



DIGITAL TRANSFORMS PHYSICAL

Inspection for Quality and Field Maintenance Use Cases with **AUGMENTED REALITY**

Throughout a product's lifetime, inspection is a constant.

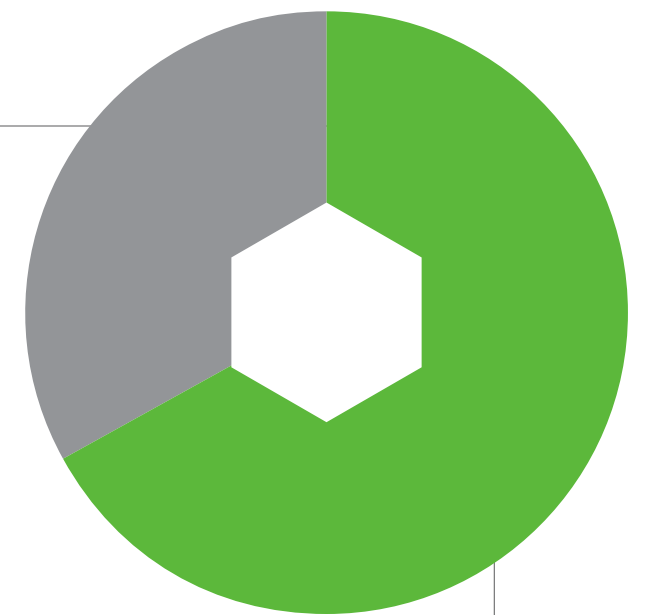
Between verifying product quality at the time of manufacturing before shipment and ongoing aftermarket maintenance and service, inspections ensure products continue to perform as intended. The importance of inspections cannot be overstated and yet for many original equipment manufacturers (OEMs), many inspection processes are still manual, involving paper-based processes and requiring a highly trained eye.

2D digital or paper-based instructions on how to perform inspections are often ambiguous, quickly outdated, and cumbersome to flip through while trying to execute the inspection at hand. Likewise, paper-based records on the results of inspections involve tedious data entry and difficult-to-navigate storage and retrieval. These processes prove to be incapable of democratizing knowledge widely to support continuous improvement.

When it comes to quality inspections and field service maintenance inspections, the limitations of manual and paper-based processes contribute to costly rework and scrap, customer dissatisfaction, and issues with employee safety, training, and retention.

To address these challenges head-on, OEMs are leveraging augmented reality (AR) for the most complex inspection use cases--and reaping meaningful business benefits.

67%

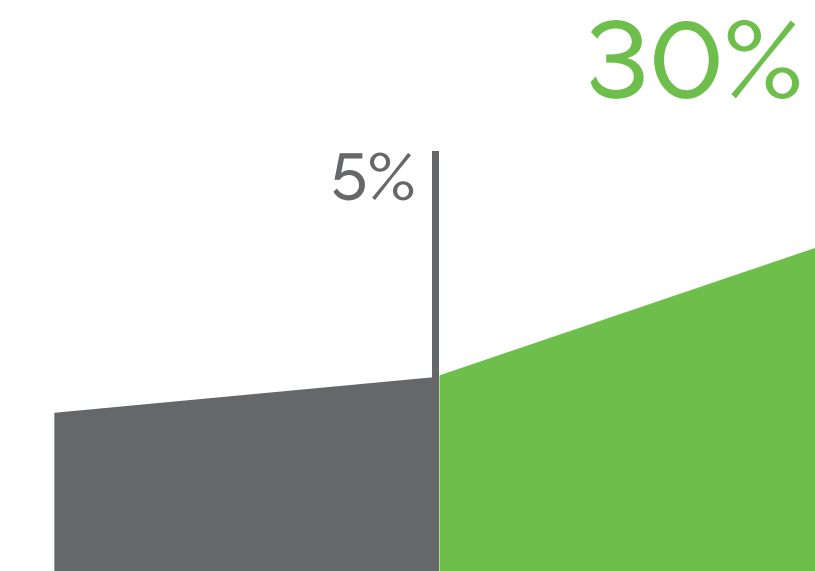


of manufacturers still utilize manual paper processes and inspections within their manufacturing process.

