

White paper

Considering the Advantages of Voice for Your Forklift Fleet?

New Multifunction Terminals
Make it Easier than Ever

Voice technology and full-screen, multifunction forklift-mounted terminals that support bar code, RFID and other technologies each have their place in efficient warehouse operations. Both options have relative strengths and limitations regarding their convenience, efficiency, accuracy and the types of information they can collect, process and present to users. While voice- and forklift-based multifunction terminals each have their place, traditionally they have not had a place in the same warehouse, because processes are built around either scanning or voice technology and investment in one tends to preclude investment in the other.

“One leading trend in the warehouse market has been towards a more multi-modal adoption of AIDC technologies. It is not linear barcodes vs. matrix symbologies. It is not voice technologies vs. RFID. Rather it is a mapping of specific workflows and identification of which technology best suits that process, i.e. pallet picking requirements are vastly different to those of case picking.”

VDC Research

http://blog.vdcresearch.com/mobile_and_wireless/2011/01/index.html

This white paper explains why using voice technology and multifunction forklift-mounted terminals and scanners does not have to be an either-or decision. It shares insights from early adopters and other forward-thinking organizations about the role and value of using voice and other input technologies together on multifunction forklift terminals. The paper presents documented benefits, including cost savings, productivity gains and accuracy improvements, and describes how multifunction voice terminals enable efficient new processes, including:

- Receiving
- Putaway
- Picking
- Inspection
- Cross docking
- Exception management

To limit workers to voice- or scan-based processes is to limit the full benefits that automation can provide. Today some of the key integration and cost obstacles that have prevented voice, bar code and RFID technology from being used together are disappearing. There are also new business processes emerging that take advantage of voice in combination with other technologies to produce new levels of accuracy and productivity.

Forklift Mounted Voice and Scanning Terminals Each Have a Place

The benefits and dependability of voice systems have been widely proven and the technology is currently used by hundreds of thousands of workers in warehouses and distribution centers worldwide. Bar code scanning systems are even more widely deployed, while keyboard entry and full-screen terminals also remain popular. Compared to manual, paper-based processes, these technologies produce productivity and accuracy improvements. Compared to each other, the decision to use a voice- or scan-based forklift terminal has historically come down to which input technology best supports the company's preferred work processes, because both technologies offer significant benefit over manual and keyboard-based data entry.

Here is a brief overview of how voice- and scan-based terminals are each used for typical picking operations, and the advantages and limitations to these technologies and processes.

Voice Picking

Picking is by far the most common use of voice technology in distribution centers and its accuracy and productivity benefits have been well documented. In a typical work process, a voice terminal is worn on the order selector's belt, or sometimes is permanently mounted on a forklift, and the user wears a headset. The warehouse management system (WMS) wirelessly sends a pick order, and the voice system directs the order selector to the pick location via an audible message through the headset. Upon arriving at the pick location, the order selector speaks a location code or check digit into a microphone that is integrated into the headset. The system verifies that the order selector is in the right place, and then provides audible instructions for what item to pick and the quantity. The order selector then picks the product and speaks an item identifier into the headset. The identifier may be the product SKU number or a serial number, with system-assigned check digits commonly used in place of long strings of numbers to prevent voice fatigue and reduce the possibility of a data entry error.

The picking process described above is accomplished without any visual prompts or key data entry, so no computer screen, keyboard or other input device are needed. The intuitive voice interface also makes picking operations extremely accurate and efficient. Numerous voice users have reported picking accuracy rates of more than 99 percent.

Improved picking accuracy is a major component of the voice technology value proposition, and drives several other benefits. Companies that use voice technology in their warehouses are 17 percent less likely to add warehouse space to meet their needs and are 1.3 times more likely to improve perfect order rates by improving pick accuracy and on-time shipments.¹ Another independent study² calculated the costs of picking errors at \$10.71 per piece picked, \$9.00 per carton and \$13.86 per pallet. For a high-volume distribution center, each one percent reduction in picking errors results in annual cost avoidance ranging from \$83,145 to \$139,074.

