optimizes power output automatically. Volvo Construction Equipment integrates smart technologies into everything from excavators and wheel loaders to haul trucks and compactors. For example, selectable excavator work modes match engine speed and pump flow to the exact task, reducing fuel consumption by up to 10 percent without losing performance. And on the loading side, the second-generation Smart Control system for large wheel loaders regulates rpm to deliver up to 15 percent lower fuel consumption. To curb waste across an entire fleet without operator input, features like Auto Idle and Auto Engine Shutdown automatically drop engine speeds or turn off the machine entirely when controls are inactive for a pre-set time. Integrated systems like these ensure that every machine on the job burns only the fuel required for the task at hand. For more info, visit Volvo CE's website.

*Volvo Construction Equipment*

## Develon excavator controls deliver enhanced fuel efficiency

We've built on the success of our existing excavator platform with the new Develon -9 Series machines, which are designed with a full electric over hydraulic control system, replacing traditional mechanical pilot controls to deliver up to 8 percent greater fuel efficiency. By eliminating physical pilot lines, this state-of-the-art system significantly reduces parasitic engine load while precisely matching hydraulic flow to real-time operator demand. Power is distributed only when and where it is needed, virtually eliminating wasted energy during idling or transition movements. Beyond immediate fuel savings, this seamless electronic transition provides operators with unparalleled precision, smoother multi-functioning, and customizable control patterns. These technical advancements dramatically lower the total cost of ownership by decreasing daily fuel consumption while simultaneously reducing jobsite emissions and cabin noise. The -9 Series excavators represent a major industry leap forward, offering a proven blueprint for the future of sustainable, high-efficiency earthmoving technology across modern jobsites. — Written by Brian Kim, excavator product manager, Develon.

## John Deere JDLink

John Deere JDLink, available through the John Deere Operations Center, has major impacts on fuel savings by offering contractors and fleet managers monitoring capabilities to assist in operator training and maintenance needs. JDLink also provides real-time visibility into machine fuel consumption, allowing operators and contractors to spot inefficient practices quickly. Engine and hydraulic performance are also monitored, helping to detect issues that may increase fuel burn. On select machines, JDLink can show how different operating modes influence fuel use and provide customers with the insights they need to optimize machine performance and increase uptime. For more info, visit John Deere's website.

*John Deere*

## JCB LiveLink

Managing fuel costs starts with understanding how equipment is being used. JCB LiveLink is a telematics platform that gives contractors real-time visibility into machine location, fuel consumption, idle time, operating hours, and maintenance status. By turning machine data into actionable insights, LiveLink helps fleet managers identify unnecessary fuel burn, reduce excessive idling, and schedule preventive maintenance before minor issues become costly repairs. The system also provides service alerts, machine health information, geofencing, and fleet reporting through a single dashboard, helping contractors improve equipment utilization across jobsites. Because LiveLink supports mixed fleets, contractors can monitor equipment from multiple manufacturers in one platform, simplifying fleet management while improving operational efficiency. By helping crews make informed decisions based on real-world machine data, JCB LiveLink supports lower operating costs, increased uptime, and more efficient fuel use across today's construction projects. For more info, visit JCB's website.

*JCB*

## Wirtgen Mill Assist, EcoPlus, and more

Wirtgen Group enhances fuel efficiency in road construction through smart automation, digitalization, and alternative drive systems. Its approach targets reduced fuel consumption and $CO_2$ emissions using technologies such as Mill Assist, EcoPlus, and E-Drive concepts. Wirtgen's F Series milling machines improve efficiency with Mill Assist, which automatically determines the optimal balance between performance, fuel use, and tool wear. In Eco mode, engine and drum speeds are lowered to reduce diesel consumption and noise. Vögele's EcoPlus system uses an energy-optimized tamper drive, switchable transfer gearbox, and demand-based fan control to minimize fuel use and emissions. Kleemann's electric-over-hydraulic

and E-Drive systems further boost efficiency by reducing reliance on diesel power. With the option to run on external electricity, these solutions lower fuel costs, emissions, and overall environmental impact while maintaining productivity. Together, these technologies reflect Wirtgen Group's commitment to resource-conservation. For more info, visit Wirtgen's website.

*Wirtgen*

## Xtellio telematics platform

Companies can better manage their fleet's fuel efficiency by using connected telematics. Today's modern technology enables the ability to see what equipment is doing, where it is, and what it needs. Xtellio's Pro Xentral devices can be paired with its Xense portfolio of Bluetooth sensors to build visibility across mixed fleets, including heavy equipment, smaller machines, and other assets. Their wired devices, smaller than smartphones and only an inch thick, capture operating information such as ignition status, run hours, daily activity, and location. Wireless fuel-level sensors provide real-time readings, helping teams plan refills based on genuine need. Together, these insights can reveal avoidable runtime, improve equipment allocation, reduce service trips, and prevent machines from sitting idly. Better fuel-level visibility helps to streamline delivery routes and lowers the risk of emergency refueling. For more info, visit Xtellio's website.

