

Voice Technology in the Distribution Center

If shipment accuracy is a mission-critical requirement for your distribution operation, and if operators benefit from working in a hands-free environment, then speech technology represents an excellent opportunity to improve both efficiency and service levels.

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Speech technology requires that operators in plants and distribution centers wear wireless, voice-sensitive computers with headsets. The operators respond to computer-generated speech commands by speaking into the headset to confirm that the command has been executed. The wireless computers are lightweight (approximately one pound), and are typically worn on waist belts.

These portable computers communicate back to a host system through a wireless radio frequency network based on the current 2.4 GHz communications standards. The host computer can be an enterprise resource planning (ERP) system or, more typically, a dedicated warehouse management system (WMS) that creates text-based work instructions issued through traditional paper-based pick lists or radio frequency handheld terminals.

The host computer creates work files throughout the day that are essentially text-based instructions. The data in these work files must be presented to the voice application software where they can then be converted

into speech commands through text-to-speech conversion software or through a pre-recorded digitized text file. To accomplish this, an interface must be developed between the host computer and the software that controls the speech technology. These tasks are placed into a prioritized task queue for assignment to operators based on the preferred operating methodology.

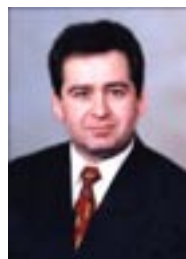
Understanding pick tasks

A simple example might be an outbound sales order normally printed on a paper pick list. Typically, the entire pick list is batch downloaded to an operator's wireless computer to initiate the process. The pick tasks are converted by the application software into computer-generated speech commands. Orderpickers are verbally instructed where to work without the need for paper documents. Depending on the capabilities of the host system, the communication of pick results can be communicated back to the host in real time or through a batch upload at the completion of the order or at the time an exception occurs.

Clearly, the former approach of realtime task confirmation is preferred as it enables better operations and improved replenishment synchronization with picking. Either way, operators confirm transactions by verbally communicating through the headset. The operator's speech is synthesized to text for confirmation by the computer, and the process repeats itself until the work is completed.

Example: grocery distribution

At a recent visit to a grocery distribution center using voice technology, I followed an order selector guided by speech instructions through a headset and mobile



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computing terminal. In this case, the technology was of the speaker-dependent type. The process is as follows:

The operator walks through the pick line with a battery-powered, double pallet jack and concurrently selects two pallets of full-case groceries to be shipped to one of the firm's retail supermarkets.

This operator happened to be a music aficionado who worked with a large portable "boom-box" pounding out rap music at full volume. As the operator walked down the aisle, the headset's speech instructions navigated him to the next pick location in the travel path.

The operator confirmed that he was at the right location by verbally communicating random check digits (e.g., 12 spoken as one-two or check one-two) appearing on a label placed on the rack beam above the product's pick location. Note that check digits are usually recommended to be two-digit numeric identifiers for easy use.

If the check digits match the expected response, then the system instructs the operator on the quantity to pick. Otherwise a mismatch requires that the computer redirects the operator to the correct location. In some distribution operations, the system may also articulate the item number, description, unit of measure and UPC code. In general, voice vendors offer software that allows dialogues to be configured by the end user. In general, it is best to keep dialogues to a minimum so as not to slow down the operators.

Different approaches are available on how to handle the issue of whether an operator may or may not pick the correct quantity. Experimentation may be required to identify the best approach for a given distribution operation.

Fine-tuning speech

To keep computer chatter down, some companies have chosen to never have the quantity spoken by the computer unless it is greater than one. This approach is fine if the vast majority of picks are for a quantity of one and the unit of measure picked is consistent, as in cases. As well, this approach requires that there is no mixing of products in the location being picked from pick or reserve. If either of these conditions is false, then more information must be conveyed to the

operator such as item number and unit of measure.

If a quantity greater than one needs to be picked, then the computer can direct the operator by indicating the quantity, e.g., pick five. The operator can confirm that the quantity has been picked through a confirmation, "five" or "grab five."

Alternatively, a countdown approach can be used whereby the operator is required to count down each unit picked with the intent to increase the probability of picking the right quantity, e.g. five-four-three-two-one. Operators may tend to go around this by just quickly reading out the countdown, but date-time stamps in the task history allow a post-audit to correct those instances.

One other approach is that quantities greater than one be communicated to operators in standard multiples of "X," such as X equals five. An example might be where a quantity of 20 cases is communicated to the operator as four commands of five cases. This approach increases control, versus a single command to pick 20; but this approach may not be popular with orderpickers who would like to know in advance if 20 cases are to be selected to allow improved pallet building.

Eliminating pick errors

The reason this issue draws attention is that if the goal of speech technology is to eliminate pick errors, then it is critical to eliminate quantity-related errors. In this regard, there are multiple techniques that can be deployed to increase quantity accuracy, and each distribution operation needs to be configured according to its business needs.

Where a pick location is empty or short, the operator tells the computer the quantity that can be picked so that he can proceed to the next task or wait for replenishment. In the ideal scenario, shorts or stock outs immediately trigger a prioritized "hot" letdown to replenish the location.

At any time, the operator can request an information repeat in case he forgot or did not hear the instructions. For example, the location name or quantity to be picked can be repeated at any time.

In distribution operations where more item information must be captured as part of the pick

process, the dialogues can be configured to require item-specific data capture. Portable scanners can be connected to the mobile computer to scan longer data streams that are too time-consuming to speak, such as lot number, serial number and UPC code.