With voice, workers typically raise their productivity along with improving accuracy. Most organizations report picking productivity gains of 15 to 30 percent after implementing voice systems, with additional productivity improvement gained because voice requires very little training and ramp up time for new users. Affiliated Foods, a wholesale distributor headquartered in Texas, is a good illustration of these benefits. After switching from paper to voice picking, Affiliated Foods reduced new employee training time from three days to one, improved forklift driver productivity by 24 percent, reduced forklift staff by 16 percent and raised accuracy to 99.75 percent.³

¹ "Event Driven Warehousing Trends: Voice Users Speak Out" Aberdeen Group. February 2012.

² "On Time and Under Budget: Maximizing Profits with Efficient Warehouse Management" Aberdeen Group. December, 2009.

³ Video testimonial accessible at:

http://www.intermec.com/voccollect/learning/content_library/Videos/index.aspx

Case study accessible at:

http://www.intermec.com/voccollect/learning/content_library/case_studies/cs-affiliated-foods.aspx

While these results are typical, they are not applicable to all companies and work processes. Voice is most effective for highly repetitive tasks with few variations in the process, such as picking. Operations that give workers flexibility for their pick routines (such as the ability to pick items out of the prescribed order to avoid congestion in an aisle) and those that involve frequent exceptions may be better served by another input technology. Companies that use voice technology in their distribution centers are 1.6 times more likely than non-voice users to allow dynamic task interleaving, such as switching employees from picking to replenishment (71 percent of voice users do dynamic task interleaving, compared to 45 percent of non-voice users).⁴ Not coincidentally, voice users were 1.7 times more likely to eliminate idle resources or reduce staff.

Scan Picking

For a typical forklift pallet pick transaction using bar code scanning, the driver checks the screen on a forklift-mounted terminal to read the picking destination. To eliminate driving distraction and improve safety, the screen then goes blank while the driver is en route. Upon stopping at the pick location, the driver scans a location bar code (mounted on the rack, floor or ceiling) to confirm the correct location. The item and quantity to be picked are then displayed on the terminal screen. Items are scanned as they are picked to confirm the transaction, and when all items are accounted for the driver receives new on-screen instructions and the process repeats.

The pick transaction described above is one of the most-used processes in all of warehouse management. Millions of items are scanned after they are picked each day. Bar code scanning is extremely accurate and requires much less time than recording picked items with a keypad or paper form.

Compared to voice, scan-based picking requires a few extra process steps that can limit productivity when repeated over thousands of picks. Removing the bar code scanner from the holster and returning it after each scan takes time. To receive instructions and complete the transaction, drivers must shift their eyes from the screen to the scanner to the item being scanned, which is more time-consuming than voice. Because voice keeps the user’s eyes and hands free, it provides a major safety advantage for forklift operators compared to screen-based systems.

Screens do have several advantages. They can display more extensive instructions, plus images and even video, to provide operators with a higher level of support than is possible through a pure voice solution. This makes bar code systems popular for situations where workers must frequently deal with exceptions. The table below provides basic guidance on the work environments most favorable for each technology.

Of course, real-world work environments do not fit neatly into the categories described in the table. For example, voice may be the most efficient option for picking in a particular warehouse, but not for other common tasks such as cycle counting and cross docking. Because voice or bar code input has traditionally been an either-or proposition, businesses have had to determine which technology provides the biggest net benefit because of its productivity advantage for some tasks and disadvantages for others. Another consideration is that different people work better with different technologies. Businesses need to consider the user experience and decide whether it is worthwhile to make some allowances so workers can use the technology they prefer, instead of the one that could provide incrementally more productivity at the expense of morale.

Barriers to Multi-Technology Systems

In a perfect world, voice, bar code, and RFID technology could be used interchangeably and seamlessly so each technology could be used for the work processes to which it is best suited. In the real world, this hasn’t occurred on a large scale because of the cost required to operate multiple devices and the complexity of integrating them.

As noted, businesses tend to use either voice or bar code in their warehouse or distribution center operations. This division occurs for several reasons. First, when the decision is made to invest in either a forklift-based voice or multifunction, screen-based terminal system, businesses are unable or reluctant to make a second investment in the other. Additional investment has been needed because voice and other input systems (e.g. bar code, RFID) have not had native interoperability. Because voice is a hands-free, eyes-free technology, voice terminals do not have the screens that bar code-based operations require. Unlike bar code and RFID, which are standardized and enable plug-and-play, mix-and-match operations using products from multiple manufacturers, voice recognition remains a specialized, proprietary technology. Ruggedized forklift-mount industrial terminals do not have native support for high quality voice recognition, typically accomplished through the use of a hands-free headset. Further, the voice module must be integrated with both the terminal and with the host warehouse management system.