*Xtellio*

## Maybe just go electric: Skyjack's battery-powered scissor lifts

Skyjack's electric machines are easily rented to support the diverse environmental needs of the construction, manufacturing, technology, and energy sectors that are leaning on and producing green technology. The popularity of Skyjack's machines continues to climb as more organizations are reaching for quiet, compact, and maneuverable access equipment with zero emissions. Skyjack's new SJ3232 E electric drive scissor lift features a narrow width, machine length of only 91.6 inches, 550-pound capacity, and low machine weight of just 5,850 pounds. Meanwhile, the new SJ5545 E scissor features a platform height of 45 feet, a load capacity of 770 pounds, and fully welded cross-bracing that improves operator comfort at height. Rental companies and contractors can also rely on the zero-emission productivity of the new SJ45 AJE+ and SJ60 AJE+ battery-electric rough terrain articulating booms and the onsite maneuverability of the compact SJ45 AJN and SJ45 ARJN battery-electric slab booms. For more info, visit Skyjack's website.

# How Close Is Construction to Fully Autonomous Jobsites?

## Why construction's future depends on people, trusted data, and gradual automation — not a fully human-free jobsite.

TROY DAHLIN

All photos provided by Leica Geosystems.

The idea of an autonomous jobsite is popular, and while some in the industry promote the notion that the jobsite is either already or largely self-sufficient, to most, it doesn't look very autonomous — if by autonomous, we mean that no people are needed to start or complete a construction project.

To be sure, some aspects are automated, but the jobsite itself is far from autonomous. If we're honest, it may never reach 100 percent autonomy — and perhaps it shouldn't. That's because technology and autonomy cannot fully replace the human factor — the person on the jobsite who makes decisions based on intangible factors and actionable data.

Even the Jetsons, the cartoon that in many ways accurately predicted where humanity was headed in the 21st century, had people around to perform tasks. The jobsite should too. And while artificial intelligence contributes to the autonomous jobsite, it cannot solve every challenge that the jobsite will present. Unless AI can analyze soil logs and design files, create estimates, assemble bids and schedules, coordinate logistics, and operate machinery without human oversight, in

a rapid and ever-changing environment, a fully human-free jobsite remains out of reach.

## How autonomous is autonomous?

Autonomy is a spectrum, and complete autonomy remains a ways away. We're still in the pioneering phase. While we are continuously automating features and repetitive machine motions, **today, perhaps 5 percent of the jobsite is autonomous**. A good goal over the next 10 years is to reach around 40 to 50 percent autonomy, meaning not fully autonomous but rather more automated components, with a few autonomous assets we can leverage.

*Grade control is impressive automation tech.*
*Leica*

Machines cannot replace the intuition and judgment of experienced operators. Consider compaction, which is still as much a mystery to contractors today as it was decades ago. Operators still interpret the data, and it's often more of an educated guess, based upon years of experience with different soil and rock types, in differing weather conditions.

When someone figures out how to measure density with a roller, that becomes hugely interesting, because now you're mapping deficiencies in your grade as you go. That's because there is a difference between solving a technology problem and solving a contractor problem. If you solve a contractor problem, it gets adopted. If you don't, it may not add value.

As technology providers, we must focus on solving contractor problems — not just technology problems — to truly add value. People already take what AI says as gospel truth. How do we know the data is reliable before we let it make decisions? It only takes one failure for people to lose trust, and on the jobsite, a failure could be catastrophic.

AI will continue to be an increasingly powerful tool. The journey to an autonomous jobsite will never stop and will continue long after we are all gone.

## Where do we go from here?

Contractors aren't going to flip a switch and go completely autonomous overnight, even if the technology is fully available. We're not built that way; we do things a little at a time. Autonomy is going to come in pieces — function by function and machine by machine. It's not about flipping a switch; rather, it's about building toward it. A fully autonomous jobsite remains a distant goal, if it's achievable at all.

*Let's start by installing a machine guidance system on this excavator.*
*Leica*

Uber uses drivers' cars, while Waymo owns and retrofits vehicles. They have different cost structures, but the same revenue target. Technology has to work, and the business model has to work. Right now, we have good data. What the overall industry lacks is a seamless workflow. We need to move data easily from person to person and then automate that movement. Once that's solved, we can layer in decision-making automation.

## Factories have already done a lot of this

Large OEMs for many years have had factories moving floors, robotics, and automated workflows. As advanced and automated as they are, they are still not fully autonomous. The same is true for construction. We've already automated more than we realize: GPS replaced the many steps of manual layout. We have automated self-leveling buckets and safety systems. Each of these technology improvements and automations seemed small at first. Taken holistically, they have automated significant aspects of the jobsite, but only a small portion of it. Safety and productivity go together. And when you improve both, the entire system also becomes more sustainable.

## Data security must be a pillar in autonomy progress

AI introduces risks. People trust it too much, and the data, unless verified or from a known source, might be biased or wrong. This isn't about being negative on AI; it's about understanding the verification hurdles. As part of that, contractors need to ensure they have the right governance and validation requirements in place. The construction industry has reached an important milestone with the release of ISO/TS 15143-4, a new international standard designed to improve how critical project data moves from the office to the field. This project, leveraging leaders across the industry, is essential for advancing toward true autonomy, as shared standards create the foundation for integrated, automated workflows.

For contractors and project teams working with mixed fleets and multiple technology platforms, this standard helps remove long-standing barriers by enabling smoother, more reliable data exchange across brands. The result is less friction, better collaboration, and more efficient workflows on site.

*Without people, technology doesn't work.*
*Leica*

## It only takes one failure to lose trust

Data security will remain critical, as contractors seek trusted ecosystems and robust protections while leveraging more integrated, automated systems. The construction industry's opportunity lies in balancing automation, data security, and human expertise to build smarter, safer jobsites. Embracing change and participating in the development of new standards and technologies will be key to unlocking the full potential of autonomy, while ensuring that people remain at the heart of every project.

### About the Author

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