

**RYDER SMART WAREHOUSES:**  
BUILDING THE SUPPLY CHAIN  
OF TOMORROW, TODAY

# The groundwork for the warehouse of the future is in place

*Powered by the digital supply chain, tomorrow's warehouse relies on a strategic mix of innovative technology to deliver end-to-end execution, control, and agility.*

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The "now economy" and rising consumer expectations of two day delivery through omni-channel fulfillment continue to disrupt supply chains. This disruption is causing executives to utilize new technology based on faster fulfillment and better order accuracy to meet rising customer expectations.

According to the 2017 MHI Annual Industry Report, 92 percent of respondents believe at least one of nine major technologies can transform supply chains and position their companies to meet customer needs over the next 10 years. These technologies include robotics, predictive analytics, drones, autonomous vehicles, sensors, wearables, voice-controlled technology, cloud computing, and 3D printing.

At Ryder, we've extensively examined these technologies and disruptive trends to determine how they support smart warehouses, and deliver the most value to our customers while helping them stay ahead of their competitors. We have prioritized four types of innovative technologies most applicable to creating and supporting a smart warehouse: robotics, sensors and automatic identification tools, wearables and mobile technology, and drones.

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When implemented correctly, these four technologies define the five key attributes Ryder has identified that create a smart warehouse: automate as it makes sense economically; remain nimble with space, staff, and software; scale instantaneously in response to needs; provide 100 percent real-time visibility; and use a web-centric approach to run the business and provide a customer-centric experience.

In this report, we highlight each of the four technologies, the applications in warehouses and distribution centers, and the results achieved by implementing the technologies.



# Robotics

Robotics includes autonomous forklifts, tuggers, transporters, and assembly line vehicles. These devices provide a safe, efficient and reliable solution for the movement of goods in a warehouse, while improving productivity, visibility, and customer service levels.

Robots have the capability to move around in their environment and are not fixed to one physical location. They also have the ability to navigate an uncontrolled environment without the need for physical or electro-mechanical guidance devices. Robots are also tolerant of highly dynamic environments - speed, temperature, etc.

Through implementation, we found autonomous forklifts significantly reduce travel time, giving employees more time to complete other, more complex tasks. According to data, employees spend approximately 30 percent of their shift traveling inside the warehouse. The implementation of robotics at a Ryder-managed warehouse produced 20 to 30 percent increase in productivity, and 20 percent operating savings by decreasing labor costs, raising service levels, and improving efficiency.



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AUTONOMOUS FORKLIFTS  
SIGNIFICANTLY REDUCE TRAVEL  
TIME, GIVING EMPLOYEES MORE  
TIME TO COMPLETE OTHER,  
MORE COMPLEX TASKS

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## ROBOTICS APPLICATIONS

REPETITIVE CASE MOVES

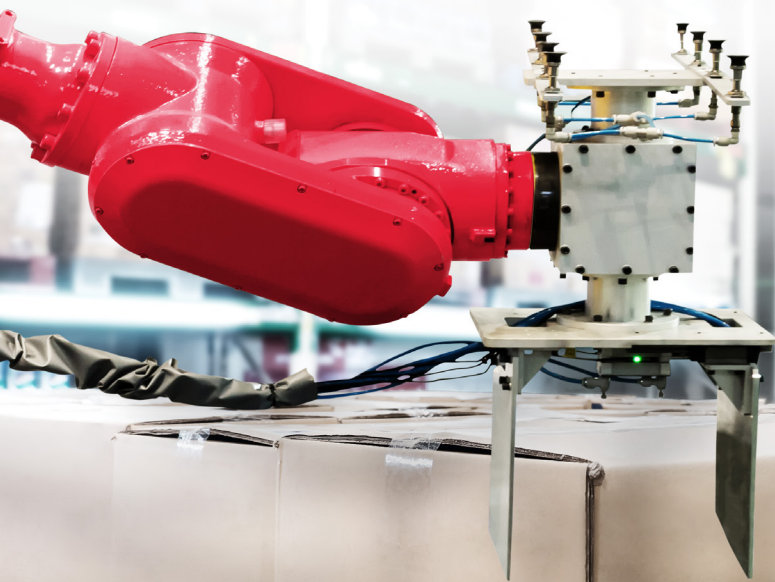
LONG DISTANCE MOVES

EMPTY TRIP

CASE PICKING

PICK TO TOTE

KITTING



## Sensors & tracking technology

Sensors and identification tools automatically locate and profile inventory to capture and communicate data across the supply chain. Inside the smart warehouse, these technologies are used for tracking, tracing, security, inventory consolidation, and event management. They also give complete visibility of products and processes in the warehouse to enable more control and reduce risk.