MANUFACTURING QUALITY INSPECTIONS

As a critical aspect of the quality control process, manufacturing quality inspections occur before the sale and shipment of products and are instrumental in finding errors and defects before products reach customers. Pre-assembly inspections focus on the raw materials and components process but the product can also be inspected during and postproduction to ensure it meets engineering specifications.

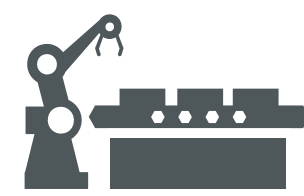
According to Quality Digest, experts have estimated that the Cost of Poor Quality (CoPQ) can range from 5% to 30% of gross sales for manufacturing and service companies.



TYPES OF INSPECTIONS



INCOMING PARTS



IN-LINE



END-OF-LINE



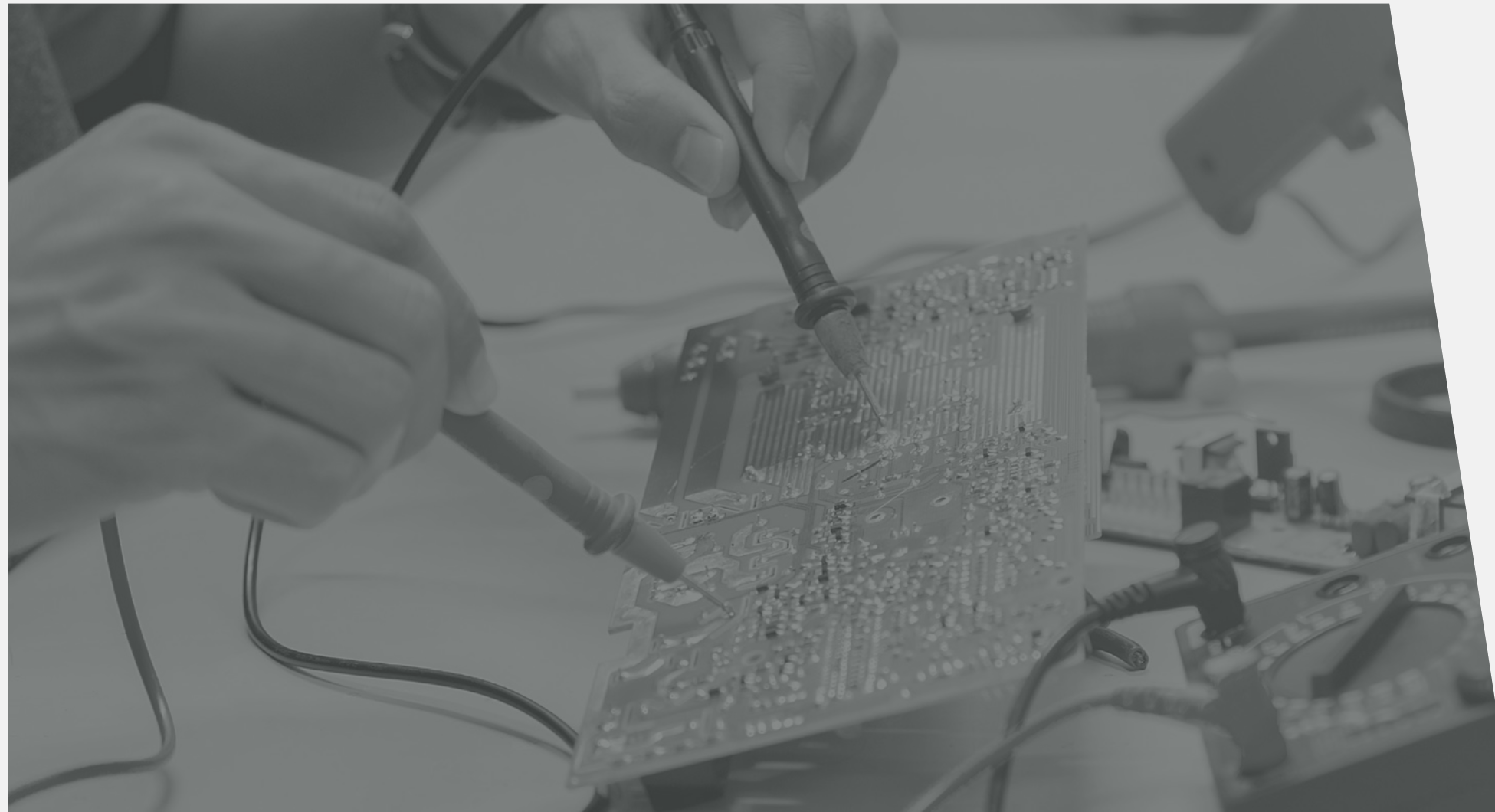
PACKAGING/
CONTAINER LOADING



TRAINING



TYPE OF INSPECTION: INCOMING PARTS



BEFORE

MANUAL, PAPER-BASED PROCESSES

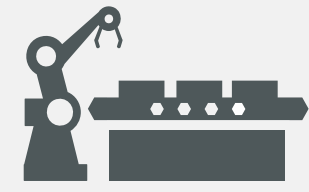
Frontline workers need to perform testing on incoming parts and subassemblies before production to ensure specifications are met. If an issue is missed and an incorrect part is installed during assembly, it can delay production and delivery and hurt warranty costs.



AUGMENTED REALITY

With AR, the relevant 3D digital content is anchored to the product itself. Frontline workers can quickly and easily identify component issues earlier in the assembly process before parts go into production.

AFTER



TYPE OF INSPECTION: IN-LINE



BEFORE

MANUAL, PAPER-BASED PROCESSES

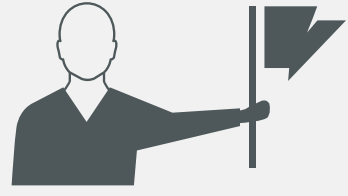
Frontline workers carry out visual inspections during production to ensure products are correct and meet specifications. If a defect is undetected at this stage, finding it later in the production process results in costly scrap and rework.