Lessons learned

The most illuminating aspect of this particular visit was that the system had no difficulty recognizing and interpreting the operator's speech - despite the fact that less than three feet away, the background rap music was extremely loud. The operator picked his order and built his pallets at a rate of roughly 200 cases per hour, or one case every 18 seconds, with no paper lists, labels or other handheld devices. It is interesting to note that the operator consistently communicated the location's check digit well in advance of actually arriving at the location, thereby speeding work, and in this case, increasing incentive pay. This particular company reported a significant reduction in warehouse employee turnover since they implemented the technology.

In this distribution center operation, management decided to implement a random audit procedure to ensure shipment accuracy. Operators are randomly audited by a supervisor at any time during the picking or pre-shipping process, mainly to catch quantity mispicks. The random audit monitors situations where workers don't want to pick heavy cases even though they have confirmed to the system that they did the work.

Types of operations and functions most suited for speech technology

To date, firms that have invested in speech technology include, but are not limited to, the following industries and tasks:

- Retail and wholesale grocery;
- Foodservice;
- Food manufacturing;
- General merchandise, health and beauty care;
- Convenience stores;
- Apparel and garment;
- Automobile manufacturing;
- Package sorting.

Speech technology has been deployed in functional operations that include, but are not limited to:

- Full-case orderpicking;
- Split-case orderpicking;
- Flat garment orderpicking;
- Manufacturing quality assurance processes;
- Pallet receiving and breakdown operations;
- Putaway and replenishment lift truck operations;
- Cycle counting;
- Package sorting operations that require human intervention for non-labeled packages.

As mentioned earlier, in distribution operations where outbound lot number or serial number tracking or other extraneous information must be captured, it is too time consuming to expect operators to verbally read and speak long character strings. To accommodate this business requirement, a bar code scanner can be plugged into the operator's wireless computer to permit scanning bar coded lot or serial number information. The integration of speech and scanning technology in these distribution centers is an example of how the best of both worlds is achieved.

Voice for high-volume operations

Currently, the vast majority of speech technology implementations are for high-volume full-case picking operations where there are ergonomic advantages to having hands-free paperless picking operations. The grocery and foodservice industries have been early adopters of this technology for several reasons:

- These industries have very low net margins and are characterized by labor-intensive, high-volume distribution operations, especially in the orderpicking function. Speech technology provides improvements in shipment accuracy and labor productivity that are critical to these companies.
- Food distributors often have up to 50 percent of their workers in cold storage environments like freezers where gloves must be worn. The handling of paper lists or labels or the use of radio frequency equipment can be cumbersome and difficult to handle with gloves. Here, voice technology offers paperless and hands-free ergonomics.
- Capturing catch weight information, such as variable weights associated with meats and cheeses, can be done verbally during the pick process thereby

increasing accuracy and saving time and labor associated with keypunching this hand-written data after orders are picked.

- The labor involved with order checking to validate shipment accuracy can be extremely costly. In many operations, the savings in reduced checking labor is enough to cost justify the technology investment with less than a two-year payback.

Broadening to other industries

There are other distribution applications that are excellent candidates for speech technology, but have been slow to take advantage. For example, the drug wholesale industry is characterized by razor-thin margins, high-volume shipments of value products where order accuracy is critical. Other industries include retail mass merchants, automobile aftermarket parts distributors, high-volume office supplies distributors, garment distributors, aerospace and defense, liquor and spirits, computer electronics, home furnishings, candy, tobacco, health and beauty care, and so on. In short, companies that stand to gain the most benefit from speech technology in the distribution center are those firms that distribute high-volume or high-value merchandise where there is low tolerance for errors and where returns are expensive to handle.

Alternatives to speech

In terms of competing technology solutions to improve order accuracy in the distribution center, the two most common alternatives to speech are radio frequency/bar code scanning and pick-to-light systems. Both of these alternatives enable high productivity and high order accuracy in a paperless environment. The following points summarize the tradeoffs of each solution:

- Radio frequency and handheld bar code scanners are about half the cost of a speech recognition terminal; this is an important consideration for small- and medium-sized distribution operations. RF devices make sense when detailed bar code information needs to be captured with each transaction. When companies mix products and units of measure in pick and reserve locations, it becomes crucial to scan the product being handled. Here is where RIP and bar coding makes sense.

- Pick-to-light systems are typically deployed in splitcase picking environments where products are picked from and stored in gravity flow racks. Operators are guided to pick their orders by lights that indicate the pick location and the quantity to pick. Operators push a button to signal the completion of the pick and the next location illuminates. Pick-to-light solutions are commonly used in distribution centers where pick-rate productivity ranges between 300 to 500 order lines per hour or more. Applications include high-volume health and beauty care distribution centers. In these types of operating environments, pick-to-light technology represents a more suitable paperless solution because the use of speech technology would simply slow operators down to a much slower pick rate. Though it is always dangerous to generalize, pick-to-light is a less flexible solution because it is installed with fixed equipment in the distribution center. Therefore, it is difficult to adapt to sudden changes in order profiles, new product lines or significant changes to the distribution operation. One other consideration is that pick-to-light solutions are also deployed in environments where operators do not need to pass one another during the pick process.

This is an excerpt of an extensive article. For a complete copy and for more on KOM International, contact Wulfraat at marc.wulfraat@komintl.com, or phone 514-849-4000, ext. 226.

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