Operations Characteristics	Recommended Technology
Complex, high-throughput operations with piece and case picking; varied product types with multiple or difficult handling aspects; typical receiving, put away, inventory and loading applications; minimal exception handling.	Voice
Basic, average-throughput operations with lower numbers of SKUs, lower throughput case or pallet level picking, and typical receiving, put away, inventory and loading applications; workers can override assigned tasks to avoid congestion and deal with exceptions.	Terminal-based bar code or RFID reading

⁴ “Event Driven Warehousing Trends: Voice Users Speak Out” Aberdeen Group, February 2012.

Multi-Technology System Benefits

While voice, bar code and RFID all can be highly effective, each has limitations. No single technology is usually the best for all the different tasks that workers must perform. Therefore, organizations must make tradeoffs. They usually choose the technology that is best for their most labor-intensive, highest-volume operations (e.g. picking), and accept the performance limitations that result for secondary activities (e.g. outbound loading). Sometimes they'll use different terminals for different tasks, which drives up capital costs and maintenance expenses. A multi-technology environment featuring voice and multifunction terminals enables organizations to implement the most efficient work processes for all the tasks their workers perform, while minimizing performance tradeoffs related to the limitations of a specific technology.

"The true benefit of voice technology may come not simply as an incremental performance gain, but from its ability to catalyze system-wide improvement by interfacing with, and leveraging, various other supporting technologies....Voice systems pair well with ruggedized mobile computers, RFID, traditional bar code scanners and multi-modal devices that combine these functionalities within a single unit."

Aberdeen Consulting

"A Sound Decision: Utilizing Voice Technology for Improved Productivity and Quality"

If different technologies are going to complement each other in warehouse operations, the technologies need to be integrated. Continually switching among multiple, standalone systems is not convenient for workers and would likely offset any efficiency benefits that could be gained by using the optimal technology for each process. Intelligent integration of technology and process is essential.

The terminal represents the most logical place to integrate functionality. Voice and bar code systems both use terminals, and so do most RFID systems. Voice terminals typically only support voice input, while ruggedized terminals used with bar code and RFID readers typically do not support voice. There are no technology limitations that prevent multifunction terminals from supporting RFID, bar code and voice. These technologies have largely been kept apart by market forces, because solution providers tend to develop one of the technologies and promote it over the others. By voice-enabling a terminal used to support bar code or RFID reading, or adding support for other input technologies to a voice terminal, organizations can maximize their technology investments and manage their operations with the best technology for each specific task.

To maximize convenience and productivity for the user and return on investment for the enterprise, a multifunction forklift-mounted voice terminal needs to seamlessly support different input technologies, peripheral devices and enterprise software applications. Essential features and capabilities include:

- Native support for voice, bar code and RFID so data input is seamless for the user and software applications;
- Sufficient interface ports and/or Bluetooth connectivity to support current and future peripheral needs, including scanners, printers, RFID readers and other devices;
- Compatibility with wireless LAN and wide-area wireless networks to support use in the warehouse, on the dock and in the yard;

- A CAN-BUS interface so the forklift can be included in fleet management applications;
- Support for terminal emulation to provide necessary backward compatibility with enterprise applications;
- Appropriate mounting brackets and power connections to ensure longevity and reliability.

These capabilities have historically not been available, but technology and commercial developments have made it practical and convenient to support voice, bar code and RFID on a single, forklift-mounted terminal. These rugged terminals do not require multiple, separate interfaces to be developed to warehouse management systems and other enterprise applications, or for drivers and interfaces to be installed to enable bar code and RFID input to voice systems. This interoperability means new input technologies can be added to operations without requiring users to replace their existing systems. Now, businesses have a practical path to introduce new technologies and enhanced work processes at their own pace.

With the value potential of multi-technology systems clear and with integration and investment obstacles significantly reduced, the final barrier to implementing multi-technology systems to support warehouse operations is determining the best way to take advantage of them. The following sections highlight how multifunction forklift-mount terminals that support multiple input technologies enable efficient new warehouse work processes.

Use Cases

Here are a few ideas and examples of how forklift-mounted terminals that support voice, bar code and RFID technologies can enable new work processes to improve common warehouse operations.