AFTER

AUGMENTED REALITY

Frontline workers can detect deviations and compare between as-is and as-planned through precise visual comparisons. Defects found during production are digitally captured and communicated so stakeholders can take action to prevent further issues.



TYPE OF INSPECTION: END-OF-LINE



BEFORE

MANUAL, PAPER-BASED PROCESSES

For the final audit before shipment to customers, quality engineers need to visually verify product quality with speed and accuracy. If an incorrect product makes it into the customer's hands, it leads to costly recalls, warranty claims, and poor reputation.



AUGMENTED REALITY

To improve accuracy and efficiency during the final audit, AR standardizes processes and provides easy to follow visual instructions based on best practices. Preventing the delivery of incorrect products protects brand reputation and customer satisfaction.

AFTER



TYPE OF INSPECTION: PACKAGING / CONTAINER LOADING



BEFORE

MANUAL, PAPER-BASED PROCESSES

Using paper-based instructions, frontline workers need to confirm products are packaged according to quality specifications. Ambiguous instructions can cause improper packaging and container loading, leading to product damage, returns, and delayed deliveries.



AFTER

AUGMENTED REALITY

AR instructions provide the necessary 3D context to help frontline workers verify the correct packaging of high-value products that require sensitive handling. Proper packaging and loading are critical to protecting products and ensuring they reach their destination in as-planned condition.