Identification tools such as RFID and bluetooth technology provide real-time asset location and enable performance management that tracks financial loss, product quality, audit & compliance, customer satisfaction, and safety. This is done through a combination of software and mechanical equipment used to improve the movement of material in and out of a distribution center traditionally handled manually by human labor. When implemented in a Ryder warehouse, productivity and cost savings increased between 25 and 50 percent.

In another application, sensors are used on the clamps of a forklift giving supply chain managers the ability to monitor parameters such as the amount of pressure applied to a product when picked. This actionable, real-time information can dramatically reduce product damage during the handling and delivery process, as it minimizes risk in the warehouse custody chain and provides significant cost savings in inventory loss and accuracy.

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THIS INNOVATIVE TECHNOLOGY  
PROVIDES REAL-TIME ASSET  
LOCATION AND ENABLES  
PERFORMANCE MANAGEMENT

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### SENSORS AND TRACKING TECHNOLOGY APPLICATIONS

RECEIVING

INVENTORY MANAGEMENT

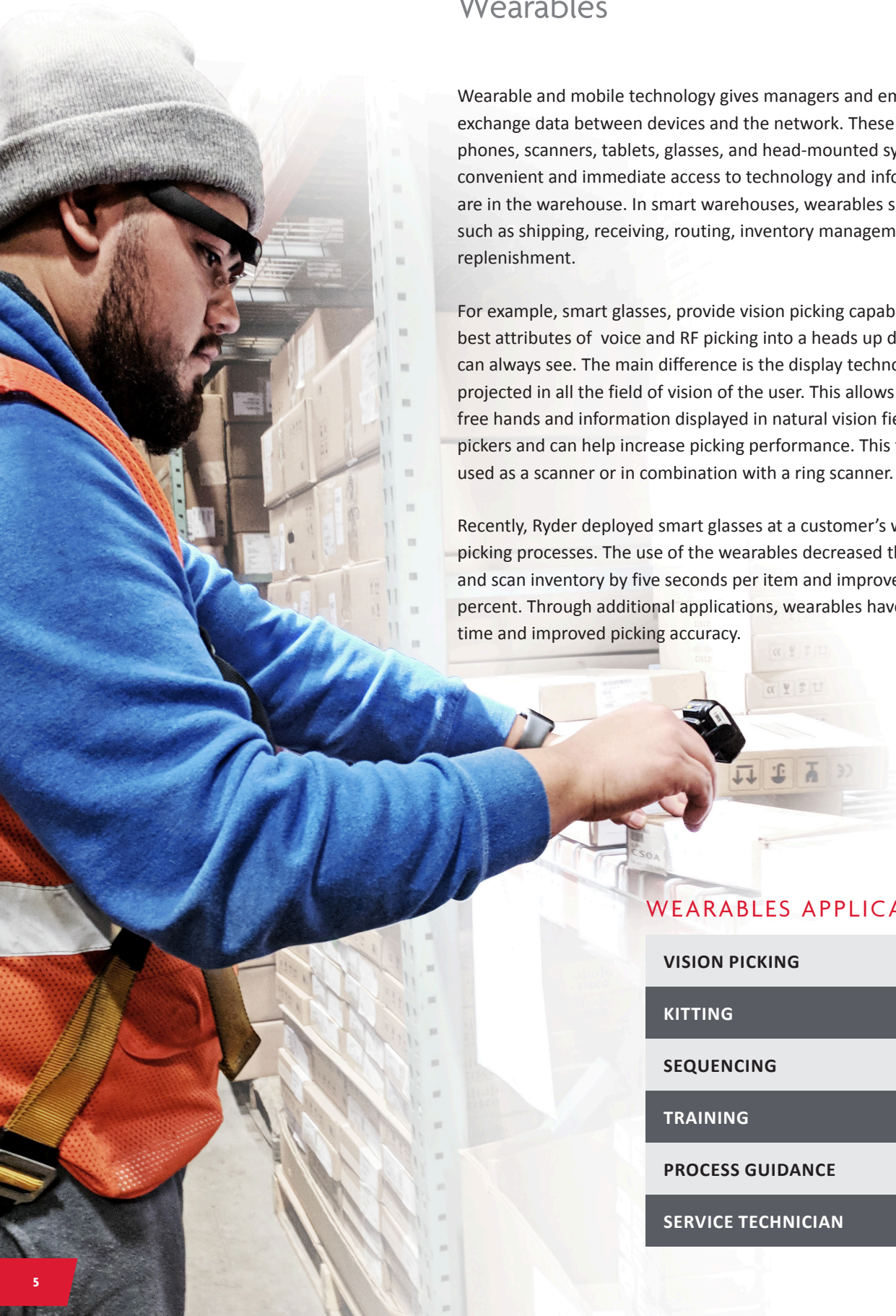
CONVEYANCE

SORTATION

PACKING

PALLETIZING





## Wearables

Wearable and mobile technology gives managers and employees the capability to exchange data between devices and the network. These devices – including smart phones, scanners, tablets, glasses, and head-mounted systems – give employees convenient and immediate access to technology and information wherever they are in the warehouse. In smart warehouses, wearables support core processes such as shipping, receiving, routing, inventory management, picking, and replenishment.

For example, smart glasses, provide vision picking capabilities by combining the best attributes of voice and RF picking into a heads up display that the operator can always see. The main difference is the display technology - an image is projected in all the field of vision of the user. This allows the user to have both free hands and information displayed in natural vision field eases the work for pickers and can help increase picking performance. This technology can also be used as a scanner or in combination with a ring scanner.

Recently, Ryder deployed smart glasses at a customer’s warehouse to improve picking processes. The use of the wearables decreased the time it took to pick and scan inventory by five seconds per item and improved efficiency by 20 percent. Through additional applications, wearables have also reduced training time and improved picking accuracy.

### WEARABLES APPLICATIONS

VISION PICKING

KITTING

SEQUENCING

TRAINING

PROCESS GUIDANCE

SERVICE TECHNICIAN

# Drones

Drones have many uses in the smart warehouse including inventory management, facility management and security. Drones are used to travel through facilities to map the warehouse and update data on inventory and facility conditions. Manually, this task could take two or more employees and at least one scissor lift to complete.