Receiving with PO confirmation: Using either a voice instruction over the headset, or an on-screen message, the forklift driver is directed to the dock to receive an incoming shipment. Upon arriving, the voice or screen displays the purchase order information, including lists of items that have and have not been recorded. The driver receives a putaway instruction by voice and/or screen, scans or speaks the confirmation after picking up the item, and proceeds to the putaway location. Benefits: efficient voice-directed putaway with a convenient, persistent visual reference of items to receive.

Assisted putaway: Drivers receive putaway location information by voice. If drivers get lost, they can consult a map on the terminal screen and receive directions. With RFID and Wi-Fi enabled forklifts, drivers could receive turn-by-turn instructions via the headset from a real-time locating system (RTLS). Benefits: safe hands- and eyes-free process for receiving putaway instructions; easy visual reference to find destination; lost drivers can find locations without involving other drivers or supervisors; helps new employees who are unfamiliar with layout and putaway locations be productive; especially useful when stock is rotated seasonally and putaway locations are ever-changing.

Putaway/picking location confirmation: Long-range imagers can quickly and accurately read bar codes from 50 feet away. Drivers may have a difficult time reading shelf- or ceiling-mounted location codes from that distance. Benefits: workers have flexibility to use most convenient input method; bar code scanning eliminates possibility of errors resulting from speaking the wrong location code.

Putaway optimization: Putaway instructions are received by voice. Upon arriving at location, the driver can consult a schematic on the terminal screen for optimal stacking configuration. The screen can display special notes or warnings related to the specific location or item. Benefits: optimizes space utilization; improves compliance with putaway plans; supports consistency in item storage; reduces damage.

Cross docking: In this time-sensitive operation, workers could use RFID readers to simultaneously identify all the cartons on a pallet to verify they belong with the shipment, or perform verification by using a bar code reader to quickly scan the labels. The voice system would provide audible confirmation and direct drivers to the appropriate dock, eliminating the need to consult a screen for order confirmation or dock instructions. Benefits: operations are error proofed and productivity is enhanced.

Inspection: Workers would use voice to enter item identification and to approve items that pass inspection. The terminal screen would display a list of common problems and corresponding error codes. If a problem is detected it would be recorded by speaking the problem code (the fastest option) or entering it on the terminal keypad (e.g. "one" for broken product, "two" for damaged packaging, "three" for missing label). The screen would then provide instructions (e.g. deliver to rework; or print new label from forklift-mounted printer). If the problem doesn't meet standard descriptions, the worker could use the keypad to enter a short note. Benefits: more accurate inspection result entry; more flexibility to describe problems and exceptions; repair instructions, diagrams and other information to resolve the issues can be presented on screen for on-site problem resolution.

Screen persistence: Inspection is a good example of a screen persistence application. The worker benefits by having a list of problem descriptions on the screen and does not have to remember the appropriate error code to speak into a voice system. Screen persistence is also valuable when workers have some flexibility for the order in which they pick or put away items, for example, allowing drivers to pick out of the suggested order to avoid congestion in an aisle. Screen persistence would help because drivers could consult an on-screen list of all the items to be picked to make a decision about which item to pick next. The actual picking and putaway transactions would still be completed by voice. Benefits: highly productive and accurate voice data entry maintained; flexibility gained to efficiently work around unexpected conditions.

Exception management: Using screen-based systems with voice is very effective for dealing with exceptions, such as recording problems discovered during inspections, changing the picking or putaway order, reporting a spill, noting a maintenance need, and many of the dozens of other unusual situations that periodically occur.

Using voice and a full-screen terminal that supports other data collection technologies together on a forklift is a relatively new concept, since technology developments have made it practical only recently. More new ideas, use cases and best practices will continue to emerge as businesses apply multifunctional terminals to improve their warehouse work processes.

Conclusion

Using voice terminals or full-screen terminals that support other input technologies no longer needs to be an either-or decision for warehouse operators. Rugged, cost-effective terminals that are now available that support voice, bar code, RFID and other technologies, and there are several advantages to using them. Multifunctional terminals eliminate the performance and convenience tradeoffs that are required when a single input technology is used for all warehouse operations. In a warehouse, where fundamental, repetitive tasks are performed thousands of times each day, using the most appropriate technology to make just a small incremental improvement to the process can produce significant productivity gains and cost reductions. Workers now can have the best of all worlds when it comes to convenient data entry options.