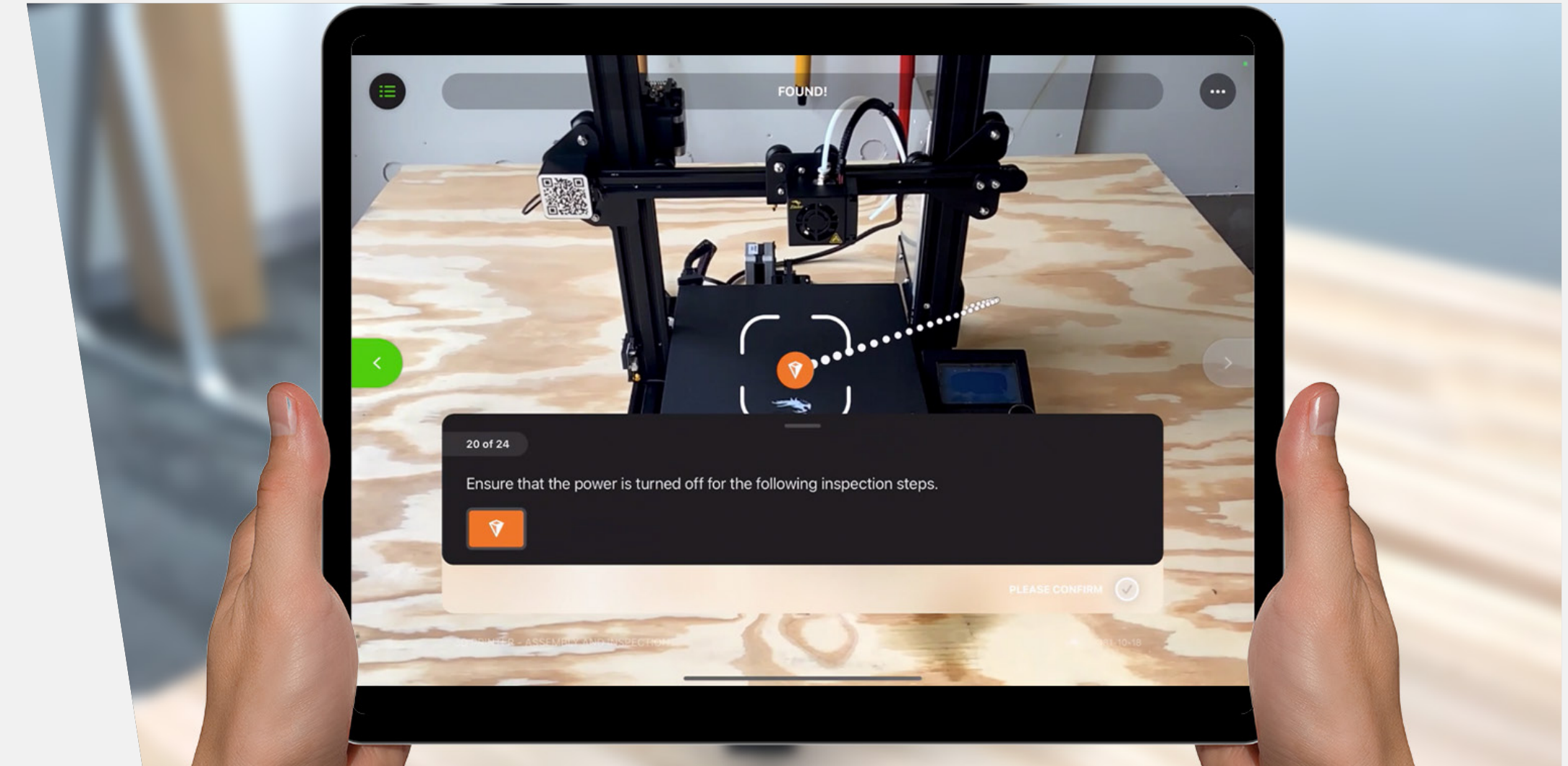
TYPE OF INSPECTION: TRAINING



BEFORE

MANUAL, PAPER-BASED PROCESSES

Efficient and accurate inspection procedures require effective training and compelling learning materials. Paper-based instructions keep new workers in the classroom longer and keep training costs high, particularly for high-turnover industries.