The drone can be programmed by the operator to perform automatic inventory checks throughout the warehouse, accurately identifying inventory in put away locations, at the frequency of your choosing. Moving the process of information capture into the air provides on demand checks and avoids the time, expense, and risk of using a scissor lift to access difficult to reach locations within the warehouse. When Ryder piloted drones in customer warehouses, they successfully scanned 108 pallets and locations in 20 minutes compared to 45 minutes to complete the task manually. Additionally, a cycle count on an entire warehouse that took up to two days to complete, is completed in less than 2 hours with a drone.

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MOVING THE PROCESS OF INFORMATION CAPTURE INTO THE AIR PROVIDES ON DEMAND CHECKS AND AVOIDS THE TIME, EXPENSE, AND RISK OF USING A PEOPLE LIFT TO ACCESS DIFFICULT TO REACH LOCATIONS WITHIN THE WAREHOUSE

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By using drones, employees are better able to focus on value-added functions, assets are freed up, and the task can be completed up to 66 percent faster. Benefits have also including more accurate cycle counting and increased safety.

## DRONE APPLICATIONS

CYCLE COUNTING

INVENTORY VERIFICATIONS

RACK VERIFICATION

FACILITY MAPPING



At Ryder, we are leveraging our relationships with technology providers to work with and understand how these technologies fit into supply chain strategies across all industries including retail, food & beverage, consumer packaged goods, technology, and building materials, and help customers overcome the escalating complexities of the industry. By deploying these technologies in a number of warehouses and distribution centers, we have established best practices that we are applying with our customers across multiple industries.

Through these applications and best practices, Ryder has positioned customers to overcome the disruption caused by the demand of omni-channel fulfillment as well as meet rising expectations. With smart warehouses that are flexible, automated, scalable, and customer-focused, supply chains can quickly become the most valuable tool in driving efficiency and meeting customer needs. Consumers are getting smarter, and now, we're making sure our customer's warehouses and distribution centers are too.



## About Ryder

Ryder is a FORTUNE 500® commercial fleet management, dedicated transportation, and supply chain solutions company. Ryder's stock (NYSE:R) is a component of the Dow Jones Transportation Average and the Standard & Poor's 500 Index. Ryder has been named among FORTUNE's World's Most Admired Companies, and has been recognized for its industry-leading practices in third-party logistics, environmentally-friendly fleet and supply chain solutions, and world-class safety and security programs. The Company is a proud member of the American Red Cross Disaster Responder Program, supporting national and local disaster preparedness and response efforts. For more information, visit [www.ryder.com](http://www.ryder.com), and follow us on our Online Newsroom and social media pages: Facebook, LinkedIn, Twitter, Instagram, and YouTube.