Using multifunctional terminals adds incremental value to warehouse automation programs without diminishing the value of any individual technology used. With multifunctional terminals, warehouses can attain the productivity improvements and 99+ percent picking accuracy associated with voice technology and get the additional contextual information that full-screen terminals provide, all while preserving the flexibility to introduce other technologies and work processes at their own pace. Businesses no longer need to pay a premium for these capabilities by purchasing and supporting multiple terminals and undertaking extensive integration projects. Ruggedized full-screen terminals that support voice, bar code, RFID and other wireless connectivity are now available to support warehouse operations today and provide a clear migration path to tomorrow's best practices.

With an integrated solution, enterprises have the option to use processes that are voice only, voice-and-scan, or voice-scan-and-screen. This flexibility helps maximize labor productivity. Different people work more effectively with different technologies. Some workers are visual oriented and work best with screen-based systems. Others may operate more effectively with voice only. Some work well in a multi-modal environment. Multifunctional terminals can offer all things to all people, allowing maximized value and ROI.

About Intermec and Vocollect

Vocollect, a business unit of Intermec, is the number one developer and manufacturer of voice solutions for mobile workers worldwide, helping customers achieve a higher level of business performance through voice. Every day, Vocollect and its partners enable over 400,000 workers worldwide to distribute more than \$4 billion dollars' worth of goods. Together, Vocollect and Intermec have pioneered voice-enabled workflow and data-collection solutions that have transformed a broad range of industries using ruggedized computers, voice, bar code, RFID, wireless LAN and other technologies.

The CV41 rugged forklift-mounted computer is the first mid-priced multifunctional terminal with integrated support for Vocollect voice technology. It seamlessly integrates Vocollect



voice systems with Intermec data collection technologies. The CV41 runs the Microsoft Windows CE 6.0 operating system, has an 8-inch WVGA touchscreen display, full keypad and provides VT220, 3270 and 5250 terminal emulation. The CV41 has native support for bar code, RFID and voice input, includes USB, RS-232, headset and other interface ports, plus Bluetooth,

802.11-standard wireless LAN and optional wide area wireless network connectivity. The terminal is removable from the forklift cradle to enable quick swap-ins of replacement devices when maintenance or battery recharging is required. The flexible feature set enables the CV41 to easily integrate into warehouse environments, maximize uptime and user productivity, and enable new technologies and inputs to be added in the future.

The CV61 is the larger sibling to the CV41 and successor to the venerable CV60. Like the CV41, it also includes integrated Vocollect voice support. The CV61 boosts forklift operator



performance while making it easy to upgrade from legacy vehicle-mount systems. Running either Windows 7 Professional or Windows XP, the CV61 includes a 30.7 cm (12.1 in) LED-backlit touchscreen display, 1.8 GHz Intel Atom processor, an IP66 rating, and backward compatibility with CV60 peripherals.

About Vocollect

Vocollect, a business unit of Intermec, Inc. (NYSE:IN), is the leader in creating and providing voice-centric solutions for mobile workers in distribution and warehouse environments worldwide. The speech recognition software and extreme recognition accuracy of in-vocabulary speech helps customers achieve a higher level of business performance through voice. Every day over 350,000 workers worldwide use Vocollect's comprehensive voice solutions to distribute more than \$3.5 billion in goods from distribution centers and warehouses to customer locations. A global team of over 2,000 supply chain reseller and channel partner experts supports Vocollect voice offerings. Vocollect VoiceWorld Suite integrates with all major WMS and ERP systems, including solutions from SAP AG, and supports the industry's leading mobile computing devices. For more information, visit www.vocollect.com. Vocollect®, Vocollect Voice® and Vocollect VoiceWorld Suite™ are trademarks of Intermec IP Corp. All rights reserved.

About Intermec

Intermec Inc. (NYSE:IN) develops and integrates products, services and technologies that identify, track and manage supply chain assets and information. Core technologies include rugged mobile computing and data collection systems, voice solutions that increase business performance, bar code printers, label media, and RFID. The Company's products and services are used by customers in many industries worldwide to improve the productivity, quality and responsiveness of business operations. For more information about Intermec, visit www.intermec.com or call 800-347-2636.

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