AUGMENTED REALITY

Easy-to-follow visual instructions can bring new workers up to speed quickly and provide more effective on-the-job training, even for complex part inspections. Improved upskilling and cross-training efforts build a more agile workforce and unlock manufacturing flexibility.

AFTER

POST-MAINTENANCE INSPECTIONS

Equipment inspections can proactively identify potential issues so technicians can take action before problems occur and disrupt customer operations. Routine and post-maintenance/repair inspections help ensure better machine performance and prevent major repairs or equipment failure--keeping customer downtime and service costs low.

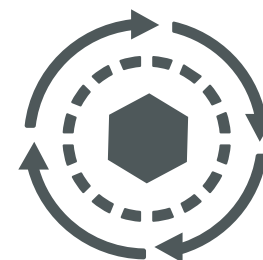
Based on Aberdeen's independent research, unplanned downtime, most commonly resulting from a critical piece of equipment not functioning properly, can cost companies \$250K/hour in lost production, equating to more than \$2 million annually.



TYPES OF INSPECTIONS



ROUTINE
MAINTENANCE



POST
MAINTENANCE



MAINTENANCE
INSPECTION TRAINING



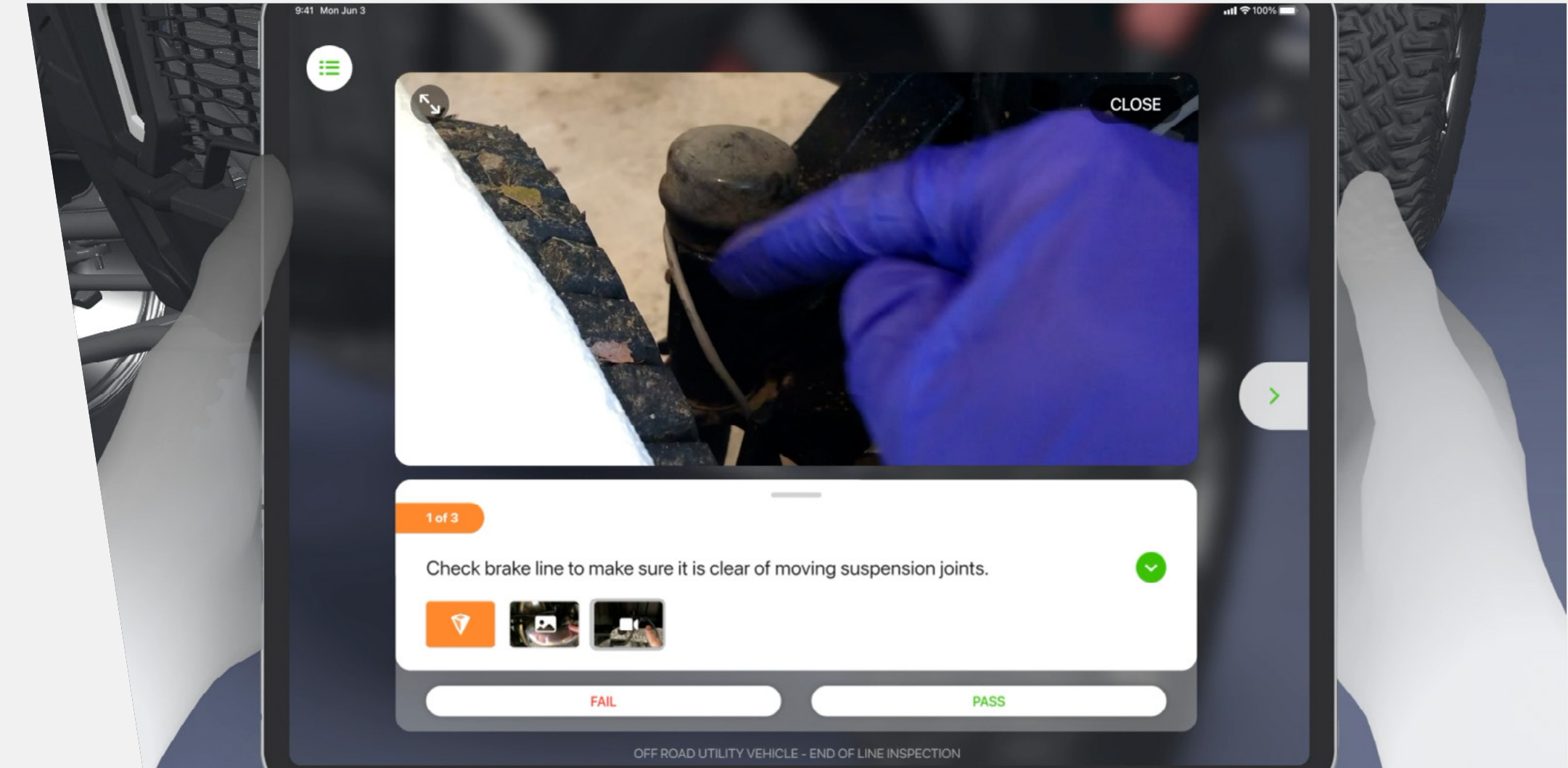
TYPE OF INSPECTION: ROUTINE MAINTENANCE AND PREVENTATIVE CHECKS



BEFORE

MANUAL, PAPER-BASED PROCESSES

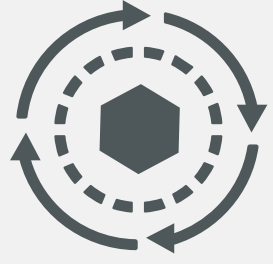
Technicians regularly inspect products under operation to determine how they are functioning. Between observing the equipment and consulting work instructions, technicians can't work with a singular focus and potential performance issues may go undetected and cause failures, resulting in downtime.



AUGMENTED REALITY

Technicians gain clarity with contextualized 3D markers and points of interest that inform them exactly which part they are looking at and where to find it. Increasing technicians' accuracy prevents inspection errors and reduces costly downtime for end-customers.

AFTER



TYPE OF INSPECTION: POST-MAINTENANCE, RETROFIT, AND REFURBISH



BEFORE

MANUAL, PAPER-BASED PROCESSES

Using paper-based instructions, technicians must inspect and verify that routine maintenance procedures were carried out correctly. Overlooking a critical step during this inspection puts the product at risk of failure and prolonged downtime.



AUGMENTED REALITY

Visual cues and guidance on-demand can provide feedback in real-time to confirm every inspection step is completed correctly. Providing confirmation at the time of inspection ensures equipment is running safely and properly and reduces the need for repeat service dispatches.

AFTER



TYPE OF INSPECTION: MAINTENANCE INSPECTION TRAINING



BEFORE

MANUAL, PAPER-BASED PROCESSES

New hires or customer technicians working on unfamiliar products have a higher likelihood of making inspection errors, which can result in safety and machine failure consequences. Lengthy and expensive training limits the ability to cross-train technicians on different products.



AUGMENTED REALITY

AR-based inspection training eliminates the need for paper and enables new technicians to focus on the inspection task at hand, helping to improve accuracy and safety. AR shortens the learning curve for new or existing employees—reducing costs and increasing agility.

AFTER

OPTIMIZE YOUR INSPECTION PROCEDURES

How much are your paper-based inspection instructions driving up the cost of quality—or reducing the quality of your products? Augmented reality unlocks new levels of efficiency, accuracy, and transparency for manufacturing quality and field maintenance inspection use cases. As the latest out-of-the-box AR solution from PTC, [Vuforia Instruct](#) makes it easy to create, execute, and analyze CAD-based inspection instructions for frontline workers.

Read the IDC Tech Spotlight, *Improving Inspection Procedures with Augmented Reality Technology*, to learn how AR helps you drive business value across your operations.

